***Zborník vedeckých príspevkov z medzinárodnej vedeckej konferencie***

# *VPLYV INDUSTRY 4.0 NA TVORBU PRACOVNÝCH MIEST 2019*

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1) Innovation in terms of Industry 4.0
2) Social and Economic Development within the Industry 4.0
3) Industry 4.0 and Labor Market Changes

## Program

***Streda / Wednesday - 21. November 2019:***

***Registration*** *$9^{00}$-$10^{00}$*

***Opening ceremony and plenary session*** ***$10^{30}$-$12^{00}$***

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## Keynote speakers:

- ***Martin MORHÁČ***
  „INDUSTRY 4.0 STARTS - HIGH TIME TO START DEVOTING TO THE DEVELOPMENT OF WORKERS"
  Director, SOVA Digitál, Inc.

- ***Eva VANKOVÁ***
  " INDUSTRY 4.0 - CHANGES FROM THE HR PERSPECTIVE IN THE MANUFACTURING COMPANY"
  Human Resources Director, VETROPACK Nemšová, Ltd. Nemšová

- ***Martin HOŠTÁK***
  „IMPACT OF INDUSTRY 4.0 AND ITS IMPACT ON EMPLOYMENT"
  The National Union of Employers

| | |
|---|---|
| **Lunch** | *$12^{00}$-$13^{00}$* |
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| **Dinner** | *$18^{00}$-$19^{00}$* |
| ***Closing of the conference*** | **$19^{00}$-$22^{00}$** |

***Section 1 - Innovation in terms of Industry 4.0***

*Chair: doc. PhDr. Zoltán Rózsa, PhD.*

- ***Ruta ADAMONIENE - Martina BLAŠKOVÁ - Ruta PETRAUSKIENE - Rimantas RAULECKAS***
  THE IMPORTANCE OF INTERCULTURAL COMPETENCE IN ORGANIZATIONS DURING THE 4TH INDUSTRIAL REVOLUTION

- ***Svetlana POPOVA***
  CHALLENGES OF TEACHING AND MANAGING GENERATION Z
- ***Nadja PADE - Rozalia SULÍKOVÁ - Lubomira STRÁŽOVSKÁ***
  STUDENT COACHING IN THE PHASE OF CHOOSING THEIR PROFESSION: GENERATION Z NEEDS ORIENTATION
- ***Andrius STANKEVIČIUS***
  BIG DATA AND MUNICIPAL WASTE MANAGEMENT: CHALLENGES AND OPPORTUNITIES
- ***Biruta SLOKA - Laura KERŠULE - Iluta SKRUZKALNE***
  ROLE OF TELECOMMUNICATION PERSONNEL FOR INDUSTRY 4.0 JOB CREATION
- ***Irena BAKANAUSKIENÉ - Asta KYGUOLIENÉ - Lina ŠIUMETÉ***
  DISCOVERING GENERATIONAL DIFFERENCIES IN EMPLOYER ATTRACTIVENESS: THE CASE OF FINANCIAL ORGANIZATION
- ***Aleksey CHECHULIN - Ekaterina USACHEVA***
  THE IMPACT OF DIGITAL ECONOMY ON THE EMPLOYMENT AND CAREER PROSPECTS OF MANAGEMENT SPECIALISTS
- ***Ruta ADAMONIENE - Aurelija PURAIEE - Vytautas ŠLAPKAUSKAS***
  THE IMPACT OF 4.0 INDUSTRIAL DEVELOPMENT ON THE FUTURE TRAINING OF POLICE OFFICERS
- ***Farheen NAZ - Róbert MAGDA***
  INDUSTRY 4.0 IN INDIA AND ITS IMPACT ON LABOUR MARKET
- ***Irina BRITVINA - Polina SHUMILOVA - Dmitriy ZAKHAROV***
  LABOR MIGRANTS AS A RESOURCE FOR THE SHADOW ECONOMY IN A CONTEXT OF TRANSITION TO INDUSTRY 4.0
- ***Marina IZMAILOVA - Mikhail ABRASHKIN - Margarita SAVINA - Martin ŠIKÝŘ***
  THE STRATEGIC APPROACH TO THE INNOVATIVE DEVELOPMENT OF THE RUSSIAN ECONOMY MARKET
- ***Nikolai SINIAK - Adriana GRENČÍKOVÁ - Ninoslav MARINA – Sergey SHAVROV***
  THE IMPACT OF PROPTECH 3.0 ON THE REAL ESTATE INDUSTRY WORKPLACES
- ***Nadiya DAVYDENKO - Olena LEMISHKO***
  THE IMPACT OF THE INDUSTRIAL REVOLUTION ON THE POPULATION EMPLOYMENT STRUCTURE IN THE AGRARIAN ECONOMY SECTOR
- ***Valentinas NAVICKAS - EOMAS SKRIPKIUNAS***
  SUSTAINABLE ARCHITECTURAL SOLUTIONS IMPACT ON COMPETITIVENESS IN CONTEXT OF INDUSTRY 4.0

## *Section 2 - Social and Economic Development within the Industry 4.0*

*Chairs: doc. PhDr. Jana Marie ŠAFRÁNKOVÁ, CSc. and Ing. Marcel KORDOŠ, PhD.*


- ***Jana Márie ŠAFRÁNKOVÁ - Martin ŠIKÝŘ***
  HUMAN RESOURCE MANAGEMENT CHALLENGES OF THE FOURTH INDUSTRIAL REVOLUTION FOR CZECH SMEs
- ***Daniela NOVÁČKOVÁ - Darina SAXUNOVÁ***
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- ***Jarmila WEFERSOVÁ***
  CROWDWORKING: JOBS IN THE AGE OF DIGITIZATION AND PLATFORM ECONOMY
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- ***Michal BRUTOVSKÝ - Katarína BUGANOVÁ***
  INCREASING THE RESILIENCE AND COMPETITIVENESS OF INDUSTRIAL ENTERPRISES TO EXTERNAL AND INTERNAL IMPACTS THROUGH THE IMPLEMENTATION OF RISK MANAGEMENT IN PROJECT MANAGEMENT
- ***Katarína BUGANOVÁ - Jana ŠIMÍČKOVÁ***
  INCREASING THE COMPETITIVENESS OF ENTERPRISES THROUGH THE IMPLEMENTATION OF RISK MANAGEMENT IN THE CONTEXT OF THE INDUSTRY 4.0 CONCEPT
- ***Vojtech KOŘEN***
  INDUSTRY 4.0: THE SOCIAL DIMENSION OF EDUCATION NEEDS
- ***Lucia STUPAVSKÁ - Veronika JOHANESOVÁ - Miloš ČAMBÁL***
  ANALYSIS OF THE IMPACT OF THE FOURTH INDUSTRIAL REVOLUTION ON EMPLOYEES OF INDUSTRIAL COMPANIES IN THE CONTEXT OF GENERATIONS
- ***Andrea HORVÁTHOVÁ - Emília KRAJŇÁKOVÁ - Rolf KARBACH***
  BUSINESS EDUCATION IN CONDITIONS OF INTELLIGENT PRODUCTION
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  THE INFLUENCE OF THE OFFICE WELLBEING ON USERS'AGILITY IN PROPERTY DEVELOPMENT AS A PART OF INTERNAL MARKETING APPROACH
- ***Eva RIEVAJOVÁ - Michal HRNČIAR***
  IMPACT OF INDUSTRY 4.0 ON THE TRANSPORT SECTOR AND RELATED SERVICES IN THE CONTEXT OF HUMAN RESOURCES DEVELOPMENT IN THE SLOVAK REPUBLIC
- ***Mykolas NAVICKAS - Juscius VYTAUTAS***
  SHADOW ECONOMY IMPACT ON LABOR MARKET AND ITS EVOLUTION DURING INDUSTRY 4.0 REVOLUTION

- ***Emília KRAJŇÁKOVÁ - Jaroslav VYHNIČKA***
  IMPACT OF INDUSTRY 4.0 ON CHANGES IN THE STRUCTURE AND NUMBER OF JOBS
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  IMPACT OF INDUSTRY 4.0 ON THE LABOR MARKET OF THE SLOVAK REPUBLIC IN THE CONTEXT OF LABOR MIGRATION
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- ***Marcel KORDOŠ***
  THE SYNERGY OF TOURISM AND INDUSTRY 4.0 IN SPAIN WITHIN THE EXAMPLE OF AIRBNB AND COLLABORATIVE ECONOMY


## *Section 3 - Industry 4.0 and Labor Market Changes*

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- ***Nikolay ZAKHAROV - Andrey KUZNETSOV - Marina PERFIEYEVA***
  THE IMPACT OF INDUSTRY 4.0 ON THE LABOUR MARKET IN RUSSIA
- ***Vilma TUBUTIENE - Diana SAPARNIENE***
  IMPACT OF INDUSTRY 4.0 ON CHANGES IN PUBLIC OFFICIALS' COMPETENCY FRAMEWORK: CASE OF LITHUANIAN CIVIL SERVICE
- ***Sergej VOJTOVIČ - Magdaléna TUPÁ - Rolf KARBACH***
  CHANGES IN THE LABOR MARKET IN V4 COUNTRIES IN THE CONTEXT OF LABOR IMMIGRATION
- ***Mária HUDÁKOVÁ - Matej MASÁR - Daniel BREZINA***
  PERCEPTION OF PERSONNEL AND SAFETY RISKS BY SMES IN SLOVAKIA AT THE TIME OF THE INDUSTRIAL REVOLUTION INDUSTRY 4.0
- ***Matej MASÁR - Mária HUDÁKOVÁ***
  THE IMPACT OF HUMAN FACTOR ON PROJECTS OF IMPLEMENTATION CONCEPT INDUSTRY 4.0 IN MANUFACTURING ENTERPRISES
- ***Eva IVANOVÁ - Jana MASÁROVÁ - Eva KOIŠOVÁ***
  EVALUATION OF THE LEVEL OF DEVELOPMENT OF DIGITAL ECONOMY AND DIGITAL SKILLS IN THE SLOVAK AND CZECH REPUBLIC
- ***Eva GRMANOVÁ***
  EMPLOYMENT OF FOREIGNERS BY PROFESSION IN THE SLOVAK LABOUR MARKET
- ***Vladislav BERKOVIČ - Tatiana MASÁROVÁ - Adriana GRENČÍKOVÁ***
  IMPACT OF INDUSTRY 4.0 TO CHANGES IN THE STRUCTURE OF JOBS

- ***Valentinas NAVICKAS - Rusné JEGELAVIČIUTĖ***
  FOLLOWERS AS A DETERMINANT OF LEADERSHIP COMPETENCIES DEVELOPMENT DURING INDUSTRY 4.0 REVOLUTION

- ***Miriama DUBOVSKÁ - Eva RIEVAJOVÁ***
  IMPACT OF SELECTED ASPECTS ON LABOR MOBILITY AND IMPACTS OF INDUSTRY 4.0 ON EMPLOYMENT PROCESSES WITHIN THE EURES-T BESKYDY PARTNERSHIP

- ***Tatiana MASÁROVÁ - Jakub SOKOL***
  CHANGES IN SKILLS AND PROFESSION STRUCTURE AS A CHALLENGE ARISING FROM THE ESTABLISHMENT OF INDUSTRY 4.0

- ***Peter SIKA***
  SILVER ECONOMY POTENTIAL FOR THE LABOR MARKET AND INDUSTRY 4.0

- ***Simona HÝŽOVÁ - Kamila MAYEROVÁ - Jaroslav VYHNIČKA***
  REQUIREMENTS FOR EDUCATION AND QUALIFICATION OF PEOPLE IN INDUSTRY 4.0

- ***Anna BONDARENKO - Svetlana BONDAR - Karol KRAJČO - Nikolai SINIAK***
  APPLICATIONS OF STATISTICS IN REGIONAL ECONOMICS IN CONTEXT OF SMART, SUSTAINABLE AND INCLUSIVE GROWTH

- ***Dagmar PETRUŠOVÁ - Peter PETRUŠ***
  USE OF ICT IN ENTERPRISES OF THE SLOVAK REPUBLIC IN THE CONTEXT OF INDUSTRY 4.0

- ***Jana SOCHUĽÁKOVÁ - Katarína KRÁĽOVÁ***
  POSITION OF SME S IN THE CONTEXT OF INDUSTRY 4.0

**OBSAH**

**Úvod / Introduction** ..... **13**

**THE IMPORTANCE OF INTERCULTURAL COMPETENCE IN ORGANIZATIONS DURING THE 4TH INDUSTRIAL REVOLUTION** ..... **14**
*Ruta ADAMONIENE, Martina BLAŠKOVÁ, Ruta PETRAUSKIENE, Rimantas RAULECKAS*

**THE IMPACT OF 4.0 INDUSTRIAL DEVELOPMENT ON THE FUTURE TRAINING OF POLICE OFFICERS** ..... **24**
*Ruta ADAMONIENE, Aurelija PŪRAITĖ, Vytautas ŠLAPKAUSKAS*

**DISCOVERING GENERATIONAL DIFFERENCIES IN EMPLOYER ATTRACTIVENESS: THE CASE OF FINANCIAL ORGANIZATION** ..... **35**
*Irena BAKANAUSKIENĖ, Asta KYGUOLIENĖ, Lina ŠIUMETĖ*

**VPLYV INDUSTRY 4.0 NA ZMENY V ŠTRUKTÚRE PRACOVNÝCH MIEST** ..... **44**
**Impact Industry 4.0 to Changes in the Structure of Jobs**
*Vladislav BERKOVIČ, Tatiana MASÁROVÁ, Adriana GRENČÍKOVÁ*

**TREND ANALYSIS OF INDUSTRY DIGITIZATION IN EU MANUFACTURING SECTOR** ..... **53**
*Daiva BIČKAUSKĖ, Žaneta SIMANAVIČIENĖ, Artūras JAKUBAVIČIUS*

**LABOR MIGRANTS AS A RESOURCE FOR THE SHADOW ECONOMY IN A CONTEXT OF TRANSITION TO INDUSTRY 4.0** ..... **63**
*Irina BRITVINA, Polina SHUMILOVA, Dmitriy ZAKHAROV*

**ZVYŠOVANIE ODOLNOSTI A KONKURENCIESCHOPNOSTI PRIEMYSELNÝCH PODNIKOV NA VONKAJŠIE A VNÚTORNÉ VPLYVY POMOCOU IMPLEMENTÁCIE MANAŽMENTU RIZÍK V PROJEKTOVOM RIADENÍ** ..... **70**
**Increasing the Resilience and Competitiveness of Industrial Enterprises to External and Internal Impacts through the Implementation of Risk Management in Project Management**
*Michal BRUTOVSKÝ, Katarína BUGANOVÁ*

**ZVYŠOVANIE KONKURENCIESCHOPNOSTI PODNIKOV PROSTREDNÍCTVOM IMPLEMENTÁCIE MANAŽMENTU RIZÍK V KONTEXTE KONCEPCIE INDUSTRY 4.0** ..... **79**
**Increasing the Competitiveness of Enterprises through the Implementation of Risk Management in the Context of the Industry 4.0 Concept**
*Katarína BUGANOVÁ, Jana ŠIMÍČKOVÁ*

**THE IMPACT OF DIGITAL ECONOMY ON THE EMPLOYMENT AND CAREER PROSPECTS OF MANAGEMENT SPECIALISTS** ..... **87**
*Aleksey CHECHULIN, Ekaterina USACHEVA*

**THE IMPACT OF THE INDUSTRIAL REVOLUTION ON THE POPULATION EMPLOYMENT STRUCTURE IN THE AGRARIAN ECONOMY SECTOR** ..... **94**
*Nadiya DAVYDENKO, Olena LEMISHKO*

**VPLYV VYBRANÝCH ASPEKTOV NA PRACOVNÚ MOBILITU A DOPADY INDUSTRY 4.0 NA PROCESY ZAMESTNANOSTI V RÁMCI PARTNERSTVA EURES-T BESKYDY .....100**
**Impact of Selected Aspects on Labor Mobility and Impacts of Industry 4.0 on Employment Processes within the Eures-T Beskydy Partnership**
*Miriama DUBOVSKÁ, Eva RIEVAJOVÁ*

**IMPACT OF POST-GLOBAL PROCESSES ON THE REGIONAL LABOUR MARKET.....111**
*Alena FROLOVA, Tatyana TCHILIMOVA, Irina SOFRONOVA*

**DÔVODY ZAVÁDZANIA INDUSTRY 4.0 V SLOVENSKEJ REPUBLIKE .....117**
**Reasons for Introducing Industry 4.0 in the Slovak Republic**
*Adriana GRENČÍKOVÁ, Karol KRAJČO*

**ZAMESTNANIE CUDZINCOV PODĽA VYKONÁVANEJ PROFESIE V SR .....123**
**Employment of Foreigners by Profession in the Slovak Labour Market**
*Eva GRMANOVÁ*

**VPLYV INDUSTRY 4.0 NA SEKTOR DOPRAVY A SÚVISIACICH SLUŽIEB V KONTEXTE ROZVOJA ĽUDSKÝCH ZDROJOV V PODMIENKACH SLOVENSKEJ REPUBLIKY .....133**
**Impact of Industry 4.0 on the Transport Sector and Related Services in the Context of Human Resources Development in the Slovak Republic**
*Michal HRNČIAR, Eva RIEVAJOVÁ*

**VNÍMANIE PERSONÁLNYCH A BEZPEČNOSTNÝCH RIZÍK MALÝMI A STREDNÝMI PODNIKMY NA SLOVENSKU V ČASE PRIEMYSELNEJ REVOLÚCIE INDUSTRY 4.0.....142**
**Perception of Personnel and Safety Risks by SMEs in Slovakia at the Time of the Industrial Revolution Industry 4.0**
*Mária HUDÁKOVÁ, Matej MASÁR, Daniel BREZINA*

**POŽIADAVKY NA VZDELANIE A KVALIFIKÁCIU ĽUDÍ V PRIEMYSLE 4.0 .....152**
**Requirements for Education and Qualification of People in Industry 4.0**
*Simona HYŽOVÁ, Kamila MAYEROVÁ, Jaroslav VYHNIČKA*

**DIGITAL MARKETING FOR GREEN GOODS PROMOTION: MODERN TRENDS IN ENTREPRENEURSHIP .....160**
*Olena CHYGRYN, Tetyana PIMONENKO, Svitlana BILAN, Lyudmila STARCHENKO*

**HODNOTENIE ÚROVNE ROZVOJA DIGITÁLNEJ EKONOMIKY A DIGITÁLNYCH ZRUČNOSTÍ V SLOVENSKEJ A ČESKEJ REPUBLIKE .....167**
**Evaluation of the Level of Development of Digital Economy and Digital Skills in Slovak Republic and Czech Republic**
*Eva IVANOVÁ, Jana MASÁROVÁ , Eva KOIŠOVÁ*

**THE STRATEGIC APPROACH TO THE INNOVATIVE DEVELOPMENT OF RUSSIAN ECONOMY .....176**
*Marina IZMAILOVA, Mikhail ABRASHKIN, Margarita SAVINA, Martin ŠIKÝŘ*

**LABOUR MARKET CHANGES IN THE REGIONS OF SLOVAKIA IN THE CONTEXT OF INDUSTRY 4.0.....183**
*Dana JAŠKOVÁ*

**PODNIKOVÉ VZDELÁVANIE V PODMIENKACH INTELIGENTNEJ VÝROBY .....192**
**Enterprise Training in Conditions of Smart Manufacturing**
*Rolf KARBACH, Emília KRAJŇÁKOVÁ, Andrea HORVATHOVÁ*

**ASPECTS OF ROBOTICS IMPLEMENTATION WITHIN THE CHANGES ON LABOR MARKET IN POLAND .....200**
*Marcel KORDOŠ*

**THE SYNERGY OF TOURISM AND INDUSTRY 4.0 IN SPAIN WITHIN THE EXAMPLE OF AIRBNB AND COLLABORATIVE ECONOMY .....213**
*Marcel KORDOŠ, Jakub SOKOL*

**INDUSTRY 4.0: THE SOCIAL DIMENSION OF EDUCATION NEEDS .....223**
*Vojtěch KOŘEN*

**THE INFLUENCE OF PERSONALITY TRAITS ON SPECIALISTS' SELF-REGULATION IN THE CONDITIONS OF THE IV INDUSTRIAL REVOLUTION.....235**
*Olga KUZMINA, Elena KORNILTSEVA, Nafisa GAGARINA*

**APPLICATIONS OF STATISTICS IN REGIONAL ECONOMICS IN CONTEXT OF SMART, SUSTAINABLE AND INCLUSIVE GROWTH .....240**
*Karol KRAJCO, A. BONDARENKO, S. BONDAR, Nikolay SINIAK*

**VPLYV PRIEMYSLU 4.0 NA ZMENY V ŠTRUKTÚRE A POČTE PRACOVNÝCH MIEST .....247**
**Impact of Industry 4.0 on Changes in the Structure and Number of Jobs**
*Emília KRAJŇÁKOVÁ, Jaroslav VYHNIČKA*

**INDUSTRY 4.0 AND PROBLEMS OF LABOR MIGRATION .....254**
*Alexander KUZNETSOV, Yuri ERMAKOV*

**ZEFEKTÍVNENIE PROCESU VZDELÁVANIA A HODNOTENIA ODBORNEJ SPÔSOBILOSTI ZAMESTNANCOV SÚKROMNÝCH BEZPEČNOSTNÝCH SLUŽIEB ....260**
**Streamlining Professional Qualification Assessment Process for Private Security Employees**
*Patrik LAHUTA,Mária HUDÁKOVÁ*

**VPLYV ĽUDSKÉHO FAKTORA NA IMPLEMENTÁCIU PROJEKTOV KONCEPCIE INDUSTRY 4.0 VO VÝROBNÝCH PODNIKOCH .....268**
**The Impact of Human Factor on Projects of Implementation Concept Industry 4.0 in Manufacturing Enterprises**
*Matej MASÁR, Mária HUDÁKOVÁ*

**ZMENA V ZRUČNOSTIACH A ŠTRUKTÚRE PROFESIÍ AKO VÝZVA VYPLÝVAJÚCA ZO ZAVÁDZANIA PRIEMYSLU 4.0.....277**
**Changes in Skills and Profession Structure as a Challenge Arising from the Establishment of Industry 4.0**
*Tatiana MASÁROVÁ, Jakub SOKOL*

**INDUSTRY 4.0 IN INDIA AND ITS IMPACT ON LABOUR MARKET .....284**
*Farheen NAZ, Róbert MAGDA*

**GRANTING INVESTMENT AID TO BUSINESS SERVICE CENTERS IN SLOVAKIA** ..... **290**
*Daniela NOVÁČKOVÁ, Darina SAXUNOVÁ*

**STUDENT COACHING IN THE PHASE OF CHOOSING THEIR PROFESSION: GENERATION Z NEEDS ORIENTATION** ..... **302**
*Nadja PADE, Rozalia SULIKOVA, Lubomira STRAZOVSKA*

**THE USE OF ICT IN ENTERPRISES OF THE SLOVAK REPUBLIC IN THE CONTEXT OF INDUSTRY 4.0** ..... **308**
*Dagmar PETRUŠOVÁ, Peter PETRUŠ*

**CHALLENGES OF TEACHING AND MANAGING GENERATION Z** ..... **313**
*Svetlana POPOVA*

**THE FINTECH SECTOR AS A DRIVER OF PRIVATE ENTREPRENEURSHIP DEVELOPMENT IN TIME OF INDUSTRY 4.0** ..... **319**
*Pavlo RUBANOV, Serhiy LYEONOV, Yuriy BILAN, Oleksii LYULYOV*

**HUMAN RESOURCE MANAGEMENT CHALLENGES OF THE FOURTH INDUSTRIAL REVOLUTION FOR CZECH SMEs** ..... **328**
*Jana Marie ŠAFRÁNKOVÁ, Martin ŠIKÝŘ*

**POTENCIÁL STRIEBORNEJ EKONOMIKY PRE TRH PRÁCE A INDUSTRY 4.0** ..... **335**
**Silver Economy Potential for the Labor Market and Industry 4.0**
*Peter SIKA*

**THE IMPACT OF PROPTECH 3.0 ON THE REAL ESTATE INDUSTRY WORKPLACES** ..... **345**
*Nikolai SINIAK, Adriana GRENČÍKOVÁ, Ninoslav MARINA, Sergey SHAVROV*

**THE ROLE OF TELECOMMUNICATION PERSONNEL FOR INDUSTRY 4.0 JOB CREATION** ..... **355**
*Biruta SLOKA, Laura KERŠULE, Iluta SKRŪZKALNE*

**POSITION OF SMES IN THE CONTEXT OF INDUSTRY 4.0** ..... **364**
*Jana SOCHUĽÁKOVÁ, Katarína KRÁĽOVVÁ*

**REDUCING JOB INSECURITY IN THE LIGHT OF INDUSTRY 4.0: THE ROLE OF SUSTAINABLE HRM** ..... **370**
*Živilė STANKEVIČIŪTĖ, Eglė STANIŠKIENĖ*

**BIG DATA AND MUNICIPAL WASTE MANAGEMENT: CHALLENGES AND OPPORTUNITIES** ..... **382**
*Andrius STANKEVIČIUS*

**ANALYSIS OF THE IMPACT OF THE FOURTH INDUSTRIAL REVOLUTION ON EMPLOYEES OF INDUSTRIAL COMPANIES IN THE CONTEXT OF GENERATIONS** ..... **390**
*Lucia STUPAVSKÁ, Veronika JOHANESOVÁ, Miloš ČAMBÁL*

**MANAŽMENT RIZÍK AKO NÁSTROJ NA ZVYŠOVANIE ÚSPEŠNOSTI INOVAČNÝCH PROJEKTOV ..... 397**
**Risk Management as a Toool for Increasing the Success of Innovative Projects**
*Jana ŠIMÍČKOVÁ, Katarína BUGANOVÁ*

**THE IMPACT OF INDUSTRY 4.0 ON THE LEVEL OF SHADOW EMPLOYMENT ..... 405**
*Inna TIUTIUNYK, Tatiana VASYLIEVA, Yuriy BILAN, Evgenij KOVALENKO*

**VPLYV PRIEMYSLU 4.0 NA TRH PRÁCE SLOVENSKEJ REPUBLIKY V KONTEXTE PRACOVNEJ MIGRÁCIE ..... 414**
**Impact of Industry 4.0 on the Labor Market of the Slovak Republic in the Context of Labor Migration**
*Magdaléna TUPÁ*

**PRACOVNÁ IMIGRÁCIA V KRAJINACH V4 V KONTEXTE ROZVOJA INDUSTRY 4.0 ..... 423**
**Working Imigration in the V4 Countries in Industry 4.0 Development Context**
*Sergej VOJTOVIČ, Magdaléna TUPÁ, Rolf KARBACH*

**THE INFLUENCE OF THE OFFICE WELLBEING ON USERS`AGILITY IN PROPERTY DEVELOPMENT AS A PART OF INTERNAL MARKETING APPROACH ..... 432**
*Linda VAŠKOVÁ*

**DIGITAL REVOLUTION AND LABOR MARKET ..... 440**
*Jarmila VIDOVÁ*

**CROWDWORKING: JOBS IN THE AGE OF DIGITIZATION AND PLATFORM ECONOMY ..... 448**
*Jarmila WEFERSOVÁ*

**THE IMPACT OF INDUSTRY 4.0 ON THE LABOUR MARKET IN RUSSIA ..... 454**
*Nikolay ZAKHAROV, Andrey KUZNETSOV, Marina PERFILYEVA*

**THE DILEMMA OF JOB CREATION AND LOSS BEFORE OF INDUSTRY 4.0 ..... 457**
*Nickolay ZAKHAROV, Irina BRITVINA, Andrey KUZNETSOV*

# Úvod

Medzinárodná vedecká konferencia „Vplyv Industry 4.0 na tvorbu pracovných miest nadväzuje na predchádzajúcu úspešnú konferenciu z jesene roka 2018, ktorej zborník je evidovaný v databáze Web of Science spoločnosti Clarivate Analytics. Ide o sériu tradične poriadených podujatí Fakulty sociálno-ekonomických vzťahov v oblasti riadenia ľudských zdrojov a personálneho manažmentu. Konferencia sa koná v prostredí kúpeľného mestečka Trenčianske Teplice a koná sa v rámci projektu VEGA: č.1/0430/18 Vplyv Industry 4.0 na zmeny pracovných miest, s podporou SOVA DIGITAL a.s. Zameriava sa na aktuálne otázky trhu práce a vplyvu 4. priemyselnej revolúcie na zmeny na trhu práce, v oblasti riadenia ľudských zdrojov, vyhľadávania zamestnancov, pracovnej migrácie, sociológie, politológie, právnych disciplín, hospodárskej politiky, medzinárodných vzťahov, regionálneho rozvoja, demografie a na problematiku zavádzania nových technológií vo všetkých oblastiach spoločenského života.

Na plenárnom zasadnutí vystúpi Ing. Eva Vanková z VETROPACK Nemšová, s.r.o. Nemšová, Ing. Martin Morháč predseda predstavenstva SOVA Digital a.s. a Ing. Martin Hošták, PhD. z Republikovej únie zamestnávateľov. Medzinárodný vedecký a organizačný výbor zaručuje jej kvalitu. Pod jeho vedením je vydaný predkladaný recenzovaný zborník príspevkov,

Cieľom konferencie je stanoviť základné otázky pre nezávislý základný výskum, ktorý bude realizovaný v rámci projektu VEGA, realizovaný na Fakulte sociálno - ekonomických vzťahov Trenčianskej univerzity Alexandra Dubčeka v Trenčíne.

# Introduction

The International Scientific Conference "The Impact of Industry 4.0 on Job Creation" builds on the previous successful conference from autumn 2018, of which proceedings have been already recorded within the Web of Science database of Clarivate Analytics. It is a series of traditionally organized events at the Faculty of Social and Economic Relations in field of Human Resources and Personnel Management. The conference, being supported by SOVA DIGITAL, Inc., takes place in the city spa of Trenčianske Teplice and takes place within the project of Slovak Ministry of Education Grant Agency VEGA: Reg. No.1 / 0430/18 „The Impact of Industry 4.0 on Job Changes“. The conference scope is focused on current labor market issues and the impact of the 4th Industrial Revolution on changes on labor market, human resources management, employee search, labor migration, sociology, political science, law, economic policy, international economic relations, regional developmen.

The plenary session will be held by the keynote speakers Ing. Eva Vanková - VETROPACK Nemšová, Ltd., Nemšová, Ing. Martin Morháč - the Board of Directors Chairman of SOVA Digitál, Inc. and Ing. Martin Hošták, PhD. - The National Union of Employers. The International Scientific and Organizing Committee guarantees the conference quality and under its leadership submitted papers are published in this Conference Proceedings,

The goal of the conference is to outline the principal questions set for independent basic research, which will be executed under the VEGA project, being solved at the Faculty of Social and Economic Relations, Alexander Dubček University in Trenčín.

# THE IMPORTANCE OF INTERCULTURAL COMPETENCE IN ORGANIZATIONS DURING THE 4TH INDUSTRIAL REVOLUTION

***Ruta ADAMONIENE***[1]
***Martina BLAŠKOVÁ***[2]
***Ruta PETRAUSKIENE***[3]
***Rimantas RAULECKAS***[4]

**Abstract:** *Nowadays people live in a world of many interacting cultures and spend a lot of time communicating across cultures with other people and organizations around the world. Knowledge and skills of intercultural communication and the employees' familiarity with the cultural practices of their assignments are in demand in many professions. The need for intercultural competence research in the 4th industrial revolution arises from economical, political and labor changes, and increased use of information technology. The article is aimed at revealing the importance of intercultural competence in the organizations during the 4th industrial revolution. The publication presents the main findings of the research, which confirmed that employees' intercultural competence is influenced by their education and age; relationships among intercultural competence of employees and their education and age are moderated by different sectors; expectations towards international cooperation are positively related to the perceived importance of intercultural competence; public sector is different from others because of its expectations and tolerance relation, which is not typical in other sectors.*

**Key words:** *intercultural competence, public sector, private sector, the 4th industrial revolution.*

**JEL Classification:** *M12, L33, M53.*

## 1. INTRODUCTION

The guidelines of the 4th industrial revolution – a deeper understanding of dynamics, values, interculturalism, stackeholders and technologies in a changing world – give the opportunity to employees and managers to take a closer look and to consider the links between technology and society in more detail, and to understand how our actions shape the future. However, it is not enough just to recognize the speed of change and the responsibilities resulting from the development and application of new technologies. All organizations, sectors and employees need to take actions to develop approach to technology, management and values. Organizations should therefore invest in the development of new competencies, more flexible management methods and strategies that enable multicultural communities to understand the opportunities offered by the technology of the 4th industrial revolution.

In recent years, focus on the topics like intercultural communication, intercultural competence, etc. has increased in the scientific literature significantly. These topics have been addressed by scholars such as Bird, A., Mendenhall, M., Stevens, J. M. & Oddou, G. (2010); Deardorf, K. D. (2006) and others. As Gražulis (2016) stated, the society's current perception of the intercultural differences of countries and various ethnic groups living there has been formed by the many efforts of different scientists.

[1] Prof., PhD., Mykolas Romeris University, Maironio str. 27, Kaunas, Lithuania, e-mail: rutadam@mruni.eu
[2]Prof., PhD., University of Zilina, Univerzitna 8215/1, Zilina, Slovak Republic, e-mail: martina.blaskova@fri.uniza.sk
[3]Assoc. prof., PhD., Kaunas University of Technology, Mickeviciaus str. 37, Kaunas, Lithuania, e-mail: ruta.petrauskiene@ktu.lt
[4]Assoc. prof., PhD., Kaunas University of Technology, Mickeviciaus str. 37, Kaunas, Lithuania, e-mail: rimantas.rauleckas@ktu.lt

**The aim of the publication** is to reveal the importance of intercultural competence in the organizations during the 4th industrial revolution. These hypothesis of the research were formulated: 1) Intercultural competence of employees is affected by their education and age; 2) Relationships among intercultural competence of employees and their education and age are moderated by sector; 3) Expectations towards international cooperation are positively related to the perceived importance of intercultural competence (if intercultural initiatives (projects, programs) are expected to expand in the future then the importance of employees' intercultural competence is higher); 4) The relationship between the perceived expansion of intercultural initiatives in the future and the importance of employees' intercultural competence is moderated by sector.

Perception of cultural differences both in society and in the work environment as not a barrier, but as an advantage and opportunity to use strengths of each culture, requires to develop tolerance, multicultural awareness, and constant development of intercultural competence of employees in organizations. Intercultural competence is a trinomial construct developed over a lifetime. Successful employee performance in modern organizations depends on the employees' ability to adapt to the changing environment, where the major factor is an individual's gained competence and conditions for its development.

The results of survey presented in this article is part of international research carried out in several countries Poland, Slovakia, the Czech Republic and Lithuania.

## 2. THEORETICAL INSIGHTS

In today's world, people live in a world of many interacting cultures and spend a lot of time communicating across cultures with other people and organizations around the world. Culture and intercultural competence of the staff of organizations play a key role in a diverse environment. Knowledge and skills of intercultural communication and the employee's familiarity with the cultural practices of their assignments are in demand in many professions in all sectors (NGO, private and public sector) (Spitzberg & Changnon, 2009).

Research shows that intercultural competence cannot be acquired in a short space of time or in one module at university. It is not a naturally occurring phenomenon but a lifelong process that needs to be addressed explicitly in learning and teaching and staff development.

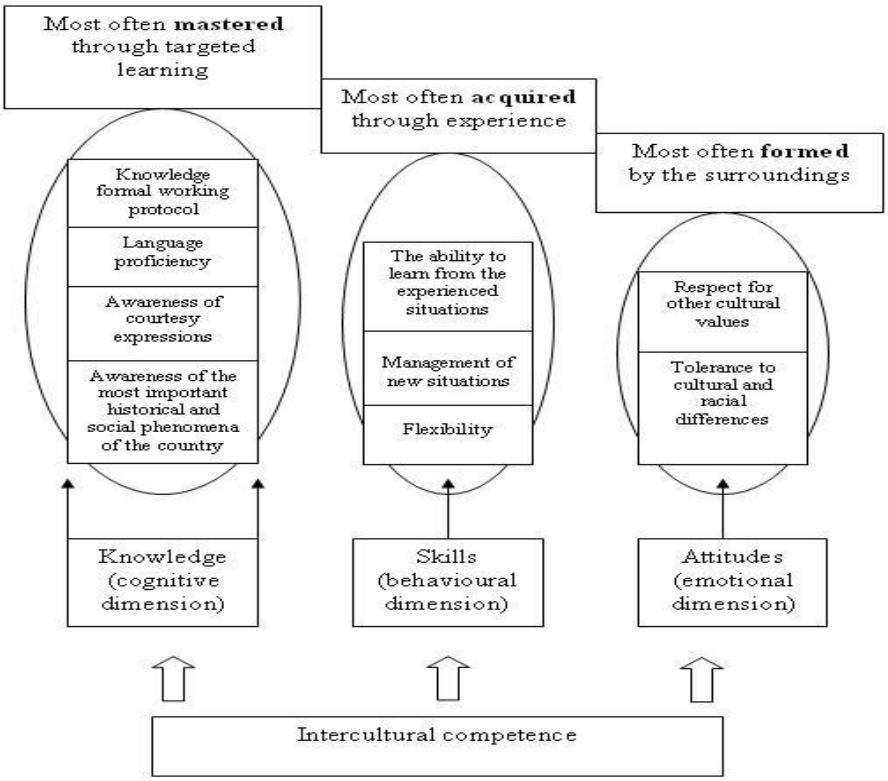
The conception of competence is widely analyzed in scientific literature although does not have deep traditions. The main initiators of this problem investigation are Boyatzis (1982), Spencer&Spencer (1993), Collin (1997) and others. In general terms the competence can be described as consistency of knowledge and skills, and capacity to apply them in particular circumstances. In describing the concept of excellence, scientists emphasize the knowledge, skills, and abilities needed to succeed in a particular position (Blaskova, Adamonienė and Petrauskienė, 2017). Sudnickas and Kratavičiūtė-Ališauskienė (2011) in terms of competences emphasizes that they cannot be universal in all cultures, professions and types of services.

Modern society cannot be described without mentioning *globalization***.** Globalization and human interconnectedness happen due to the shifts in economy and politics, the complexity of business environment, information technology, and emergence of new global players (Thomas, 2008; Kordos, 2019, Kordos, 2018). The processes of globalization create new major chanllenges on a daily basis because of the difficulties in bridging cultures and eliminating boundaries between existing cultural differencies. However, globalization is the reality of our present-day living (Navaitienė, Rimkevičienė, Račelytė, 2016). The necessity of intercultural competence is described by such ongoing changes (Matveev, 2017):

- *The shifts in economy and politics.* Corporate restructuring, downsizing, mergers and acquisitions, increase in the regional trade agreement revealed the shifts in the business environment.
- The *workforce* itself has *changed* due to a faster, larger, and different nature of migration in many countries. Due to this emerging cultural diversity of the global marketplace definitely makes intercultural competence an extremely important skill for contemporary managers;
- *An increased usage of information technologies*. This helps while communicating transcend geographical boundaries. Although IT makes communication among organizations more convenient, faster, and user-friendly, the information-driven environment places certain challenges on the skills level of professionals, including the level of intercultural competence. New communication technologies are connecting people around the world and reshaping how we work, play, and communicate.

Intercultural comeptence can be understood as ability acquired on the basis of the certain knowledge and attitudes that enables individuals to work effectively in the context of different cultures (Mažeikienė&Virgailaitė-Mečkauskaitė, 2007) or as ability to develop targeted knowledge, skills and attitudes that lead to visible behaviour and communication that are both effective and appropriate in intercultural interactions (Deardorff, 2006). As stated Spitzberg and Changon (2009), intercultural competence is the appropriate and effective management of interaction between people who, to some degree or another, represent different or divergent affective, cognitive and behavioral orientations to the world.

**Figure 1: Intercultural competence research model**




Source: prepared by international group of scientists (2017)

The intercultural competencies can be identified as falling into three main categories: cognitive, affective and behavioural. While cognitive competencies relate to a person's ability to process information, affective competencies relate to a person's emotional responses and behavioural competencies relate to a person's behavioural actions (Lloyd, Härtel, 2010).

Many scientists (Spencer & Spencer (1993), Chen and Naquin (2006), and others) agree that in the definition of intercultural competence should be taken into account such dimensions as knowledge, abilities (skills) and attitudes. Based on these elements, **Fig. 1** presents a theoretical model for the research of intercultural competence (which was prepared by all members of this international research). There should be emphasized that this theoretical construct have been empirically validated.

## 3. METHODOLOGY OF THE RESEARCH

To find out the respondents' views a quantitative research method was used and a questionnaire was designed. The format of questions in the first part of the questionnaire, which is intended to evaluate the employees' intercultural competence (knowledge (cognitive dimension), skills (behavioural dimension) and attitudes (emotional dimension)), was a 5-point Likert scale, or, as it is also called, a summative scale, when statements can be evaluated separately or together as forming certain constructs. Statements were evaluated from absolute agreement (5 points) to absolute disagreement (1 point) by marking a particular square or from very important (5 points) to not important (1 point).

Confirmatory factor analysis and structural equation modelling were employed with *lavaan* package in R software. Likert type measurement scale are treated as continuous variables, full information maximum likelihood estimation is selected to account for the presence of missing values, which are assumed to be missing completely at random. *Cronbach's alpha* coefficient calculated with SPSS (*Statistical Package for the Social Sciences*) programme is used to assess the scale internal consistency. In the questionnaire *Cronbach's alpha* coefficient for individual question blocks was not lower than 0.8, which means that the questionnaire is designed properly.

The research questionnaire on intercultural competence was composed of several question blocks, but in this article were taken into account just these statements:

- Demographic questions, revealing a common demographic characteristics of the respondents;
- Questions intended to identify the frequency of the respondents' communication with foreigners;
- The respondents' perception of the need for development of their intercultural competency in their work environment;
- Statements intended to evaluate the cognitive dimension (related to knowledge) of the respondents;
- Statements intended to evaluate the behavioural dimension (related to skills) of the respondents;
- Statements intended to evaluate the emotional dimension (related to attitudes) of the respondents.

These statements were identified during operationalization process. This **process** helps to define fuzzy concepts and allows them to be measured empirically and quantitatively. It means that there were defined measurable statements for each group of cognitive (e. g. etiquette requirements, taboo topics, most usual stereotypes, etc. ), behavioural (e. g. the ability to apply knowledge in practice, to establish and maintain intercultural contact, etc.) and emotional (e. g. empathy and tolerance to cultural differences, rejection of discriminating and racist behaviour, openness, etc.) dimensions.

**There were formulated such main hypothesis of the research:**

- H1a Intercultural competence of employees is affected by their education and age.

- H1b Relationships among intercultural competence of employees and their education and age are moderated by sector (private, public, NGO).
- H2a Expectations towards international cooperation are positively related to the perceived importance of intercultural competence (if intercultural initiatives (projects, programs) are expected to expand in the future then the importance of employees' intercultural competence is higher).
- H2b The relationship between the perceived expansion of intercultural initiatives in the future and the importance of employees' intercultural competence is moderated by sector (private, public, NGO).

The research on intercultural competence carried out by the researchers of each participating country is based on the principle of voluntariness and is organized by the researchers individually or in groups. Before the research commences the research participants are informed on the object and the aim of the research, its practical value, research methods and procedures, profile of the respondents, and the timeline. Respondents were informed on data confidentiality.

957 respondents have participated in this research in Lithuania. 72,8% of them were women and others – men. This is how the respondents were distributed by age group: <25 – 20,5%, >25-35 – 32,5%, >35-50 – 25,8%, >50 – 20,8%. 84,5% of respondents were with university education. 27,6% of respondents represented privat sector organizations, 68,2% - pubic sector organizations and 1,8% - non-governmental organizations.

## 3. RESULTS OF THE RESEARCH

46% of respondents stated that the need of international cooperation in their organizations will increase during next five years and 36,5% - that this need will remain as it is now. As the main important intercultural competencies respondents pointed out: language knowledge, tolerance to cultural and racial differences, understanding of courtesy expressions and respect for the values of other cultures.

### Measurement model for Hypothesis 1

Exploratory (EFA) and confirmatory (CFA) factor analyses with R package lavaan were applied to the initial list of intercultural competence items. In EFA stage items with high cross-loadings and low r-squared values were removed one by one from further analysis. Content validity of intercultural competence construct was not threatened by removing these items based on empirical criteria. The measurement model with the remaining items demonstrate sufficient construct validity: paired constructs tests (Anderson, Gerbing, 1988) are statistically significant (thus discriminant validity is established), all items' loadings are above 0.6, $p<0.05$ (thus convergent validity is demonstrated). All r-squared coefficients for observed and latent variables are above 0.5. Alpha and omega internal consistency reliability coefficients for the factors are above 0.7 (Table 1).

**Table 1: Reliability measures for dimensions of intercultural competence construct**

| | Cognitive dimension factor 1 | Cognitive dimension factor 2 | Cognitive dimension factor 3 | Behavioural dimension | Emotional dimension | Total |
|---|---|---|---|---|---|---|
| Alpha | 0.806 | 0.862 | 0.961 | 0.941 | 0.918 | 0.960 |
| Omega | 0.806 | 0.865 | 0.951 | 0.943 | 0.893 | 0.971 |
| AVE | 0.581 | 0.618 | 0.667 | 0.846 | 0.631 | 0.663 |

Source: own elaboration (2019)

The fit indices for the measurement model are below established thresholds as RMSEA upper CI90 limit is below 1, CFI>0.9, SRMR < 0.8: X2 (340) = 2683.604, p<0.001, Comparative Fit Index (CFI) = 0.912, Tucker-Lewis Index (TLI) = 0.902, CI90 RMSEA = [0.075; 0.081], SRMR =0.058.

**Structural model for Hypothesis 1**

H1a Intercultural competence of employees is affected by their education and age

First, there was tested the model with direct paths of education and age variables on overall intercultural competence. Next, the influence of education and age on lower order constructs – cognitive, behavioural and emotional dimensions – were tested as well. The models have almost identical fit indices as the measurement model.

Results (Table 2) indicate that the cognitive dimension has the lowest average in the sample and emotional dimension – the highest, that is the respondents have quite well developed the emotional aspect of intercultural competence, an average behavioural and low cognitive competence.

**Table 2. Standardized path coefficients and statistical significance values***

| | **Intercultural competency** | **Cognitive dimension** | **Behavioural dimension** | **Emotional dimension** |
|---|---|---|---|---|
| Age | **-0.079** (0.037) | **-0.183** (<0.001) | -0.025 (0.477) | -0.028 (0.443) |
| Education | **0.104** (0.006) | **0.118** (0.002) | **0.099** (0.005) | 0.059 (0.103) |
| Average in original units | | 0.054 | 3.43 | 4.455 |

* Statistically significant coefficients (α=0.05) bolded
Source: own elaboration (2019)

Structural path (beta) coefficients reveal that the older the person the lower the score of intercultural competence and the higher the education level the higher the score. The effects are small, however. This pattern, especially the influence of age, is reinforced for cognitive dimension, however age has no impact on emotional dimension (coefficients are non-significant). Behavioural dimension is influenced only by education level, but not age.

In general, the statistically significant path coefficients support the H1a hypothesis with the additional benefit of identifying the direction of effects.

H1b Relationships among intercultural competence of employees and their education and age are moderated by sector (private, public, NGO)

The same analyses were repeated as for H1a hypothesis for different sectors (Table 3) as well. Employment sector indeed acts as a moderator: private sector employees' intercultural competence and its dimensions are affected more by the education compared to public sector employees. In NGO sector education has the extremely high impact on cognitive dimension, although results may be unreliable due to small sample size.

There can be stated that the private sector demonstrates consistent influence of education on all dimensions of intercultural competence as all path coefficients are statistically significant. In public sector only two dimensions of intercultural competence are affected by education and in NGO – only one dimension. No surprise that education has the highest impact on cognitive dimension in all three sectors.

**Table 3: Standardized path coefficients and statistical significance values in sectors***

| Sector | | Intercultural competency | Cognitive dimension | Behavioural dimension | Emotional dimension |
|---|---|---|---|---|---|
| Private (n=329) | Age | -0.064 (0.330) | **-0.123** (0.069) | -0.049 (0.416) | 0.009 (0.880) |
| | Education | **0.183** (0.007) | **0.184** (0.007) | **0.138** (0.021) | **0.136** (0.026) |
| | Average, original units | | 0.044 | 3.669 | 5.219 |
| Public (n=767) | Age | -0.057 (0.214) | **-0.172** (<0.001) | -0.025 (0.557) | 0.003 (0.937) |
| | Education | 0.090 (0.051) | **0.099** (0.039) | **0.096** (0.026) | 0.046 (0.308) |
| | Average, original units | | 0.034 | 3.630 | 4.275 |
| NGO and other (n=68)** | Age | 0.094 (0.603) | -0.117 (0.518) | 0.159 (0.333) | 0.127 (0.417) |
| | Education | 0.2 (0.400) | **0.475** (0.011) | -0.030 (0.848) | 0.042 (0.785) |
| | Average, original units | | -0.017 | 4.408 | 6.550 |

* Statistically significant coefficients (α=0.05) bolded
** Unreliable results (Heywood case: negative variance estimate found possibly due to small group size)
Source: own elaboration (2019)

Age in general is not statistically significantly influencing intercultural competence in different sectors, primarily due to small effect/insufficient statistical power, but it has a quite uniform negative impact in all sectors on cognitive dimension of intercultural competence. Therefore, the sector variable does not moderate much or even doesn't moderate at all the influence of age on intercultural competence and its dimensions.

## Measurement model for Hypothesis 2

It was found that there are two groups of intercultural competence priorities via EFA. There were removed the items with low loadings, high cross-loadings and low variance explained by a common factor model. The final measurement model fit is adequate: Chi-square(4)= 23.489, p<0.001; CFI=0.992, TLI=0.0979, RMSEA=0.066, CI90%=[0.042;0.092], SRMR=0.02. The alpha and omega internal consistency reliability coefficients for the factors are above 0.7, the average extracted variance is above 0.5 (Table 4).

To conclude, in modelling phase of the measurement model there was found that there are two groups of intercultural competence priorities that can be treated as separate constructs (chosen for further analysis) or lower order constructs representing a more general latent variable.

**Table 4: Reliability measures for dimensions of intercultural competence construct**

| | Priorities 1 | Priorities 2 | Total |
|---|---|---|---|
| Alpha | 0.829 | 0.849 | 0.825 |
| Omega | 0.832 | 0.850 | 0.889 |
| AVE | 0.624 | 0.738 | 0.675 |

Source: own elaboration (2019)

## Structural model for Hypothesis 2

Expectations towards international cooperation was measured by a question with 3 answer categories: 1. The need for international cooperation will increase; 2. The need for cooperation will remain at the current level; 3. The need for cooperation will decrease. This variable as a predictor of priorities of intercultural competence as an ordinal variable were included. The robust fit statistics demonstrate good fit: Chi-square(7)=13.686, p=0.057; CFI=0.988, TLI=0.982, RMSEA=0.032, CI90%=[0;0.056], SRMR=0.018.

The standardized regression coefficients for first factor is -0.150 (p<0,001) and for the second factor -.153 (p<0,001). The minus sign is due to negative coding, therefore, there may be concluded that that initial H2a hypothesis holds (i. e., expectation of future expansion of intercultural initiatives (projects, programs) is a statistically significant predictor of the employees' intercultural competence priorities), although the effect size is small (based on Cohen's criteria 0.1 for small effect, 0.3 for medium and 0.5 for large effect), see "Overall" row in Table 5.

However, in private sector the second factor of priorities related to tolerance is not predicted by expectations towards international cooperation as the path coefficient is non-significant (Table 5). In contrast, in public sector this coefficient is one of the highest (-0.193). In NGO sector the expectations towards international cooperation have the highest influence (the effect is of a moderate size) on flexibility oriented factor of intercultural competence priorities (-0.351), but no effect on tolerance oriented factor of intercultural competence priorities.

**Table 5: Influence of Expectations towards international cooperation on two factors of intercultural competence priorities (standardized path coefficients and statistical significance values)**

| Sector | | **Priorities 1 (Flexibility)** | **Priorities 2 (Tolerance)** |
|---|---|---|---|
| Private (n=299) | Expectations | **-0.159** (0.012) | -0.087 (0.190) |
| | Average, original units | 0 | 2.279 |
| Public (n=661) | Expectations | **-0.143** (0.001) | **-0.193** (<0.001) |
| | Average, original units | 0 | 3.580 |
| NGO and other (n=55) | Expectations | **-0.351** (0.019) | -0.072 (0.619) |
| | Average, original units | 0 | 0.753 |
| Overall (n=957) | Expectations | **-0.150** (<0.001) | **-0.153** (<0.001) |
| | Average, original units | 0 | 3.089 |

* Statistically significant coefficients (α=0.05) bolded
Source: own elaboration (2019)

Averages of latent variables were calculated by restricting the intercept of one item in each latent variable to zero and one latent variable mean to zero. We can conclude that second factor of priorities (Tolerance) has higher average than the first factor (Flexibility) in all sectors, i.e., respondents are prioritizing tolerance more that flexibility. As well, public sector representatives are the most concerned with tolerance related priorities (average of 3.58) compared to representatives of other sectors.

In general, there was notice that the sector acts as a moderator of the relationship between future expectations and priorities: in case of flexibility related intercultural comtetence priorities the path coefficient for NGO sectors is much higher than in private and public sector and in case of tolerance related priorities public sector stands out as the only sector with

statistically significant path coefficient. Therefore, the H2b hypothesis formally is supported by data.

## 4. CONCLUSION

Intercultural competence cannot be acquired in a short space of time or in one module at university. It is not a naturally occurring phenomenon but a lifelong process that needs to be addressed explicitly in learning and teaching and staff development. Different people and societies value different things, and this can lead to disagreements over the application of certain social and cultural approaches to technology. The fact that different cultures and values emphasize differences in priorities should not be an obstacle to thinking about technology based on values and existing competencies. We should understand which priorities are necessary for societies and technologies to function and convey those values. The progress of the 4th industrial revolution encourages managers and employees from various organizations to develop a responsible relationship with technologies and to take into consideration the people who will be affected by these choices.

Generally, **H1a hypothesis** was confirmed but not for the emotional dimension. It means that only cognitive and behavioral dimensions of intercultural competence of employees is affected by their education and age. **H1b hypothesis** was confirmed as well. It means that relationships among intercultural competence of employees and their education and age are moderated by different sectors. The private sector demonstrates consistent influence of education on all dimensions of intercultural competence (cognitive, behavioural and emotional). In public sector only two dimensions of intercultural competence are affected by education and in NGO – only one dimension. It was found out that education has the highest impact on cognitive dimension in all three sectors. **H2a hypothesis** was confirmed but relation is not very strong. It means that expectations towards international cooperation are positively related to the perceived importance of intercultural competence. **H2b hypothesis** was confirmed, we can state that public sector is different from others because of its expectations and tolerance relation, which is not typical in other sectors.

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# THE IMPACT OF 4.0 INDUSTRIAL DEVELOPMENT ON THE FUTURE TRAINING OF POLICE OFFICERS

***Ruta ADAMONIENE***[5]
***Aurelija PŪRAITĖ***[6]
***Vytautas ŠLAPKAUSKAS***[7]

**Abstract:** *The staff of public safety authorities are probably given the most attention, they are more demanding than usual in other organizations, not only in terms of ethics, but also in terms of their qualifications and competences. Considering that the legal regulation of competency groups and their education procedure in the system of public safety institutions in Lithuania is constantly changing, it is necessary to analyse the current competency system and their education procedure, ensuring proper preparation of officers of relevant institutions to work taking into account contemporary geopolitical, demographic, economic, cultural, social realities of society and to motivate officers to seek, acquire or renew the missing competencies necessary for their professional activities. Therefore, the aim of this article is to reveal the most typical functions and competencies of police officers and to present directions and opportunities for developing a competency development model for officers from a 4.0 industrial development perspective. The development of a competency development model would provide an effective and well-grounded training system for officers, focused on the competency development process and provide research-based conclusions on the further development of the competency development model for public safety officers to meet social needs.*

**Key words:** *public safety authorities, police officers, competency development, 4.0 industrial development.*

**JEL Classification:** *M12, L33, M15, L30*

## 1. INTRODUCTION

The challenges of training and further education of police officers as well as search for their solutions in Lithuania are conditioned by complex factors generated by the interaction of global and regional levels nationwide. The modern world is bound not only by global flows of information, capital, services, and movement of goods and people, but also by the wide range of opportunities to exert both positive and negative effects on these flows and other stationary and variable objects. Already, most of the aforementioned global flows, stationary and variable objects are protected (organized, coordinated, controlled) by digital technology, and in the foreseeable future, digitalization will encompass the very aspects and processes of human existence. Any security entity, from an individual or group of individuals to a state or a transnational entities, can have both a public and a latent impact on the security status of any other entity.

To date, the "cooperation" of state and municipal authorities and the institutions of society as a social organizations regarding the maintenance (prevention) of the state of public safety is taking place without realizing that the creation of public safety is both a common good and a non-intrusive process. It is obvious that different state and municipal authorities have different powers to design and implement common safety prevention. But to date, there is a specialized approach to public safety prevention that is not properly institutionalized at either state or

[5] prof, PhD., Mykolas Romeris University, Maironio str. 27, LT-4211, Kaunas, Lithuania, e-mail: rutadam@mruni.eu
[6] assoc. prof, PhD., Mykolas Romeris University, Maironio str. 27,, LT-4211, Kaunas, Lithuania, e-mail: aurelija.puraite@mruni.eu
[7] prof, PhD., Mykolas Romeris University, Maironio str. 27,, LT-4211, Kaunas, Lithuania, e-mail: slapkauskas@mruni.eu

municipal level. It is therefore difficult to involve local communities in preventing this complex phenomenon. On the other hand, legislation relating to the prevention of public safety is still under development, although the movement and the networked nature of social groups and their ephemeral character are essential features of modern societies. As a result, smart technologies and social networking are becoming the primary tools for individuals to take care of their own security. But this field is not yet developed either.

Therefore, in the context of the development of regional policy, the crucial question is whether the provision of public safety services through market mechanisms alone can be effective on the boundaries of civilizations? Mostly remote areas are home to older groups, in which young families are a minority. The purchasing power of the population in such regions is low and the network of public services is likely to shrink further. With low employment and lack of cultural services, there is a degradation of communication culture. As a result, specific public safety problems, such as alcoholism and domestic violence, health neglect and incontinence, depression and suicides, sects and other problems related to the negative changes in personality and sociality are likely to deepen.

The state and municipalities have a duty to protect public order and it is likely that they will also have to assume additional responsibilities for providing specialized public safety services in remote areas, especially in peripheral ones. Part of the public safety services can be provided by mobile teams of professionals who act as a "hub" of social networks where information flows (Kordos, 2019; Kordos, 2018). The public order protection mobile group usually consists of a police officer, a social worker, a child protection specialist, a psychologist, a medical worker. Such a group can act as a sustainable and cohesive team if the professionals in the group share at least some of the same competencies and can help each other make the necessary decisions in one or the other practice situation.

The research object of the article is the activities of the police officer in the implementation of the police mission in the regions - effectively using the available resources to defend the rights and freedoms of the people of Lithuania, protect the society and the state, help the person, family and community. The aim of the article is to reveal the problematic aspects of the development of police officers' competencies and to present the directions and possibilities of the development of the police officers' competency development model in the perspective of 4.0 industrial development. The effective realization of the police mission now involves not only classic police functions and competences that express them, but also new generic, special and strategic competences that are linked to the development of information technologies.

## 2. PECULIARITIES OF THE DEVELOPMENT OF POLICE OFFICERS' COMPETENCES

Police officers, in their daily work, perform many of the functions assigned to them by law. The work of a police officer is a fairly broad field of activity and includes: maintaining public order, ensuring traffic safety, conducting pre-trial and administrative investigation, regulating migration processes, controlling licensed activities, police force and personnel management, training and education of police officers, preventive work with persons, including minors. Such a field of activity is not enough to have the qualifications available, it requires the specific skills of the individual, in other words, a set of relevant competences to ensure successful performance and full achievement of functions. Thus, the broader the field of activity of the employee (officer), the more different competences he or she must have.

Catalogs indicate that *subject-specific competence*, despite its dynamism, is easy to define and likely to be acquired. *Social and conceptual competences* are classified as generic

competences. *Subject-specific competence* is needed for the individual in a particular field of functional activity, and *social and conceptual* is needed regardless of what responsibilities he or she holds in the organization. The competencies listed allow organizations to gain an advantage and become strategically important. Subject to the change in the management paradigm, there is a need to define the strategic competences of the individual, which are linked to the individual's career opportunities and individual's competency development. The groups of individual strategic competences are presented in the table (see Table 1).

**Table 1: Individual's strategic competence groups**

| | |
|---|---|
| **Leadership** | - inspirational motivation;<br>- initiative;<br>- empathy;<br>- self-presentation. |
| **Strategic thinking** | - having a vision;<br>- openness to change;<br>- innovativeness;<br>- decision making. |
| **Directionality** | - pursuit of purpose;<br>- procedural competence;<br>- learning, development;<br>- knowledge management. |
| **Cooperation** | - teamwork;<br>- communication;<br>- conflict management. |

Source: Catalog of Strategic Individual Competencies, (2007), p. 9.

Smalskys, V. (2008), analyzing the problems of qualification and competency development of the Lithuanian police and taking into account the current challenges for the police personnel, distinguished the following groups of competences, the scope of their application and characteristics, which are presented in the table (see Table 2):

**Table 2: Competency groups og police personnel**

| Competence groups | Scope of application of competencies | Competence characteristic |
|---|---|---|
| **Social competence** | focused on policemen of all ranks | - ability to communicate with individuals and solve their problems;<br>- building a positive image of the police. |
| **Leadership competence** | focused on the senior teams of pollice officers | - exemplary leadership;<br>- ability to motivate;<br>- strategic focus;<br>- direct or indirect involvement in the formation and implementation of law-enforcement policy oriented towards citizens' social services. |
| **Subject-specific competence** | taking into account the separate specialization of police activities (public and criminal police), targeting both types of police officers | - guaranteeing human rights and freedoms;<br>- conduct of operational activities;<br>- crime investigation;<br>- forensic examination, etc. |
| **Personal competence** | focused on policemen of all ranks | - ability to change;<br>- self-confidence. |

Source: Smalskys, V. (2008), p. 91.

According to Smalskys, V. (2008), the importance of developing these competencies should be taken into account during the training of police officers, as they are modern competencies that form the basis for the management of public sector personnel. The training of police

personnel should be organized on the basis of two main aspects: the practice of police administration and the attitude of the social service provider.

Paurienė, G. (2011) states that in the context of globalization and integration into the European Union, the importance of intercultural competence should be emphasized in the process of training Lithuanian officials, which should become part of their professional competence.

Adamonienė, R. and Ruibytė, L. (2010), while examining the competency development aspects of police authorities' managers and seeking to provide directions for the formation of the competency development system, identified four types of competences at the individual level: professional, methodological, social and personal. The authors pointed out and revealed in their research that professional and personal competences are the most important parts of the competence of the police authorities, at the level of managers, whereas other methodological and social competences are less important. The results of the study are presented in the following tables (see Table 3 and Table 4):

**Table 3: Core parts of competence at the level of managers of police authorities**

| Professional competence | Personal competence |
|---|---|
| - higher university education;<br>- knowledge of legislation and ability to apply it in practice;<br>- pursuit of knowledge;<br>- work experience;<br>- ability to work in a team. | - excellent reputation;<br>- diligence;<br>- activity;<br>- initiative;<br>- honesty;<br>- ability to express thoughts. |

Source: Adamonienė, R.., Ruibytė, L. (2010), p. 12.

**Table 4: Missing parts of competence at the level of managers of police authorities**

| Professional competence | Personal competence | Social competence | Methodological competence |
|---|---|---|---|
| - knowledge of legislation and ability to apply it in practice;<br>- ability to work in a team, to be its leader. | - reluctance to learn and improve after work;<br>- lack of diligence, commitment, initiative, activity, optimism and dissemination of new ideas. | - insufficient attention is paid to analyzing communication situations. | - ability to plan;<br>- organization of work;<br>- analysis of work results;<br>- ability to store, manage and retrieve relevant information. |

Source: Adamonienė, R., Ruibytė, L. (2010), p. 13.

Adamonienė, R ., Ruibytė, L. (2010) noted that the Lithuanian police system, taking into account its specificity, should develop and apply a competency development system. The authors also emphasized the importance of autonomy in the training of police officers, recognizing the individual's sense of responsibility for their professional and personal development.

Summarizing the data in the table, it can be stated that the catalog identified four important groups of individual‘s strategic competences, which are: leadership, strategic thinking, directionality and cooperation. In the context of the 4.0 industrial revolution, it has become clear that these competencies are increasingly linked by the ability of an officer to apply information technologies to proactively obtain and manage appropriate information flows and provide security services. Complex provision of public safety services, which is associated with local social networks and interprofessional teamwork, became topical in Lithuanian regions. Interprofessional teamwork is carried out by a mobile team of officers, which may include a police officer, a social worker, a child protection specialist, a psychologist, and a

medical professional, as needed. Therefore, in our view, the regional police officer of the future needs to acquire additional specialist competencies in information technology management and cooperation with other mobile team professionals. The identification of relevant new competences is based on an analysis of their needs and practices.

## 3. LEGAL REGULATION OF THE COMPETENCES OF POLICE OFFICERS

The Lithuanian police system, unlike other organizations, has a need to regulate and define specific competencies of staff and their content. During the fulfilment of the *"Plan of measures for optimization of the system of professional training and in-service training of police officers"* approved on September 5, 2011 by Order No. 5-V-793, and implementing the tasks set therein, on April 6 by Order of the Commissioner General of the Lithuanian Police No. 5-V-284 *"On the approval of the description of the competencies of police officers and other police personnel"* the description of competencies was regulated. It should also be noted that this description covered not only the competences of police officers but also those of other police system personnel. Based on it, three types of competences of police officers and other police personnel were identified and legally enshrined in the police system: - *"Professional competencies* - knowledge, skills, abilities, attitudes and other personal qualities relevant to the successful joint professional activities of the criminal and public police, administrative and executive officers and other police personnel"; "*Special competencies* - knowledge, skills, abilities, attitudes and other personal qualities relevant to the successful professional performance of a criminal and public police, administrative and executive officers and other police personnel in a particular field of activity"; " *Additional specific competencies* include knowledge, skills, abilities, attitudes, and other personal qualities required for the successful professional performance of police officers and other senior police officers".

It is clear from the definitions of competences in the description that all types of competencies listed in the Lithuanian police system include the individual's knowledge, skills, abilities, attitudes and other personal characteristics. Types of competences stand out only in their scope of application. *Professional competences* are oriented towards successful joint professional activities, *special competencies* - ensure successful professional activity in a specific field of activity, while *additional specific competencies* are directed to persons who hold the position of successful professional activity.

Thus, it can be concluded that professional competences are the competences of the employee of the general police system, which must be possessed while working in the Lithuanian police system. Special and additional competences have a narrower meaning. This means that they are necessary for the specific professional activity of a police officer or for a managerial position. The profile not only regulates these competencies, but also focuses on defining their content, distinguishing between the Public and Criminal Police, officers in management and administrative functions, and other police personnel. In other words, the description was intended to establish the criteria for the training, performance and professional development of police personnel.

The description of the procedure approved by the General Commissioner of Police of the Republic of Lithuania (July 17, 2012)*"On approval of the procedure for the acquisition or renewal of the competences of police officers"* provided a definition of the totality of the competences discussed. In the Lithuanian police system, the totality of professional, special and additional specific competencies is referred to as the "competency basket". The competency basket held by a police officer shall be drawn up taking into account the job description of the police officer and the special requirements applicable to that activity. A set

of competencies is necessary for both the current position in the police and the aspirations or new ones.

## 4. MODEL FOR THE DEVELOPMENT OF POLICE OFFICIALS' COMPETENCE EDUCATION

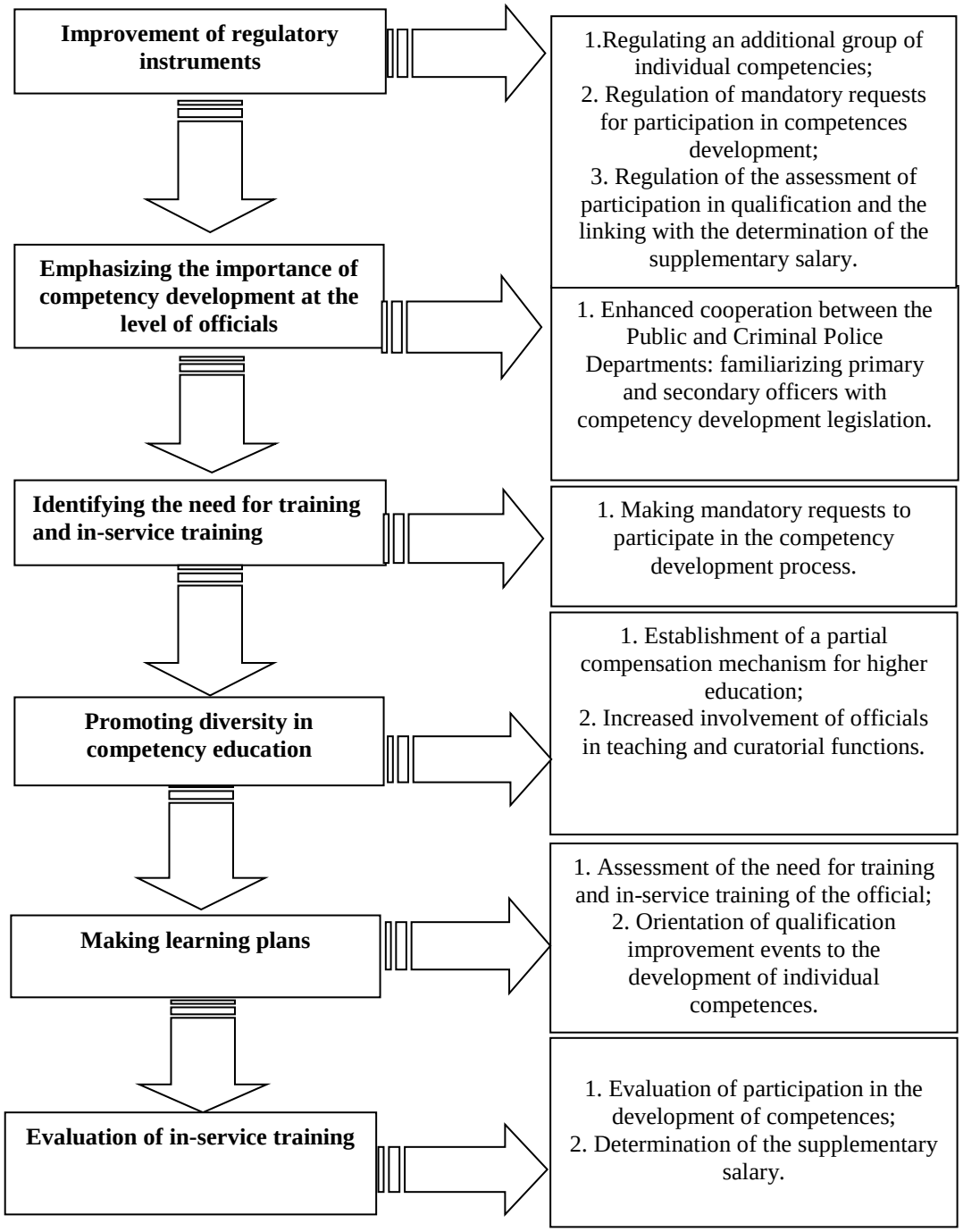
The results of the research were used to reveal the problematic aspects of police officers' competency development and to identify the directions and possibilities for the development of the police officers' competency development model. The systematic, logical and comparative analysis of scientific and methodological literature and legal acts, graphical data presentation and empirical research methods were used as the most appropriate way of data collection for a specific situation by submitting questionnaires to police officers and senior officials. The study population consists of 119 police officers, of which 98 are police officers and 21 are senior officers in a territorial police office. This territorial police institution was chosen because the research will be able to reflect the problematic aspects of competency development in the Lithuanian police system, because the legal regulation of competency development in Lithuania is the same for all territorial police institutions. *The survey was organized* to determine: the professional and demographic characteristics of the respondents; peculiarities of the competency development process in the police establishment; opportunities for improving the competency development process in the police establishment; the most important and missing part of the competencies of police officers at the individual level.

Analysis of competency development models and a survey of police officers' competencies revealed their importance for the development of the organization and its human capital. The importance of developing and implementing competency development systems is unquestionable as all organizations seek not only to create a product or to achieve a certain level of performance and thereby gain market advantage and justification, but also to create an effective, motivating employee competency development system which would guarantee the success of the organization and the realization of its aspirations. Similar requirements are applied to the Lithuanian police system, although the basis of operation of this statutory body is fundamentally different. First of all, it is not a for-profit organization that creates a unique product or seeks to gain an advantage at any cost. Police is primarily focused on work for the public and the state to ensure their safety, therefore its efficiency is evaluated and measured not only by statistical indicators that formally reflect the results of work performed, but also by public opinion, which is one of the main criteria for successful police performance. As a result, officials are subject to very high requirements, not only in the performance of their direct functions but also in their duties. In order to meet the expectations of the public, their competence and continuous education, which must be analyzed and developed not only at the level of the organization but also at the individual level, is of paramount importance.

Considering that the Lithuanian police system already has its own competency development procedure, which is regulated by legal regulation measures, as well as the results of the conducted research, we present the possibilities for improvement of the existing competency development procedure and the model of competency development (Figure 1):

*Opportunities for competency development.* The following aspects should be taken into account in the light of the results of the study conducted and the model provided for the development of competency development of officers, as well as in order to create preconditions for improvement of the competency development process regulated in the Lithuanian police system.

**Figure 1: A model of competency development**




Source: compiled by the authors based on research results

*Improvement of regulatory instruments.* Improvement of the procedure for the development of competences of officials is inseparable from the improvement of legal regulation measures. Not only do they regulate the development of officials' competences, they also define their limits at the same time. Taking into account the results obtained during the research, it would be expedient to further regulate the individual's information technology management competence group in the description of competences, which would form the basis for more flexible development of other competences of the individual and development of curricula oriented to the development of individual competences. It is also important to explicitly link the development of officers' competence training to the career prospects of the official: for example, there should be additional regulation of the mandatory competency application procedure necessary for the official's duties. At a later stage, such a request

should be accompanied by an assessment of the level of participation in the competency development process and the introduction of an additional salary supplement.

*Emphasizing the importance of the competency development process at the level of officials.* The analysis of the data of the professional development reports of the officers of the Lithuanian police system and the number of the employed officers revealed that the officials of the Administrative units and higher officials dominate the qualification improvement. The results of the questionnaire survey showed that the process of competency development among senior officials was developing more smoothly. In this context, it is assumed that it is important to involve as many primary and middle-ranking officers in the Public and Criminal Police Departments as possible in the competency development process. During internal meetings, officials should become more aware of the competency development process and their leaders should, as much as possible, encourage them to participate in competency development and highlight the importance and potential of this process.

*Identifying the need for training and in-service training.* Following the annual staff appraisal interview, police officers should submit, within a reasonable period of time, requests for the acquisition or renewal of competencies that are lacking or necessary to obtain current or higher grades. In this way, officials would be more motivated to take an interest in the process and ways of developing competencies, choosing whichever is most acceptable to them, but this would ensure that the process is systematic, ongoing and continuous. If such a procedure were to become mandatory, it could be assumed that the identification and importance of the need for training and in-service training during the annual staff appraisal interview would be more emphasized by the officers themselves and more carefully identified, avoiding subjective appraisal by managers.

*Promoting diversity in competency education.* The establishment of a partial compensation mechanism for higher education (part-time studies) would encourage some officials to opt for this form of competency development. Higher education would expand the opportunities for officers to pursue vertical careers in the Lithuanian police system and give them greater confidence in themselves and their own strength. The creation of a higher education partial compensation mechanism is more relevant for non-executive officers, as the vast majority of police department managers already have higher education, as this is a requirement for their position. In addition, the Lithuanian police system, in order to popularize ways of developing competencies, should facilitate the more active involvement of officers in the performance of pedagogical activities and curatorial functions.

*Making learning plans.* One of the demotivating factors for the active and systematic participation of officials in in-service training may be the fact that learning needs are not or only partially taken into account in the curriculum development process. For this, every effort should be made to satisfy each of them. Also, considering the most needed and missing competencies at the individual level, identified by officials during the study, the curriculum design process should be focused on designing curricula that ensure the development of individual competencies.

*Evaluation of in-service training.* One of the most popular and best motivating factors is the introduction of an additional supplementary salary. It can be assumed that adapting and linking these practices specifically to the competency development process of officials would also encourage them to become more interested in the possibilities and ways of this process. In assessing an officer's performance and drawing a conclusion without further identifying the need for training and refresher training, it would be appropriate to indicate the officer's involvement in the in-service training, which would be one of the criteria for assessing performance. And with that in mind, the final evaluation conclusion would be drawn, which would influence the determination of the amount of the supplementary salary.

## 5. DISCUSSION AND CONCLUSIONS

The analysis of the theoretical aspects of the competency development of police officers revealed that the Lithuanian police system has a newly developed and legally regulated competency development procedure, which is related to the officer's horizontal and vertical career, as well as his professional development and evaluation. In the Lithuanian police system, the process of competency development regulated by legal measures provides opportunities for officers to supplement or update their competency basket by choosing the most appropriate ways of developing competencies as well as developing their competence outside the system. However, it can be assumed that like every innovation, it has its own weaknesses and strengths, which begin to emerge in the process of their application. Therefore, it is important to periodically analyze, investigate and continually improve the current competency development process, taking into account the views, needs and expectations of officials.

The investigation conducted at the territorial police office revealed the problematic aspects of the development of officers' competences in it: the process of competency development regulated by the legal regulation acts more efficiently and smoothly at the managerial level. The research also highlighted the problem of identifying the need for further training and in-service training as one of the components of the official evaluation interview. Incorrect identification of such needs complicates the ability of officials to initiate a competency development process and also demotivates them. In determining this need, the officer's direct supervisor should avoid subjective assessment and determination of such need, and should place greater emphasis on the importance of the process in determining such need. When evaluating the variety of competency development methods, it should be emphasized that among the least popular competency development methods are the performance of pedagogical activities and curatorial functions, which creates preconditions for popularization of these methods and more active involvement of officials in the implementation of such activities.

The competency development process must not only motivate officers to actively participate in it and be interested in its capabilities and modalities, but also ensure systematic involvement of police personnel. Evaluating the data obtained during the investigation, the main opportunities for the improvement of police officers 'competency development could be: improvement of the legal regulation measures establishing the order of police officers' competency development and improvement of the order of internal processes. The professional, special and complementary competencies that make up the police officer's competency basket, and the parts that comprise them, are more focused on the training of officers to ensure the proper performance of police functions. There is a lack of regulation of an individual's IT competency group in legal regulation measures. The development of IT competences of an individual would substantially influence the level of utilization of competencies regulated by the Lithuanian police system and the development of training programs focused on the development of individual competencies. It should also be emphasized that improving the regulatory framework could significantly improve the competency development process and, at the same time, encourage officials to become more interested in its means and capabilities, after conducting an annual evaluation exercise and in-service training and regulation of requests for participation in the competency development process. In this way, the subjectivity of the officer assessor could be avoided, and it would also encourage his or her diligence in determining such a need. Officials would also be motivated if their involvement in the competency development process were one of the criteria for assessing their performance, which would determine whether a supplementary salary would be determined. In order to improve the internal processes, the authors would

attach the highlighting of the importance of the competency development process at the level of officials, which would be covered by a more active review of competency development legislation to attract and engage more senior and middle level officials. The creation of a partial compensation mechanism for higher education, which would enable the official to develop his / her competences outside the institution, as well as a more active involvement of the officials in the teaching and curatorial functions, would encourage the choice of diversity of competency development methods.

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# DISCOVERING GENERATIONAL DIFFERENCIES IN EMPLOYER ATTRACTIVENESS: THE CASE OF FINANCIAL ORGANIZATION

***Irena BAKANAUSKIENĖ*[8]**
***Asta KYGUOLIENĖ*[9]**
***Lina ŠIUMETĖ*[10]**

**Abstract:** *In the context of 4th industrial revolution, human resources became the key to the success of nowadays business and is of undisputed importance. Thus, the topic of employer attractiveness aiming to understand, what attributes of organizations make employees to choose and subsequently to stay in the organization is relevant as never. New generations are entering the labour market; thus, it becomes important to analyse the differences in their drivers and can help improving organizational attractiveness for specific generation employees. The goal of the research, presented it this article, was to identify generational differences in employer attractiveness and to provide recommendations for HR professionals by analysing attractiveness of international financial organization for the employees of different generations. The results, based on focus group insights, are presented in the article. They disclosed that different generations prioritized different attributes of organizational attractiveness.*

**Key words:** *employer attractiveness, organizational attractiveness, generations*

**JEL Classification:** *M50, M51, M52, M54, M12*

## 1.INTRODUCTION

In the context of 4th industrial revolution, human resources became the key to the success of nowadays business and is of undisputed importance. A lot of research has been performed over the past decade, aiming to identify, what makes employees choose their employers and subsequently retain them in the organization. Analyzing the drivers, that influence employee decisions to choose particular employers, scholars mention the concepts like employer branding (Alshathry et al., 2017, Fromm, 2018, Jiang & Iles, 2011), employer attractiveness (Maxwell & Knox, 2009, Minchington, 2017, Reis & Braga, 2016). Number of high profile consultancy firms, like Gallup (Gallup Q12), Great Place To Work, Deloitte etc. carry out the 'best employer', 'employer of choice' and similar competitions, based on employee satisfaction surveys, which every year present with the lists of companies most appreciated by their existing employees, contributing to their external positioning.

According to Bakanauskiene et al. (2017), there is no single list of attractiveness dimensions, that would be universal across different countries, industries and organizations. Going further, findings often conclude, that different background, gender and age of employees point to rather differing attractiveness dimensions. Age, as a dimension, is in the centre of attention globally. For the first time in modern history, the workforce consists of four/five separate generations, by dominating Generation X and Generation Y following with labor market entrants Generation Z, working side by side. The differences among them are one of the greatest challenges managers face today (Bejtkovský, 2016). This implies, that organizations, that aspire to have productive, engaged and motivated workforce, have to realize the importance of diversity amongst their employees and need to strive for the inclusive culture to

[8] Prof., PhD., Vytautas Magnus University, S. Daukanto 28, Kaunas, LT44248, Lithuania, e-mail: irena.bakanauskiene@vdu.lt
[9] Assoc. Prof., PhD., Vytautas Magnus University, S. Daukanto 28, Kaunas, LT44248, Lithuania, e-mail: asta.kyguoliene@vdu.lt
[10] MBA, Baltic Management Institute, Konstitucijos pr. 7, Vilnius LT09308, Lithuania, e-mail: lina.siumete@gmail.com

leverage the advantages (Great Place To Work, 2018). Understanding the different generations, and what motivates them, can help HR managers develop strategies to attract, develop, and retain leaders in ways that are more relevant and appealing to each cohort (Bursch & Kelly, 2014).

Looking from a global perspective, the perception of an attractive employer is also highly influenced by country context (Bakanauskiene et al., 2014). Generation research indicates, that generations are largely impacted by unique experiences, that are determined by the region (or country) of residence and the political and social dynamics during their lifetime. Therefore, it is important to use the research, performed in specific country to verify the theoretical premises and statements (Bejtkovský, 2016). The object of the research: employer attractiveness to different generations of employees. The aim of the research is to identify generational differences in employer attractiveness and to provide recommendations for HR professionals by analysing attractiveness of international financial organization in Lithuania for the employees of different generations.

In order to fulfill this goal, methods of literature analysis, qualitative research using focus group were used.

## 2. PROBLEM FORMULATION AND METHODOLOGY

Employer attractiveness, focusing on the dimensions of employer value proposition and how they are observed by existing and potential employees, has been widely researched concept since 2005 (Maxwell & Knox, 2009, Minchington, 2017, Reis & Braga, 2016). Though there is no single list of employer attractiveness dimensions, that would be universal across different countries, industries and organizations (Bakanauskiene et al., 2017), the range of employer attractiveness attributes in a shade of peculiarities of each generation can be discussed. It is worth to mention, that there is there is little agreement on the starting and ending points for generations with high discrepancies of time spans. Bakanauskiene et al. (2016) summarize generational time spans noting that Generation X are called people born in a period from 1960-1970 to 1976-1985, Generation Y – from 1977-1985 to 1994-2000, Generation Z – from 1991-2001 to 2010. Disagreement on time span and it's width can be the limitation, because different research can assign people born in the same time for different generations. Adding to this, there's a fine line between appreciating unique characteristics of different generations and perpetuating stereotypes of the generations (Bursch & Kelly, 2014). Some research even state that generational approach can only sharpen generational conflicts and deepen the gap between employees of different generations (Radulescu et al., 2018). Thus, adaptability of generational attitude should be very careful taken into account not only because of limitations of time span, but possible generational conflicts as well.

Also, there is discussion about employees' generational characteristics. The differences and similarities of Generations X, Y and Z characteristics are compared and contrasted widely in theoretical and empirical studies and professionals (Jurkiewicz, 2000; Reis & Braga, 2016; Dowd-Higgins, 2013; Bursch & Kelly, 2014; Cavazotte et al., 2012; Great Place to Work, 2018; Willianson, 2017; Bakanauskiene et al., 2016; WEF, 2018, Merriman, 2018; Fertik, 2011; Deloitte Insights, 2017; Desjardins, 2018; Kordos, 2019; Kordos, 2018). While most of the research is focused on the differing views and managerial practices of different age employees, it is even more important to shed focus on the similarities as these should be the areas, where the most impact can be done. As Harvard Business Review research implies, different generations see more differences themselves, than research actual manages to confirm. As a result, all generations want meaningful work, opportunities to learn and develop, work-life balance, and to be treated fairly and with respect (Bursch & Kelly, 2014).

Thus, the problem of the research could be formulated by question: what are generational differences in employer attractiveness? In order to identify generational differences in employer attractiveness research was done in international financial organization in Lithuania. Organizational attractiveness is considered as a high importance and wide range of issues are supported in organization in order to be attractive for employees.

Focus group was gathered to conduct a qualitative research in order to identify generational differences in employer attractiveness and to provide recommendations for HR professionals. List of attributes, discussed in the focus groups were based on organizational attractiveness questionnaire, created by Bakanauskiene et al. (2017). Employer attractiveness attributes were discussed in three age specific groups: 5 participants represented Generation X (born in 1962 – 1977), 7 – Generation Y (born in 1979 – 1990), 6 – Generation Z (born after 1991). Employees were informed on the purpose in advance. The time taken to discuss the same list of attractiveness attributes was different for different age groups: Gen X took the longest (1 hour and 10 minutes) and were the most elaborate in their answers; Gen Z were the briefest and only took 28 minutes to discuss the same list of attributes and were very concise and decided about their position; Gen Y took 45 minutes and their level of detail in the consideration varied across different questions. The results were compared, TOP attributes for each generation identified.

## 3. RESEARCH RESULTS AND RECOMMENDATIONS

The results of focus group discussion revealed that there are some differences among generations in employer attractiveness. It has to be taken into account that focus group findings may have limitations, such as individual opinions, as well as group dynamics. Despite these possible limitations, most of the research results confirm theoretical arguments.

***Generation X***. Examining focus group results of generation X, it can be noted, that Generation X, as very important indicate such organizational attributes as positive public image, social responsibility, remote/flexible, meaningful work, involvement in decision making, professional knowledge, colleague, manager relationship and salary. Though positive public image was mentioned as the very important, however, they it is not so specific to be a deciding factor or employment. The similar result is with social responsibility. Is of high importance, though respondents could not exclude what exactly is attractive under this. Remote working, flexible working time and work life balance give more freedom and allow balancing the responsibilities of different life areas. The absence of this attribute would impact the attractiveness negatively, but the presence of it is analyzed company is not a general working pattern. These opportunities are highly desired, but now utilized rather rarely and mainly related to life emergencies or health checks. Meaning and importance of the work was rated as one of the key attractiveness attributes. Clarity of expectations from their work was considered to be more important than needs for tasks to be interesting and variety of the tasks was appreciated only partially - while it is balanced and allows holding the area of expertise. Involvement into decision making was considered not just being important because of efficient work, element of control, but also because of its importance psychologically. Being involved in decision making, essentially means sense of recognition and importance, it gives overall satisfaction. The ability to make own decisions was seen as contributing to the commitment to deliver. Some female participants stated that being listened and heard was more important than promotion, while males expressed that formal promotion was more important. Developing professional skills was seen as a way to increase competitive advantage and stay current in the labor market, while individual growth was seen as nice to have element. Discussing the relationship, support and good contact with the manager was seen as having direct influence for the work - trust, empowerment, freedom to act.

Relationship with the manager were more discussed in as important for the successful work, not for emotional well-being. Though relationship with colleagues were mentioned as high importance, some observations were shared that it is not the key for good psychological balance. Salary was mentioned as more important than bonuses, which were rather nice-to-have, but stimulating. Bonuses are valuable in addition to the fixed salary and not a part of it. In the end of discussion, the results of ranking the most important attributes of employer attractiveness as TOP 3 resulted in a such sequence: 1) salary, 2) company image, 3) possibilities to develop.

Summarizing the attributes considered by Gen X focus group, they could be defined as practical and are just as important as allows doing the work well and succeeding in own area.

They pride themselves over expertise and professional skills rather than looking for variety and stimulation. Key to their well-being comes from abilities to succeed in their own role (having tools, support and empowerment) and have a longer vision on development.

***Generation Y***. As a result of discussion with generation Y, following attributes of employer attractiveness were identified as of a highest importance: remote/flexible, meaningful work, manager support, own idea realization, promotion, manager relationship, atmosphere, salary, work-life balance. One of the key attributes is possibilities to work remotely, be able to manage own working time and combine family responsibilities with the work (taking kids to kindergarten and coming later to work). It was noted that working flexibility encourages them to work from home more often, but they do not perceive it negatively as it's their own choice. If there were more clarity around clear definitions or policies concerning flexible work, they would choose to work more time remotely (at least they think they would) and would see it as a strong attractiveness attribute of the organization. Work-life balance was highlighted by respondents having small children or are in generally being active in their lifestyle. Meaning and importance of work was testified uniformly by emphasizing that it is one of the most important factors when choosing the company to work for. Having possibility of interesting tasks was associated to overall meaning of the work and considered to be very important. Variety of tasks was also rated very positively as it helps to prevent the monotony. Ability to make own decisions was considered to be important as opportunity to grow and develop. Development opportunities and abilities to rather quick career growth was mentioned as one of the key attributes, arguing that absence of promotion options results to leaving the organization. Men were very concise that the lack of promotion possibilities have been the reasons for them leaving their previous organizations. Women were more focused on the content of tasks and overall abilities to move horizontally, when discussing promotion importance. Support from manager was stressed, but in general it was assumed that good overall atmosphere can compensate for some deficiencies in relationship with colleagues and manager. Working in larger organizations was lighted as more beneficial as it allows for more variety in relationship. Discussing the compensation, most important part was given on the fixed salary. Bonuses were seen as good addition, but it has to be more substantial in absolute value (very small bonuses are perceived rather negatively). When summarizing the overall attractiveness attributes, Gen Y employees concluded TOP3 attributes of employer attractiveness: 1) salary, 2) work flexibility (work-life balance), 3) possibilities to develop.

In generally Generation Y put a lot of emphases on the development in their work and the abilities of organization to allow them grow professionally and personally. They did not make that large distinction between professional and personal growth but did mention that both are very important, while Gen X employees did not see much importance of the personal development. They also indicated more needs for stimulation (next step career opportunities, continuous learning, tasks supporting development).

***Generation Z***: comparing the attributes of the highest importance with other generations, it can be noted that Generation Z identified at least attributes as of a highest importance. They named only meaningful work, manager support and professional knowledge. Sense of meaning of the work and the purpose was highlighted as of special importance. If tasks are perceived as interesting or not is less important, comparing to understanding the purpose of them. Variety of tasks was seen as attractive only to the employees in the group that perform rather routine tasks presently. Others did not assign this attribute higher value. Gen Z focus group participants excluded relationship with the manager above all the other. While they still agreed that working in a group has some benefit and good relationship with colleagues were claimed to be important, relationship with the manager were seen as having direct impact on the meaning of the work. They seek support from the manager, but the purpose of it is to secure higher achievements in the future, not for better psychological comfort. Professional skills were given the highest priority and general personal development was rather meriting. Ability to realize own ideas was tightly related with the development possibility, which contrasted with reasoning by Gen X employees, who associated attribute with a sign of being listened and Gen Y employees, who felt, like development needs to be more holistic (professional and personal together). Listing the TOP3 priorities of Generation Z, there are such results: 1) meaningful work, 2) development opportunities and presence of inspiring people in organization, 3) good relationship with direct manager and team. Interestingly, this group by comparison were with lowest salaries, yet compensation related attributes were not seen as the key.

Comparing to others, Generation Z gave highest focus to strategic direction of the company, whist others were more concerned about the activities, more impacting their own personal situation. In terms of the relationship, they priorities the relationship that can make the most impact on their career (direct manager and team), but not the ones that creates wider sense of belonging that were so important to Gen Y colleagues. Whilst being rather idealistic, their prioritized attributes in development were more practical and focused on professional skills in which sense they were more similar to Gen X. Gen Y were more focused on holistic concept on development and could not see the professional growth without personal.

Summary of all findings comparing generational differences in employer attractiveness are concluded in Table 1.

**Table 1: Generational differences in employer attractiveness**

| Organizational Attribute | Gen X group | Gen Y group | Gen Z group |
|---|---|---|---|
| Positive public image | Very important | Less than salary | Important |
| International organization | Benefit | Benefit | Not very much |
| Social media | Not much - standard | Not much - standard | Not much - standard |
| Social responsibility | Very important | Not much | Interesting |
| Remote/flex work | Very important | One of key | Important |
| Long term perspective | 3-5 years | 2-3 years | Strategy, vision |
| Meaningful work | Very important | Very important | Highest importance |
| Decision making | Very important | Important | Important/limitations |
| Manager support | One of key | Very important | One of key |
| Team | Moderate | Moderate | Important |

| | | | |
|---|---|---|---|
| Interesting tasks | Less than clarity | Less than meaningful | Less than meaningful |
| Own idea realization | Sense of acceptance | Very important | Development tool |
| Latest technologies | If better than old | Needs to be adequate | 'What is latest?' |
| Professional knowledge | Very important | Part of development | Very important |
| Personal growth | Nice-to-have | Part of development | Complimentary |
| Varying tasks | Needs balance | Important | Important |
| Promotion | Important | Very important | Recognition |
| Colleague relationship | Very important | Less than culture | Less than manager |
| Manager relationship | Very important | One of key | Adds to meaning |
| Atmosphere | Nice-to-have | Very important | Less than colleagues |
| Bonuses | Important | Important | Important |
| Salary | Very important | Most important | Not top attribute |
| Benefits | Nice-to-have | Less than salary | Important |
| Travel | Not much | Not much | Not much |
| Work-life balance | Important | Very important | Important |

As it is seen from the results, generational differences in employer attractiveness exist. Some attributes rated by different Generations were supportive of previous research findings. As well these results support other research findings that identifying priorities of organizational attractiveness relates to the stage-of-life (family or no family, duration of employment history, corporate level etc.), socio-economic background (main financial supporter of the household, level of education, income levels) and overall experience (previous negative experiences form future expectations).

These results provide recommendations for HR professionals for targeted organization attribute improvements.

In order to attract Gen X employees, the company has to have positive public profile and be able to provide stable and sufficiently paid job, that would allow them to utilize and further develop competences. To retain employees of this generation, managers should be clear around the expectations of performance and be able to plan and provide the directions to the employees accordingly.

To attract the employees of this generation Y, company needs to be visible in public. It needs to be good at communicating the employee benefits like fair compensation, good working conditions and flexibility as this is critically important attributes for employees. In addition, visibility of other colleagues, working in the organization is important as this group seeks for peer recommendations and looks for the feedback when researching potential employment. To retain existing employees, the company needs to have the importance of compensation in mind and utilize it appropriately. Focus on the base salary means, that promotion if it does not allow expected increase in salary can become disappointing and not give the expected recognition. The expectations of compensation need to be discussed openly and details behind the salary proposals provided to the employees. These employees need to be encouraged and supported in their development journey and they need to be provided them with inspiring environment - managers, that are able to coach and advice as well as colleagues, they could learn from. In this sense - they are looking for support from their manager, but for learning -

to the entire organization. Networking and socializing are also highly important, and possibilities provided makes the organization more attractive.

To attract employees of Generation Z, company needs to be good at communicating the possibilities to develop and create the understanding how it contributes to bigger purposes of society and business overall. This information needs to be available professionally presented and if possible available via multiple sources. To retain these Gen Z employees, the organization needs to have strong internal communication and promote the learning culture. Managers are especially important for young employees, so the management structures (layers, frameworks and team sizes) needs to allow sufficient time to be spent with employees and involving them in projects and activities as a part of the regular work. Due to the early stage in careers these employees are expecting to move rather fast in organizations and if they are not given the opportunities internally, they are more prone to leave the organization. This dynamic needs to be reflected in HR practices so they would allow more agile role moves, fast and effective compensation review processes, and flexible career framework (i.e. smaller, achievement-based salary and/or role adjustments during the course of the year vs. annual salary review and bonus cycles).

## 4. CONCLUSIONS

There is no single list of employer attractiveness attributes. Different background, gender and age of employees point to rather differing attractiveness dimensions. Nevertheless, there's a fine line between appreciating unique characteristics of different generations and perpetuating stereotypes of the generations. Understanding the differences among generations and their distinctive views regarding career aspirations, work-life balance, development and rewards, recognition and relationships can help improving organizational attractiveness for specific generation employees.

Case study findings disclosed that different generations prioritized different attributes of organizational attractiveness. Gen X employees place a lot of value on stability of their work and controlled level of stimulation and task variety. They seek for defined expectations and opportunities to develop their professional skills. These employees need to be recognized for their experience and competence, provided with trust to act independently. Gen Y employees are very reward driven, so organization needs to provide both - competitive compensation and official recognition of achievements (role changes, promotions). They also put a lot of emphases on development and expect to be supported in their growth by their managers. In addition, these employees seek for larger networking, compare to others and they thrive in the organization that allows cross department collaboration, joined social activities and group projects. Gen Z individuals seek to understand the purpose of their work and overall goals of organization to ensure it. These employees expect effective communication from all levels of organization. In addition, they need to be supported by the managers and expect room for trying their ideas and freedom to make mistakes as a part of learning. As young individuals, Gen Z employees are driven by development opportunities and expect to have tasks and assignments that would allow them to grow professionally. Positive public profile, stable and sufficiently paid job, ensured possibilities to develop can attract Gen X'ers. The last two issues and flexibility of work can attract Gen Y'ers. Meanwhile for attracting Gen Z'ers next to development opportunities, meaningfulness of work and relationships with direct manager and team should be stressed.

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# VPLYV INDUSTRY 4.0 NA ZMENY V ŠTRUKTÚRE PRACOVNÝCH MIEST

## IMPACT INDUSTRY 4.0 TO CHANGES IN THE STRUCTURE OF JOBS

***Vladislav BERKOVIČ*** [11]
***Tatiana MASÁROVÁ*** [12]
***Adriana GRENČÍKOVÁ*** [13]

**Abstrakt:** *Tento príspevok približuje sled udalostí, ktoré sa bezprostredne podieľajú na vzniku štvrtej priemyselnej revolúcie nazvanej Industry 4.0. Popisuje zmeny, ktoré sa uskutočňujú vo výrobnom procese, ale aj naprieč celou spoločnosťou a aký vplyv budú predstavovať tieto zmeny na organizácie a na ľudí. Ozrejmujeme v ňom tempo zmien, ktoré sa takto uskutočňujú a sú priamo závislé na technologických možnostiach, ktoré Industry 4.0 prináša. Výskum je zameraný na súčasnú situáciu nedostatku pracovnej sily v organizáciách ktoré začínajú postupne prvky Industry 4.0 do svojich procesov implementovať. Zameraný je však hlavne na očakávania organizácií týkajúcich sa budúcej štruktúry pracovných miest pod vplyvom zavádzania Industry 4.0.*

**Kľúčové slová:** *Priemysel 4.0, štruktúra pracovných miest, budúcnosť pracovných miest*

**Abstract:** *: This article outlines the sequence of events that are directly involved in the creation of the fourth industrial revolution called Industry 4.0. It describes the changes that are made in the production process, but also across the community, and what impact these changes will have on organizations and people. It illustrates the speed of the changes that are made in this way and is directly dependent on the technological capabilities that Industry 4.0 brings. The research is focused on the current situation of shortage of workers in organizations that are gradually starting to implement elements of Industry 4.0 into their processes. However, it is mainly focused on the expectations of organizations regarding the future structure of jobs under the influence of Industry 4.0.*

**Key words:** *Industry 4.0, structure of jobs, future of jobs*

**JEL Classification:** *F66, J21, J23, Q55*

## 1. ÚVOD

Nadchádzajúce desaťročia budeme svedkami zásadných sociálnych, kultúrnych a ekonomických zmien spôsobených rýchlym vedeckým a technologickým pokrokom. Profesionálny úspech jednotlivca bude závisieť od jeho zručnosti prispôsobiť sa potrebám „nového“ trhu práce. Roboty budú vykonávať jednoduché a komplexné úlohy, ktoré sme doteraz považovali za rutinné, opakované, algoritmizovateľné. Rôzni spoločenskí aktéri, medzi nimi i tí, ktorí sú zodpovední za vzdelávanie a odbornú prípravu, budú musieť predvídať nadchádzajúce zmeny na trhu práce a začať ponúkať odbornú prípravu zameranú na rozvoj potrebných zručností v technologicky sofistikovaných povolaniach.

[11] Ing., Vladislav Berkovič., Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, Trenčín 911 50, Slovenská republika, e-mail: vladislav.berkovic@tnuni.sk
[12] Ing. Tatiana Masárová, PhD., Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, Trenčín 911 50, Slovenská republika, e-mail: tatiana.masarova@tnuni.s:
[13] Doc. Ing. Adriana Grenčíková, PhD., Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, Trenčín 911 50, Slovenská republika, e-mail: adriana.grencikova@tnuni.sk

### *1.1 Udalosti ktoré podmienili príchod Industry 4.0*

Transformácia priemyslu vplyvom inteligentných technológií sa dnes deje v nevídanej miere a stále rýchlejším tempom. Opiera sa o obrovské množstvo informácií, ktoré sa dnes získavajú pomocou všadeprítomného zberu dát. Tieto všetky dáta sa zhromažďujú, analyzujú a výrobcovia z nich využívajú pre nich užitočné informácie. Týmto spôsobom sa zvyšuje interakcia medzi výrobcom a zákazníkom a tiež sa mení vzťah s dodávateľskými reťazcami. Zákazníci vedia omnoho lepšie a presnejšie špecifikovať svoje požiadavky na kvalitu a cenu výrobku, ktorú dostane priamo výroba. Subdodávatelia v potrebnej miere, vedia vopred plánovať a plniť svoje dodávky v reálnom čase a dodávajú diely na mieru zákazníkom špecifikovanému výrobku. Zvyšuje sa flexibilita vo výrobnom procese a stále väčší dôraz sa kladie na orientáciu na zákazníka. Individualizáciou výrobkov sa bude stále viac šetriť životné prostredie, pretože sa zníži plytvanie obmedzenými prírodnými zdrojmi. Tento proces bude stále zreteľnejší a to najmä z dôvodu masívnejšej prepojenosti všetkých kanálov od výrobcov, poskytovateľov služieb až po zákazníka. Podľa Koncepcie inteligentného priemyslu pre Slovensko je toto spojenie čoraz viac založené na prepojením medzi účastníkmi tohto systému prostredníctvom digitálnych technológií a internetu vecí (IoT) (Ministerstvo hospodárstva SR, 2016).

Internet vecí (IoT) je platforma, ktorá prepája prostredníctvom neviditeľných sietí jednotlivé zariadenia a umožňuje im efektívne spolupracovať. Dnes sú to najmä zariadenia týkajúce sa energetiky, bezpečnosti, monitorovania a tiež nositeľné zariadenia a snímače. Okrem priemyslu sa IoT stále viac dotýka aj pridružených oblastí, ako je doprava a logistika. Práve tu inteligentné systémy prepojené prostredníctvom Internetu vecí a využívaním Big Data prinesú veľké úspory času, energií a v neposlednom rade to prinesie aj zvýšenie bezpečnosti. Klaus Schwab, prezident Svetového ekonomického fóra na adresu štvrtej priemyselnej revolúcie povedal: „Vo svojom rozsahu, pôsobnosti a zložitosti bude táto transformácia iná ako čokoľvek, čo ľudstvo zažilo predtým“ (SCHWAB, 2018)

Ak sa zameriame na tempo, akým sa zavádzajú výsledky inovácií do výrobných procesov a do života tak je vyššie ako kedykoľvek v minulosti. Kým v prvej priemyselnej revolúcii trvalo takmer pol storočia kým zavedenie parných strojov do výroby začalo prinášať prvé ovocie tak tempo implementácie nových poznatkov a inovácií je dnes aplikovateľné do niekoľkých mesiacov. V tomto období už to nie je veľkosť firmy, ale čas, ktorý hrá najvýznamnejšiu úlohu pri úspešnosti na trhu. Čo tu predtým nebolo a čo Priemysel 4.0 prináša, je prepojenie informačných technológií a prevádzkových (operačných) technológií s všadeprítomným prepojením digitálneho priemyslu, fyzických systémov, kyberneticko-fyzických výrobných systémov a internetu vecí do jedného celku. Aj keď pôvodný úmysel konceptu Priemysel 4.0 bol používaný iba na výrobu, jeho dosah je omnoho širší. Dnes už je badateľné, že pôvodný koncept presiahol svoj rámec a presunul sa aj do odvetví ako je inteligentná doprava a logistika, spomínané inteligentné budovy, inteligentná zdravotná starostlivosť a už dnes sú pripravované projekty na inteligentné mestá. Prínos Priemyslu 4.0 vo forme zvýšenia produktivity je len začiatok. Nasledovné faktory patria medzi základné požiadavky na efektívnu výrobu:

- Produktivita sa zvýši vďaka vysokej úrovni automatizácie, ktorá skráti výrobný čas a umožní lepšie využitie majetku spoločnosti a manažment zásob.
- Zvýšenie flexibility a to flexibilitou strojov a robotov, ktoré môžu vykonávať výrobné úkony pre veľké množstvo produktov.
- Zvýšená kvalita výrobkov vďaka snímačom a ovládačom, ktoré monitorujú výrobný proces v reálnom čase a sú schopné v prípade chyby bezprostredne zasiahnuť.

- Zvýšenie rýchlosti a to od prvej myšlienky o novom produkte, alebo výrobe až po konečný produkt prostredníctvom presných zadaní za pomoci nových možností simulácie.

## 2. CIEĽ A METODOLÓGIA

Cieľom tohto článku je zisťovanie aktuálneho nedostatku pracovnej sily v závislosti od študijného odboru a stupňa vzdelania a očakávaní zamestnávateľov. K dosiahnutiu tohto cieľa sme zvolili dotazníkovú metódu zisťovania. Dotazník patrí medzi jednu z najčastejšie používaných metód vo výskume. Používa sa v spoločenských vedách na hromadné a rýchle zisťovanie faktov, názorov, postojov, preferencií, hodnôt, motívov, potrieb, záujmov a i. (GAVORA, 2010). Dotazník bol vytvorený a následne realizovaný na internete ako stránka. Na túto stránku sa respondenti, ktorí dostali e-mailovú pozvánku mohli prostredníctvom internetu pripojiť a elektronicky vyplniť jednotlivé otázky.

Popis štruktúry dotazníka

V členení dotazníka je často využívaným kritériom delenie podľa veľkosti podniku. Pre jednoznačnosť kritériá pre mikropodnik, malý podnik, stredný podnik a veľký podnik sme veľkosti definovali v zmysle členenia Štatistického úradu Slovenskej republiky, ďalej ŠÚ SR a to nasledovne:

- podniky do 9 zamestnancov mikropodnik,
- podniky od 10-49 malý podnik,
- podniky od 50-249 stredný podnik,
- podniky od 250 zamestnancov veľký podnik.

Pri tomto členení pre zjednodušenie sme nebrali ohľad na obrat podniku a to aj z dôvodu, že výskum sa zameriava na. predpokladané zmeny v množstve a kvalifikovanosti pracovníkov v podnikoch. Oslovili sme 65 podnikov a odpovede na dotazník zaslalo 34 podnikov.

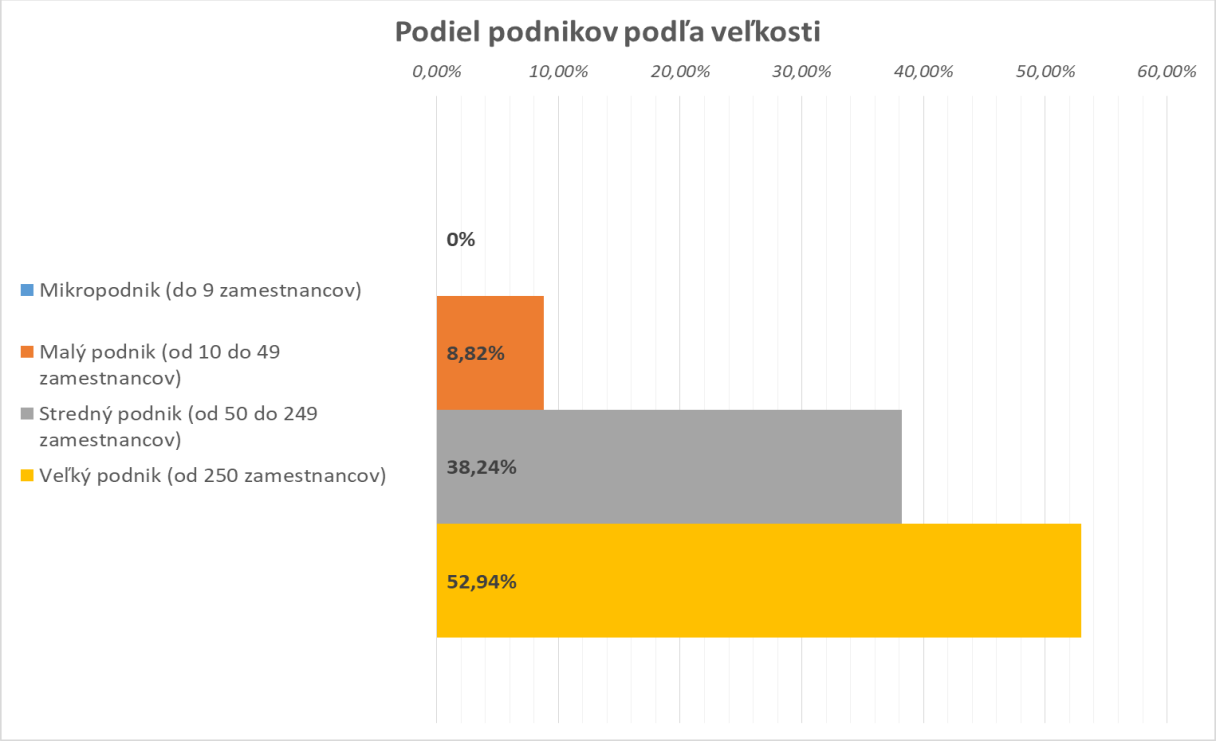
Dotazník dostal názov „Koho budeme po zavedení inteligentného priemyslu hľadať a koho už potrebovať nebudeme“ Tento názov sme zvolili z toho dôvodu, aby bolo z názvu respondentovi zrejmé k čomu sa v dotazníku bude vyjadrovať. Cieľom bolo zistenie aktuálneho stavu poznania koncepcie Priemyslu 4.0 v podnikoch Slovenskej republiky, mieru jeho aplikovania, zistenie súčasnej štruktúry výrobných a nevýrobných pracovníkov a pohľad týchto podnikov na budúcu potrebu pracovníkov v súvislosti s nástupom Priemyslu 4.0..

## 3. VÝSLEDKY PRIESKUMU

Identifikačné znaky podnikov

Z odpovedí na dotazník vyplýva, že záujem o vyplnenie dotazníka prejavili najmä veľké podniky. Naopak, nezúčastnil sa ho žiaden mikropodnik, teda podnik do 9 zamestnancov. Výsledky zloženia respondentov podľa veľkosti podnikov sú uvedené v Grafe 1.

**Graf 1: Rozdelenie respondentov podľa veľkosti podniku**




Zdroj: vlastné spracovanie

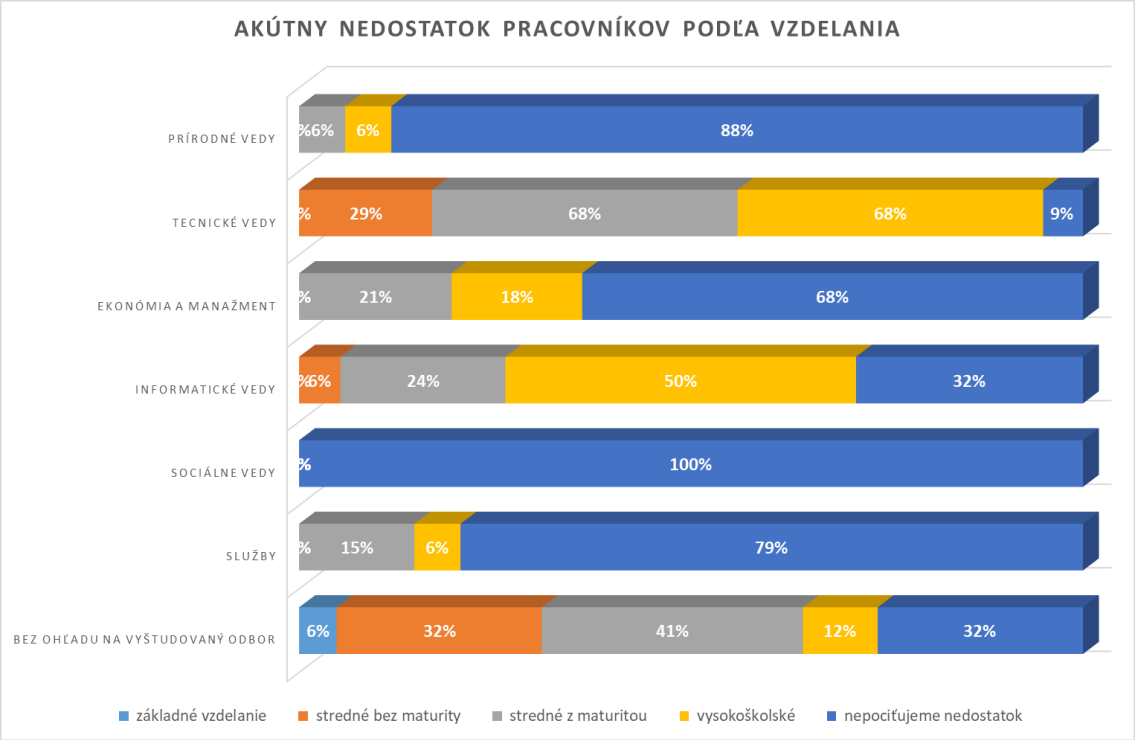
Skutočnosť, že sa dotazníkového šetrenia zúčastnili najmä veľké podniky napovedá, že záujem a praktická aplikácia Industry 4.0 bude vychádzať práve z veľkých priemyselných podnikov. Napriek tomu, že veľké podniky nezamestnávajú v priemysle najväčší počet pracovníkov, zmeny aplikované v týchto podnikoch vo veľkej miere ovplyvnia aj ich spolupracujúce podniky z portfólia malých a stredných podnikov.

Otázka aktuálneho nedostatku pracovníkov

Zmyslom tejto otázky bolo získať čo najkomplexnejší prehľad o aktuálnych požiadavkách zamestnávateľov o dopyte po pracovnej sile.

Prostredníctvom tejto otázky bola v období december 2018 až február 2019 zmapovaná situácia na trhu práce týkajúca sa nedostatkových profesií. Výsledky tohto skúmania sú zobrazené v Grafe 2 a v Tabuľke 1. Tieto odpovede nám pomerne presne dovolili interpretovať dopyt po pracovnej sile.

**Graf 2: Nedostatok pracovnej sily v závislosti od vyštudovaného odboru a najvyššieho dosiahnutého vzdelania**




Zdroj: vlastné spracovanie

Pracovníkov so základným vzdelaním uvádza ako nedostatkových len 6% respondentov. Dá sa predpokladať, že pracovníci v priemysle so základným vzdelaním nie sú príliš hľadaní a aj povaha odvetvia je určujúca skôr k vzdelaniu v rôznych odbornostiach minimálne stredoškolského stupňa. Najväčší dopyt po absolventoch stredných odborných škôl (dávnejšie nazývaných Stredných odborných učilíšť) je po absolventoch technických smerov 29% a tiež po absolventoch SOŠ bez ohľadu na vyštudovaný odbor.

Najväčší dopyt bol zo strany zamestnávateľov vyslovený po absolventoch s úplným stredným vzdelaním, teda stredoškolákoch s maturitou. Najväčší nedostatok, 68% zamestnávatelia u tejto vzdelanostnej skupiny pociťujú u absolventov s technickým vzdelaním, tiež sa tu znova objavuje výrazný dopyt po pracovníkoch bez akcentu na vyštudovaný odbor, ktorí chýbajú 40% opýtaných respondentov.

U stredoškolákov s maturitou sa už prejavuje aj výraznejšia požiadavka na absolventov z oblasti informatiky, potom ekonómie a manažmentu a tiež oblasti služieb. Z tohto dopytu po pracovnej sile s úplným stredným vzdelaním zamestnávatelia pociťujú najväčší nedostatok pracovnej sily a pri jej vyhľadávaní kladú dôraz na odbornosť.

Dopyt po vysokoškolsky vzdelaných pracovníkoch je takmer tak výrazný ako u stredoškolákov s maturitou. Opäť je v takej istej miere kladený dôraz na vyštudované technické vedy, tiež je vysoký dopyt po pracovníkoch vyštudovaných v informatických odboroch. V menšej miere je dopyt po pracovníkoch z odboru manažmentu a ekonómie, ostatné odbory sú žiadané v priemysle málo, respektíve ich je dostatok. Naopak žiaden respondent neuviedol , že pociťuje nedostatok pracovníkov vyštudovaných sociálne vedy. Tu nie je dopyt zamestnávateľov žiadny. Druhý najnižší dopyt zamestnávateľov je po pracovníkoch z odborov prírodných vied, u týchto nedostatok nepociťuje až 88% opýtaných.

**Tabuľka 1: Nedostatok pracovnej sily v závislosti od vyštudovaného odboru a najvyššieho dosiahnutého vzdelania**

| | **základné vzdelanie** | **stredné bez maturity** | **stredné s maturitou** | **vysokoškolské** | **nepociťujeme nedostatok** |
|---|---|---|---|---|---|
| *Prírodné vedy* | 0% | 0% | 6% | 6% | 88% |
| *Technické vedy* | 0% | 29% | 68% | 68% | 9% |
| *Ekonómia a manažment* | 0% | 0% | 21% | 18% | 68% |
| *Informatické vedy* | 0% | 6% | 24% | 50% | 32% |
| *Sociálne vedy* | 0% | 0% | 0% | 0% | 100% |
| *Služby* | 0% | 0% | 15% | 6% | 79% |
| *Bez ohľadu na odbor* | 6% | 32% | 41% | 12% | 32% |

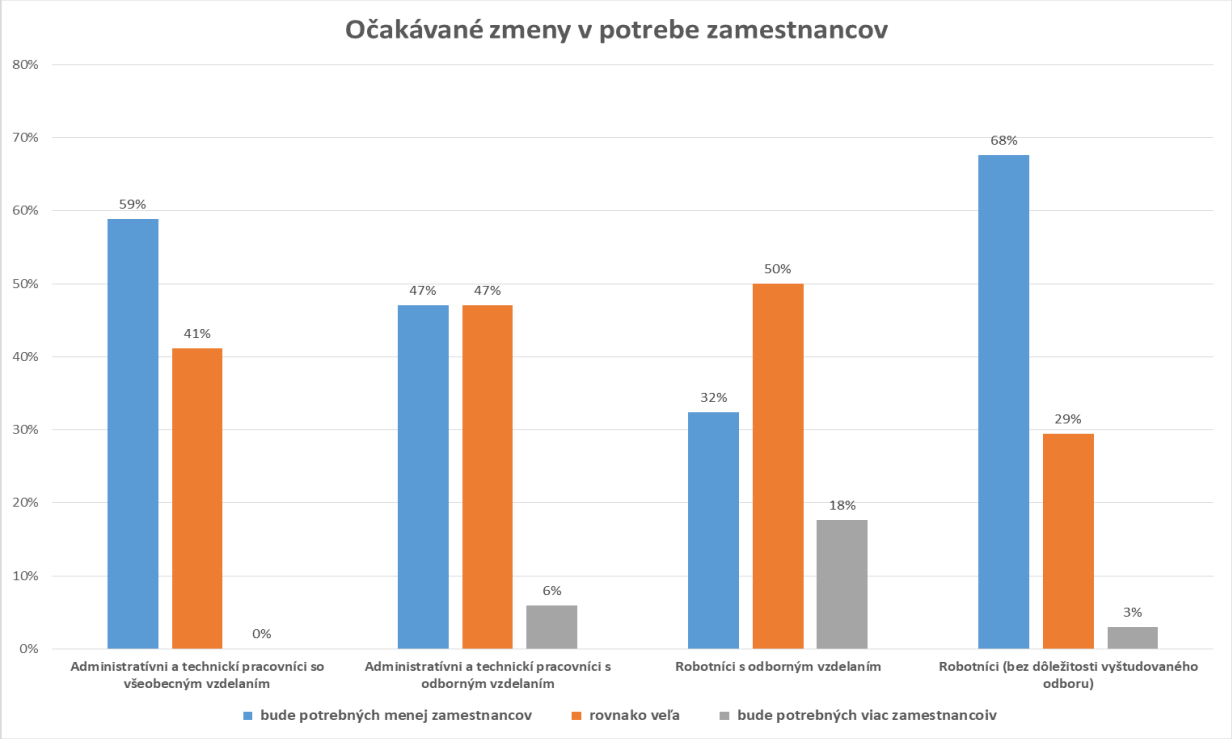
Zdroj: vlastné spracovanie

Vývoj zamestnanosti vplyvom zavádzania Priemyslu 4.0

Kľúčová otázka výskumného dotazníka, prostredníctvom ktorej sme zisťovali očakávania zamestnávateľov priemyselného sektora mala presné znenie: „Aké zmeny potreby zamestnancov predpokladáte po zavedení prvkov Industry 4.0“. Pracovníci boli rozčlenení na administratívnych a robotníkov, inými slovami výrobných a nevýrobných pracovníkov. Ďalej bola každá skupina zamestnancov rozdelená podľa vzdelania na pracovníkov so všeobecným vzdelaním a pracovníkov s odborným vzdelaním. Účastníci výskumu vyjadrovali očakávania k jednotlivým kategóriám zamestnancov v zmysle toho, či bude po zavedení prvkov Priemyslu 4.0 ich dopyt vyšší, nižší, alebo zostane nezmenený. V každom riadku bolo možné zvoliť jednu z odpovedí. Táto otázka dotazníka predstavovala najdôležitejší indikátor budúceho vývoja zamestnanosti v rozdelení na výrobných a nevýrobných pracovníkov s dôrazom na špecializáciu ich vzdelania. Výsledky zo zozbieraných odpovedí sú zobrazené v Grafe 3.

Z celkovej vzorky zúčastnených respondentov, u administratívy so všeobecným vzdelaním predpokladá znižovať stavy 59% podnikov, 41% podnikov počíta s udržaním súčasného stavu. Predpoklad znižovania stavov u administratívy a technických pracovníkov s odborným vzdelaním je o niečo nižší. U tejto skupiny pracovníkov dokonca 6% podnikov očakáva zvýšený dopyt do budúcnosti. Výraznejší rozdiel sa prejavil u robotníckych profesií. Kým u robotníkov s odborným vzdelaním polovica podnikov predpokladá udržanie ich stavov, u robotníkov bez odborného vzdelania očakáva znižovanie stavov až 68% priemyselných podnikov. U robotníkov s odborným vzdelaním sa celkovo naprieč všetkými skupinami pracovníkov očakáva vplyvom zavádzania Industry 4.0 aj najväčší dopyt.

**Graf 3: Očakávané zmeny v dopyte po pracovnej sile**




Zdroj: Vlastné spracovanie

### *Priemysel 4.0 na Slovensku*

Priemyselné podniky na Slovensku reprezentované svojim manažmentom dlho nebrali výzvy Industry 4.0 do úvahy. Videli ich skôr ako západný módny trend a implementácia platforiem ako internet vecí, Big Data a ich analytika, cloudové výpočtové operácie, virtuálna realita a 3D tlač neboli nasadzované takmer do žiadnych domácich priemyselných podnikov. Inak to bolo so zahraničnými investormi a to najmä v automobilovom priemysle a v sieti ich dodávateľov. V posledných dvoch rokoch sa však situácia mení, podniky sa o platformu Priemyslu 4.0 začali intenzívnejšie zaujímať. Problémom zostáva neistota v spôsobe akým postupne Priemysel 4.0 so všetkými svojimi zložkami efektívne implementovať. Podľa tlačovej správy PwC z 16.5.2018 pätina dodávateľov do automobilového priemyslu už investovala do Priemyslu 4.0 a tretina počíta s investíciami v najbližších dvoch rokoch. Investície sa podľa tlačovej správy PwC sa u štvrtiny dodávateľov budú pohybovať na úrovni menej ako 1% a u 30% to bude viac ako 1% príjmov.

Koncom roka 2016 zareagoval na výzvy Priemyslu 4.0 aj štát a vo svojom uznesení s názvom „Koncepcia inteligentného priemyslu pre Slovensko“ popisuje súčasnú situáciu a ukladá príslušným ministerstvám zriadiť „Platformu inteligentného priemyslu a vypracovať akčný plán inteligentného priemyslu SR.

Oblasť kde sa očakáva podpora zo strany štátu je pretrvávajúca malá pridaná hodnota v oblasti najmä automobilového priemyslu. Výskum a vývoj v podmienkach SR je na nízkej úrovni a trvalo podfinancovaný.

V roku 2018 bol následne vládou prijatý „Akčný plán inteligentného priemyslu SR“ ktorý je rozdelený do piatich prioritných oblastí v ktorých bolo prijatých spolu 45 opatrení. Prioritné oblasti sú nasledovné:

- Výskum, vývoj a inovácie

- Základné princípy IT bezpečnosti implementácie inteligentného priemyslu
- Trh práce a vzdelávanie
- Referenčná architektúra, štandardizácia a tvorba technických noriem, rámcové európske a národné právne podmienky
- Informovanie a propagácia

## 4. ZÁVER

Prebiehajúce diskusie o dopadoch zmien na zamestnanosť vnášajú často zásadne rozdielne názory medzi tých, ktorí očakávajú v novovznikajúcich druhoch pracovných miest neobmedzené príležitosti a vyhliadky na zvyšovanie produktivity pracovníkov a oslobodenia ich od fyzickej a rutinnej práce, a tých, ktorí predpokladajú masívnu náhradu práce človeka a premiestňovanie pracovných miest do iných krajín.

Bez súčasných naliehavých a cielených opatrení na riadenie krátkodobého prechodu a formovania pracovnej sily so zručnosťami budúcnosti, budú musieť krajiny čeliť stále viac narastajúcej nezamestnanosti a sociálnej nerovnosti a tiež zväčšovaním podielu podnikov so zužujúcou sa spotrebiteľskou základňou.

Zbierané údaje majú za cieľ otvoriť možnosti pre ďalšie kroky poskytnutím perspektívy vedúcim pracovníkom v oblasti ľudských zdrojov u strategických zamestnávateľov, ktorí patria medzi popredných predstaviteľov nových trendov a sú kľúčovými aktérmi pri implementácii budúcich stratégií pracovnej sily..

### *Dodatok*

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# TREND ANALYSIS OF INDUSTRY DIGITIZATION IN EU MANUFACTURING SECTOR

***Daiva BIČKAUSKĖ***[14]
***Žaneta SIMANAVIČIENĖ***[15]
***Artūras JAKUBAVIČIUS***[16]

**Abstract:** *The combination of faster increase of labour costs than the increase of productivity, together with the dominance of low-tech sectors in the Lithuanian manufacturing structure, put significant pressure on the competitiveness of Lithuanian manufacturing sector. In order to strengthen digitalization processes, it is imperative to study existing cases of industry digitalization in other EU member states. Comparative analysis of EU countries was made. Countries were analyzed by criterions such as changes in production outputs and number of employees, changes in the share of manufacturing in GDP, share of high-tech sectors in total manufacturing output, level of capacity utilization, share of employees in manufacturing sector in total employment, personnel costs and wages. The aim of this paper is to present the outputs of selected statistical data analysis, to analyze the trends in manufacturing output and to provide insights.*

**Key words:** *digitalization, digitization potential, employment, manufacturing sector.*

**JEL Classification:** E23, E24, J31, O31, O33.

## 1. INTRODUCTION

In scientific articles, authors emphasize the importance of digitization in production (Wang, 2016; Qin & Liu, 2016). They claim that companies need to implement the latest technology. The fourth industrial revolution will have a monumental impact on the global economy, so vast and multifaceted that it makes it hard to disentangle one particular effect from the next. Schwab (2016).

The OECD report (2018) shows that not only routine manual workers are at risk but also places of highly skilled workers whose work can be replaced by software. More productive workplaces with a simple working algorithm with unambiguously definable procedures, but also those jobs whose tasks can be replaced by software solutions (accounting, administration) are more threatened. On the other hand, there are jobs that do not require high qualifications, yet they are not easy to be substituted artificially (OECD, 2018).

The industry is part of the economy producing material goods that are mechanized and automated (Lasi, Kemper, Feld & Hoffmann (2014). According Manufacturing risk index (2018) Lithuania is rated amongst the Top 5 global manufacturing destinations in the world. While Lithuanian manufacturing is currently enjoying a period of dynamic growth, the combination of rapid increase in labor costs and lagging productivity, together with the dominance of low-tech sectors in the Lithuanian manufacturing structure, put significant pressure on the competitiveness of Lithuanian manufacturing sector. Majority of the entrepreneurs recognize the concept of Industry 4.0 as a great opportunity for development and improvement in competitiveness (Ślusarczyk, 2018). The strengthening of digitalization

[14] PhD student. Mykolas Romeris University, Ateities str. 20, Vilnius, LT-08303, Lithuania, email:e-mail: daiva.bickauske@gmail.com;
[15] Habilitated prof. Mykolas Romeris University, Ateities str. 20, Vilnius, LT-08303, Lithuania, email:zaneta.simanaviciene@gmail.com;
[16] Habilitated prof. Vilnius Gediminas Technical University, Saulėtekio al. 11, Vilnius, LT-10221, Lithuania, e-mail: arturas.jakubavicius@vgtu.lt.

processes in EU industry may put additional competitiveness pressures on Lithuanian manufacturing businesses. In order to maintain the competitiveness of Lithuanian industry, steps towards the digitalization of industry has to be implemented. Digitization offers the potential for quality improvement, flexibility and productivity (Hoellthaler & Braunreuther, 2018).

In order to generate specific steps/recommendations in regard to the digitisation of Lithuanian industry, it is useful to study existing cases of industry digitisation in other EU member states.

## 2. BACKGROUND OF THE SITUATION

Experts highlight four areas for which digitization technologies will have the greatest impact: productivity, revenue growth, employment and investment (Rußmann et al. 2015; Kordos, 2019; Kordos, 2018). Despite efforts, Europe's role in the global data and platform economy is limited and the uptake of digital technology by SMEs is low: 90 % of SMEs and 60% of large companies are lagging behind (Berger, 2015). The EU Digital Scoreboard measures the performance of the EU and its member states in a wide range of areas – from connectivity and digital skills, to the digitisation of businesses and public services. The digital Scoreboard includes data from the Digital Economy and Society Index (DESI) and the European Digital Progress Report. All in all, the Scoreboard analyses the country's performance through more than 150 various indicators on the digital economy and society.

**Table 1: EU Digital Scoreboard**

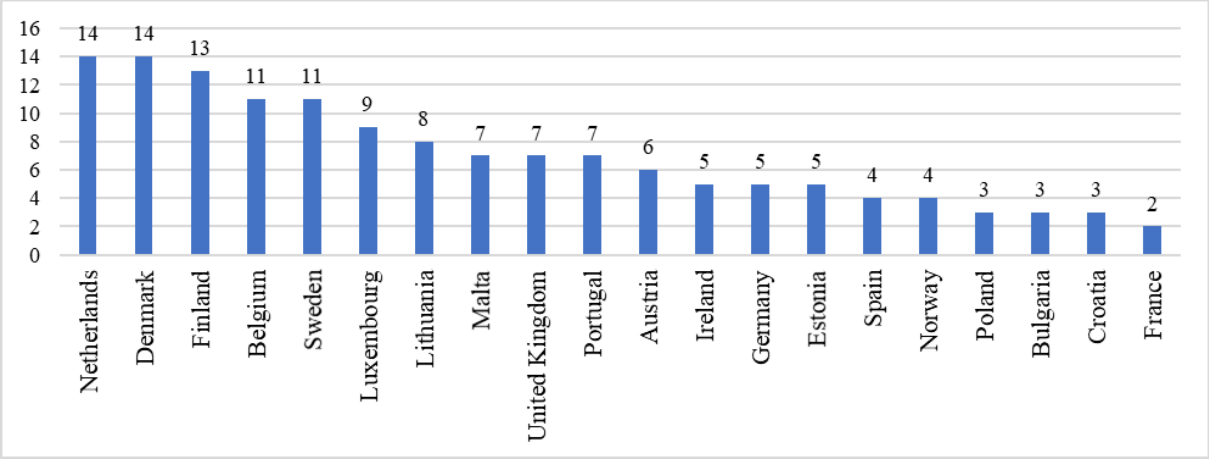
| Indicator | Unit of measurement |
|---|---|
| **Persons Employed with ICT Specialist Skills (broad measure)** | Percentage of total employment |
| **Science and technology graduates** | Number per 1000 inhabitants aged 20-29 years |
| **Individuals with basic or above basic digital skills** | Percentage of individuals |
| **Digital Skills Indicator (all individuals)** | Percentage of individuals |
| **Enterprises sharing electronic information on the supply chain** | Percentage of enterprises |
| **Enterprises with High levels of Digital Intensity** | Percentage of enterprises |
| **Enterprises purchasing Cloud Computing services of medium-high sophistication** | Percentage of enterprises |
| **Enterprises analyzing big data from any data source** | Percentage of enterprises |
| **Enterprises using mobile internet to run business applications** | Percentage of enterprises |
| **Enterprises providing persons employed with remote access to the enterprise's e-mail system, documents or applications** | Percentage of enterprises |
| **Enterprises that internally share electronic information with an ERP** | Percentage of enterprises |
| **4G mobile broadband (LTE) coverage (as a % of households)** | Percentage of households |
| **Take-up of mobile-active SIM cards for voice or data** | Number of subscriptions per 100 people |
| **Share of fixed broadband subscriptions >= 30 Mbps - advertised download speed** | Percentage of fixed broadband subscriptions |
| **Enterprises having a fast fixed broadband connection** | Percentage of enterprises |

Source: EU Digital Scoreboard, 2017

Due to the fact that the Scoreboard consists of a vast amount (over 150) indicators, the most relevant digitisation indicators from the Scoreboard were selected. All in all, 15 indicators were short-listed, and this list of indicators is provided in table 1.

With regard to each of the above indicators, a list of the top-10 countries with the highest scores in respective indicators were selected. After the exercise was completed for each indicator, the number of times the country featured in the top-10 list was calculated. The graph below provides a list of top 20 countries, i.e. the countries that dominate the top 10 positions in the indicators (i.e. demonstrate very high industry digitisation potential). In other words, the more indicators in which the country dominates, the higher the country's industry digitisation potential is assumed, based on the selected EU Digital Scoreboard indicators (see figure 1). Therefore, the measure is only indicative of digitisation potential.

**Figure 1: The number of times that a country held a top 10 position in 15 short-listed digitisation indicators**




Source: EU Digital Scoreboard, 2017

### *2.1. Industry digitalization progress*

The table below contains the data on change in manufacturing output and the number of employees in the manufacturing industry between 2017 and 2010 (post- global financial crisis. Here, progress in digitalization is assumed to be evident if there was a significant positive change in production output, while the same or reduced workforce numbers were maintained during the investigated period (see Table 3). The larger the difference between increase in output and decrease in workforce – although the number of employees could have grown or not have changed – the greater the influence of automation processes in each country. However, there may be other factors that contributed to growth in productivity; thus, this measurement is only indicative of progress in digitalization.

### *2.2. Share of manufacturing in GDP*

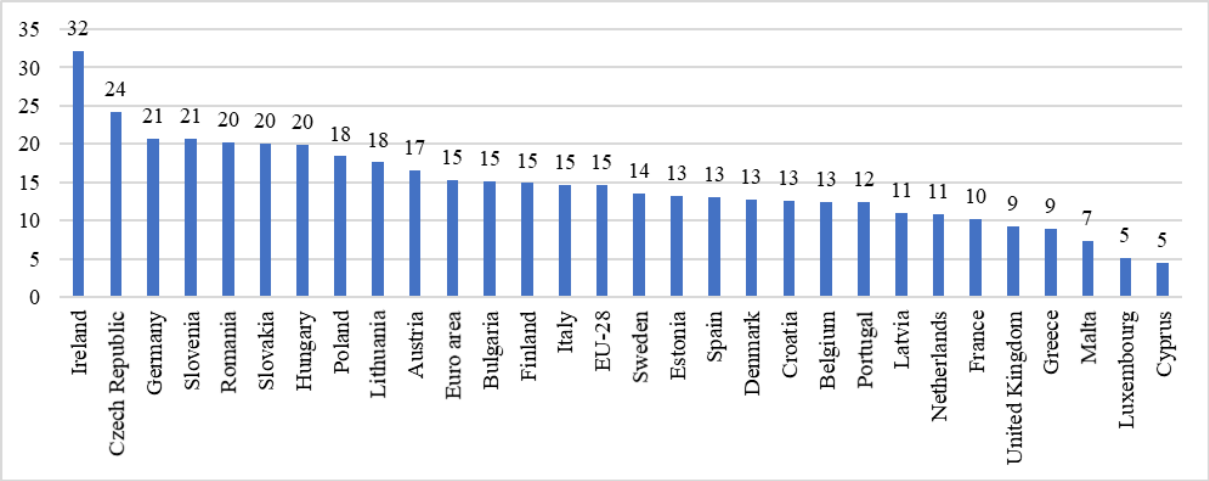
This graph (table 2.) demonstrates the share of GDP of the manufacturing sector in 2017. The manufacturing sector's share in GDP is used as an indicator to determine how developed the manufacturing sector is.

**Table 2: Manufacturing: change in production outputs and number of employees**

| Country | Manufacturing: change in production output in 2017, compared to 2010, % | Manufacturing: change in number of employees in 2017, compared to 2010, % |
|---|---|---|
| **EU-28** | 12.3 | 3.5 |
| **Euro area** | 10.7 | 0.6 |
| **Belgium** | 15.4 | -12.3 |
| **Bulgaria** | 26.0 | -5.6 |
| **Czech Republic** | 34.7 | 17.2 |
| **Denmark** | 23.4 | -5.5 |
| **Germany** | 15.6 | 3.9 |
| **Estonia** | 49.8 | 14.6 |
| **Ireland** | 62.7 | 15.8 |
| **Greece** | -3.3 | -23.4 |
| **Spain** | 1.0 | -0.6 |
| **France** | 4.7 | -2.6 |
| **Croatia** | 5.0 | -1.5 |
| **Italy** | -2.5 | -0.6 |
| **Cyprus** | -14.6 | -16.4 |
| **Latvia** | 44.9 | 5.8 |
| **Lithuania** | 43.0 | 7.2 |
| **Luxembourg** | 1.9 | -25.2 |
| **Hungary** | 32.9 | 27.3 |
| **Malta** | -1.6 | -0.4 |
| **Netherlands** | 10.3 | -0.8 |
| **Austria** | 18.9 | 8.7 |
| **Poland** | 39.0 | 18.2 |
| **Portugal** | 4.2 | -0.4 |
| **Romania** | 53.1 | 8.6 |
| **Slovenia** | 26.5 | 3.4 |
| **Slovakia** | 55.0 | 17.3 |
| **Finland** | 1.2 | -10.9 |
| **Sweden** | 2.1 | -7.3 |
| **United Kingdom** | 6.9 | 1.5 |

Source: Eurostat, 2017

**Figure 2. Manufacturing: share in GDP, 2017, %.**

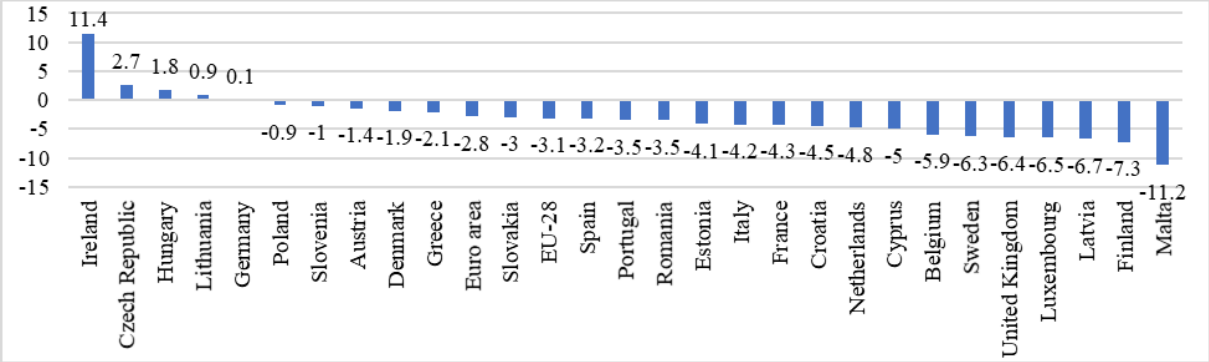



Source: Eurostat, 2017

In regard to the size of manufacturing sector (see figure 2.), Ireland, Czech Republic and Germany occupy leading positions, with their share of manufacturing in their GDP higher than the EU average (15%). Ireland enjoys the biggest manufacturing sector in total economy in the whole EU.

On the negative side, the graphs above (figure 2.) and below (figure 3.) clearly demonstrate that most economies suffer from deindustrialization, i.e. a shrinking share of manufacturing in GDP. In fact, just five countries managed to sustain or increase the share of manufacturing in GDP, the rest suffer from the most severe deindustrialization in the EU; the pace of decline in the share of manufacturing in GDP in Malta, Finland, Latvia and many other countries (see table below) is faster than that of the EU average. On the positive side, Lithuania managed to stop the decline in the share of the manufacturing sector in GDP, which is a very positive sign, especially for Lithuanian manufacturing.

**Figure 3: Change in the share of manufacturing in GDP in 2017, compared to 1995, perc. p.**



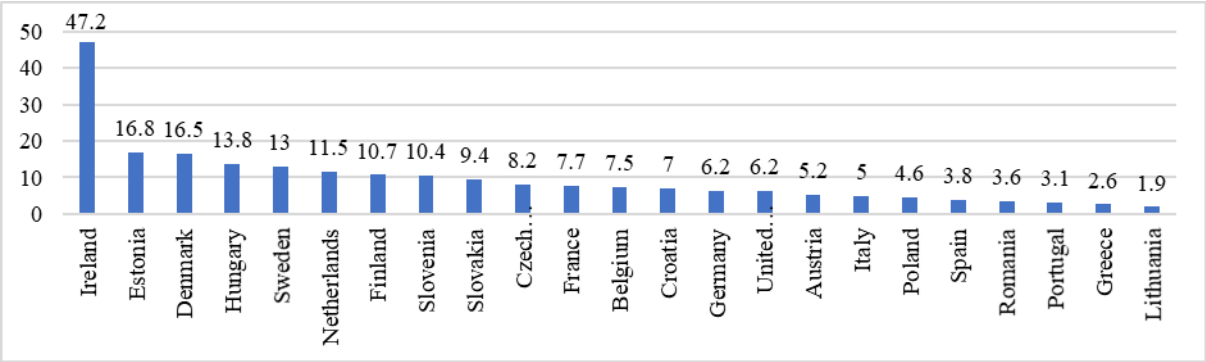

Source: Eurostat, 2017

With regard to the structure of the manufacturing sector (in terms of its technological development), there are visible differences between Lithuania and other countries. As was shown in the analysis above, Lithuanian manufacturing is heavily dominated by the medium-low and low-tech sectors, which in 2014 generated more than 80% of total manufacturing output. Unfortunately, 2014 is the latest year in which data for all the selected economies is available in the Eurostat database. On the other hand, in Germany, Sweden, Netherlands,

Ireland and Denmark, close to or slightly more than 50% of total manufacturing output is generated by medium-high and high-tech sectors.

Therefore, while Lithuania enjoys a stable share of manufacturing in GDP and rapid growth in manufacturing output, Lithuanian manufacturing lags behind the rest of Europe in regard to "innovative output" in manufacturing. Actually, data from Eurostat suggests that, in 2014, Lithuania had the lowest share of high-tech industry in manufacturing output in the whole EU (Figure 4., although data for some economies was not available).

**Figure 4: Share of high-tech sectors in total manufacturing output, 2014, %.**




Source: Eurostat, 2014

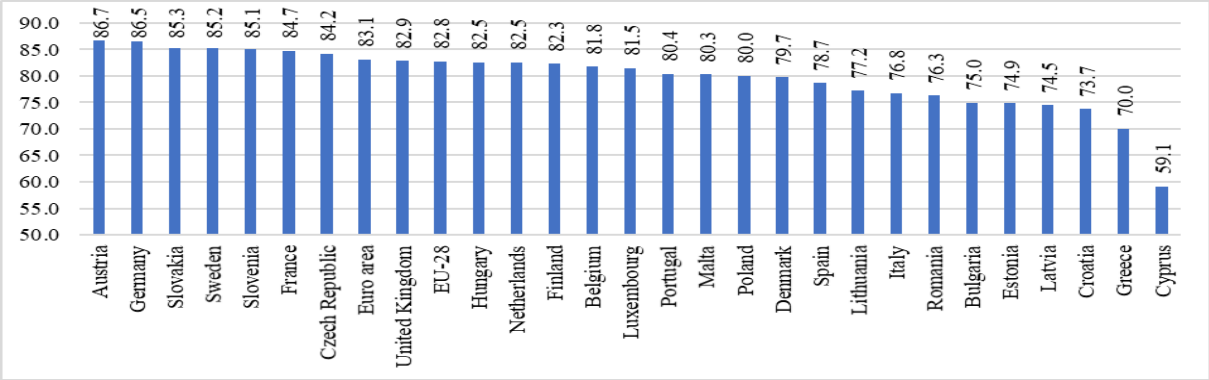
## 3. TRENDS IN MANUFACTURING OUTPUT

While Lithuania lags in terms of "innovative output" in manufacturing, the Lithuanian manufacturing sector stands out among the rest economies in terms of the rapid growth of production output. In the previous 5 years alone, Lithuanian manufacturing output rose by a third, mainly driven by increasing sales in export markets. Despite the fact that, compared to other selected economies, Lithuania has enjoyed very rapid growth in manufacturing output, the dominance of the low and medium-low tech sectors in manufacturing restricted the turnover per person employed in Lithuanian manufacturing. For example, in 2011-2015, the turnover per person in Lithuanian manufacturing stayed the same, while the actual production output was growing rapidly. Therefore, in general, while Lithuanian manufacturing companies are producing more and more goods, typically they do not earn more revenue per person employed. Other economies managed to sustain a gradual increase in turnover per person employed.

Statistics on capacity utilization draw a particularly interesting picture when comparing Lithuania to other countries (see Figure 5.). Lithuania currently has a higher rate of capacity utilization than in 2007 (before the global financial crisis). This is an optimistic sign, given that a rising rate of capacity utilization typically implies that manufacturing companies are planning to invest in additional capacity.

Manufacturing companies in many other countries are using production capacity to a much higher level than in Lithuania. Actually, in comparison to other EU economies, Lithuania is in the group of countries with the lowest rate of capacity utilization in the manufacturing sector – despite the fact that the Lithuanian manufacturing sector us enjoying very dynamic growth in production output.

**Figure 5: Manufacturing: level of capacity utilization, 2017, %.**

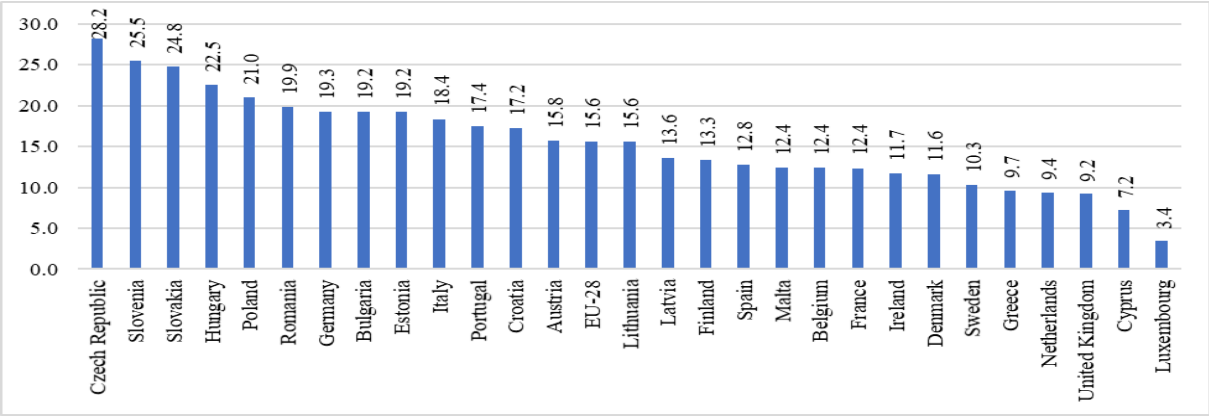



Source: Eurostat, 2017

### *3.1. Employment, labor costs and productivity*

Human capital becomes more important because not only does more have to be done with lower human resources, but organisations also need motivated employees (Bal, et al., 2010). Skilfully managed and integrated in workplaces human capital has a positive effect on the organisation's results (Foster, 2010). As regards employment in manufacturing, it is interesting to observe the long-term trend in the share of employment in manufacturing within total employment – and the trend in digitalization is clearly evident here (see Figure 6.).

**Figure 6: Share in employees in manufacturing sector in total employment, 2017, %.**




Source: Eurostat, 2017

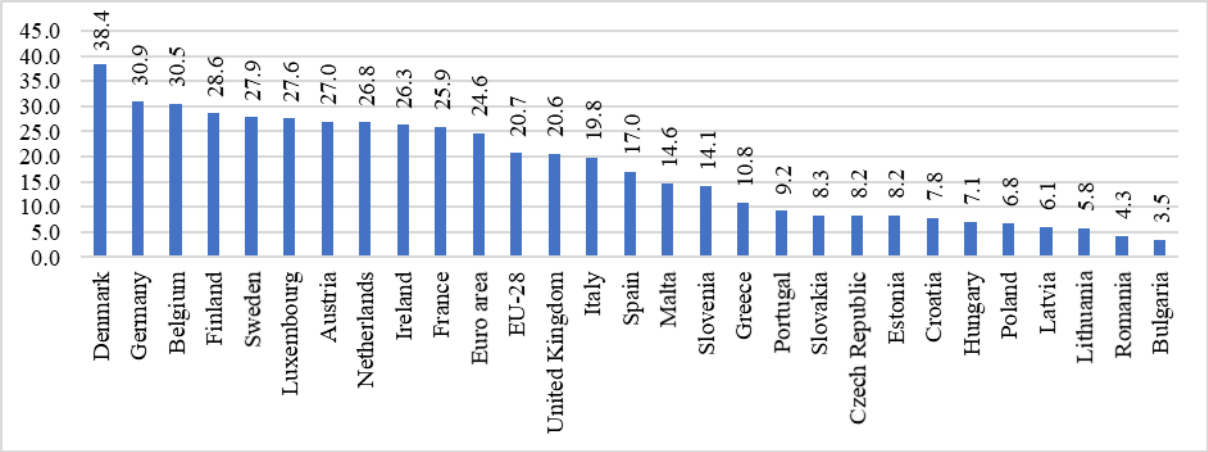
In regard to the share of employment in the manufacturing sector as a percentage of the total number of employees in the whole economy, Czech Republic, Slovenia and Slovakia are leaders among the economies in Europe. Almost one fourth of all employees are occupied in the manufacturing sector in these countries. As Kamal-Chaoui said, the question is whether advanced automation and digitalization will reduce the number of available jobs, or just transform the traditional professions into the new "digital" professions (2018).

Digitalization trends in the manufacturing sector are also clearly visible when comparing the change in number of employees between 2010 and 2017 in the total economy and in the manufacturing sector. In some of the selected economies, a substantial difference in employment trends in industry and total economy can be observed. Lithuania did not register substantial differences in trends in the total employment and employment in the

manufacturing sector. In Lithuania, the total number of employees in 2017, compared to 2010, rose by 6.6%, while the number of employees in the manufacturing sector rose by 7.2%. Of course, rapid growth in manufacturing output is a very important reason for this; however, it can also be a sign of low investment in digitalization by Lithuanian manufacturers.

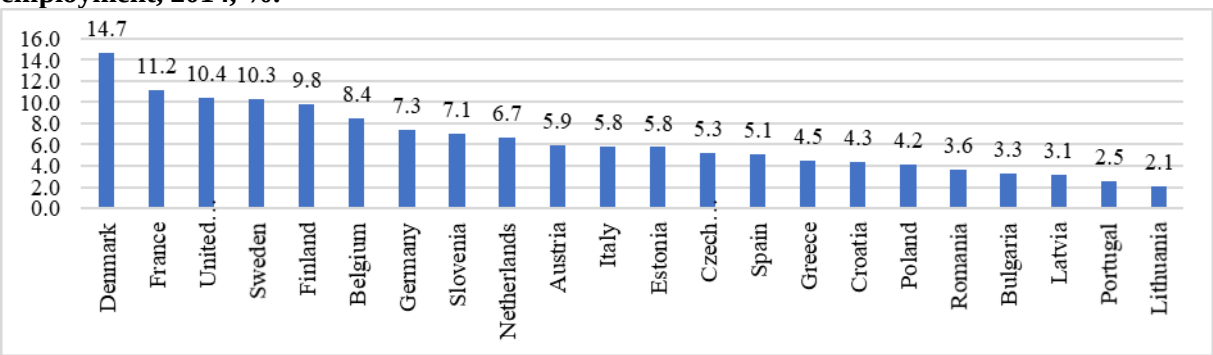
Lithuania substantially lags behind the other countries in terms of wages in the manufacturing sector: hourly wages in the Lithuanian manufacturing sector in 2017 were 3.5 times lower than the EU average (Figure 7.). A key factor behind such visible differences in salaries is the significant difference in the structure of manufacturing from the innovation point of view. Lithuanian manufacturing is still strongly dominated by low-tech (Figure 7.) sectors and contract manufacturing businesses. In the report above, it was also shown that in Lithuania, 85% of employees in the manufacturing sector are employed in the medium-low and low-tech sectors. Data from Eurostat also shows that Lithuania lags substantially behind other EU member states in employment in high-tech industry, as observed in the graph below.

**Figure 7: Manufacturing: salaries, EUR/hour, 2017.**




Source: Eurostat, 2017

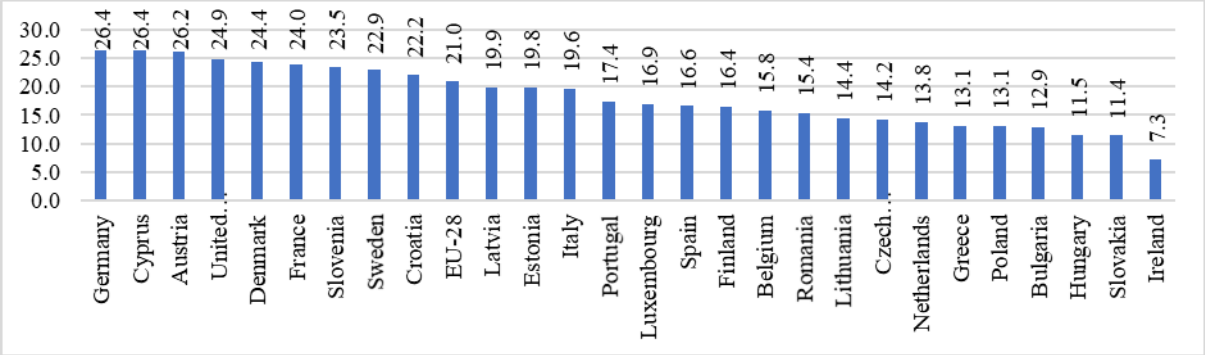
**Figure 81. Share of employees in high-tech manufacturing sector to total manufacturing employment, 2014, %.**




Source: Eurostat, 2014

Data from Eurostat shows that labor costs account for 14.4% of the total expenditure of the Lithuanian manufacturing industry, but their share is rising rather fast: in 2011, for example, the figure stood at 9.5%.

**Figure 9: Share of personnel costs in total purchases of goods and services - 2015, %.**




Source: Eurostat, 2015

In Lithuania, however, the wages and the share of personnel costs in total manufacturing expenditure in 2010-2015 both rose by 27% - perhaps a sign that Lithuanian manufacturing companies are underinvesting in digitalization (see Figure 9.).

## 4. CONCLUSION

Lithuania stands quite high in the size of the manufacturing sector (see figure 8.) and occupy leading positions (higher than the EU average 15%). Also, Lithuania managed to sustain or increase the share of manufacturing in GDP. In regard to the structure of the manufacturing sector, Lithuanian manufacturing is heavily dominated by the medium-low and low-tech sector, while in many other countries' economies, half of their manufacturing output is generated by the medium-high and high-tech sectors.

Lithuania had the lowest share of high-tech industry in manufacturing output in the whole EU, but has a higher rate of capacity utilization currently than in 2007; however, the Lithuanian rate of capacity utilization in manufacturing is much lower than in other countries.

Lithuania did not register substantial differences in trends in total employment and employment in the manufacturing sector. Growth in manufacturing output and labor working in this sector was noticed; however, it can be a sign of lagging investment into digitalization by Lithuania manufacturers; Country also lags behind in terms of wages in the manufacturing sector: hourly wages during 2017 in manufacturing sector were 3.5 times lower than the EU average; However, both wages and the share of personnel costs rose by 27% in total manufacturing expenditure in 2010-2015, which is a sign that Lithuania manufacturing companies are underinvesting in digitalization.

Obviously that situation of the lowest share of high-tech industry in manufacturing output in the whole EU has This has to change and manufacturing sector has to improve this by investing in business structure improvements and reorienting to this type of enterprise creation.

There are signs that businesses in Lithuania underinvest in digitalization processes. However, in order to remain competitive, companies will have to rethink their strategies concerning future investments.

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# LABOR MIGRANTS AS A RESOURCE FOR THE SHADOW ECONOMY IN A CONTEXT OF TRANSITION TO INDUSTRY 4.0

***Irina BRITVINA***[17]
***Polina SHUMILOVA***[18]
***Dmitriy ZAKHAROV***[19]

**Abstract:** *The problem of the shadow sector of the economy existence is a barrier to the industry 4.0 development. The volume of the shadow economy of Russia in 2018 amounted to 20% of Gross Domestic product. The shadow economy is also supported by the labor of migrants from Central Asia. Labor migrants from this region do not have a high level of education and the necessary cultural skills. In the development of the fourth industrial revolution context, this circumstance makes them uncompetitive. All this contributes to the migrants' involvement in the sphere of shadow labor relations. This situation forms the basis for conflicts between employees and employers. Our research in Ekaterinburg (Russia) shows the presence of latent conflicts, expressed in the formation of the migrant perception of the Russian employer as dishonest. On the other hand, residents of Ekaterinburg believe that migrants from Central Asian countries often provoke conflicts themselves. Minimization of conflicts in the sphere of economic and labor relations can become an important factor in their recovery in the sectors of migrant labor, as well as a factor in weakening the sphere of the shadow economy of Russia*.

**Key words:** *industry 4.0, shadow economy, labor migrants, Central Asia, conflicts, survey, Ekaterinburg*

**JEL Classification:** *J23, J24, O15.*

## 1. INTRODUCTION

The problem of the shadow economy for various reasons is relevant for many developed countries of the world trying to make the transition to a new type of economy. The shadow economy sector is an obstacle to the development of the industry 4.0 due to the significant changes of the requirements to the qualification of labor resources and their quantity.

In 2018 in Russia, the shadow economy amounted to 20% of the gross domestic product according to the Federal Financial Monitoring Service (Rosfinmonitoring). The shadow economy in Russia is supported inter alia through the labor migrants from Central Asia. The policy of the Russian government in the field of regulation and control of the presence and labor of migrants is primarily aimed at legalizing the activities of visitors from Central Asian countries. One of the substantial reasons for such control is the large-scale problem of the migrants' participation in the Russian shadow economy. The wide involvement of foreign migrants in the shadow economy is determined by unofficial employment, the lack of information about the migrant's current location and his or her living conditions in Russia, in addition to the lack of knowledge of the Russian language, the rules of public life and the Russian laws.

There exist unofficial labor relations leading to delays and non-payment of wages to migrants in Russia. Despite the laws requiring both the employee and the employer to legitimize labor

[17] Dr. of Science in Sociology, Prof., Ural Federal University, Mira St., 19, Ekaterinburg, 620002, Russia, e-mail: Irina.britvina@urfu.ru
[18] Postgraduate, Ural Federal University, Mira St., 19, Ekaterinburg, 620002, Russia, e-mail: Polina_shumilova@ mail.ru
[19] Postgraduate, Lesgaft's National State University of Physical Culture, Sports and Heals, Dekabristov str. 35, Saint-Petersburg, 190121, Russia, Saint-Petersburg, e-mail: zdn31@yandex.ru

relations, violations occur on both sides. The most migrant labor-intensive areas are construction, trade, and service sector (from 30% to 40%). These sectors of the economy are leading in the formation of demand for shadow financial services, according to the Central Bank of the Russian Federation (Bank of Russia). There is a visible correlation between these indicators. In 2018, 17 764 489 people were registered as migrants in Russia and 41% of them entered the country with the employment purpose [8]. Obviously, the labor and its payment for some of them are not officially registered. More than half of these migrants entered the Russian Federation from the Central Asian countries (Kazakhstan, Tajikistan, Uzbekistan, Kyrgyzstan and Turkmenistan).

The population of Ekaterinburg is more than 1.5 million people. It is a major Russian metropolis, the center of not only the Sverdlovsk region, but of the whole Ural Region. The geographical location of Ekaterinburg on the border of Europe and Asia leads to an increased influx of migrants from Central Asia [14]. The economic characteristics of the city attract foreign migrants from other countries due to the fact that Ekaterinburg needs workers in such areas as construction, transport, industry, and service sector. According to surveys Russian residents speak out in favor of accepting “quality” migrants (young, Russian-speaking and educated), who could effectively integrate with the new type of the Russian economy [7].

The shadow sector of the economy is designated by different terms: hidden economy, gray economy, informal, unobservable, underground, hidden economy. Several terms may be used to denote this phenomenon in a scientific text [4]. The structure of the shadow economy in Russia includes three main components: shadow (hidden) production — permitted activity, intentionally hidden from the state, evading taxpaying and following the law (for example, unofficial use of workers' labor and payment of their salaries in cash); informal production — legal but never registered production within the household for the market sale of the goods produced in it; household production for own consumption [13]. There are different positions concerning the role of this sector in the development of the country’s economy. Some authors write about its negative role, for instance, connecting the shadow economy and the rising energy demand [1], the growth of corruption and environmental pollution [10]. Others write about the positive role of the shadow economy for some segments of the population, like poor people in the situation of technological shock, that reduces the level of employment, as well as shocks in the banking and credit sector [11].

The role of migrants in maintaining this sphere is clearly interpreted as negative, which is directly related to the problem of involving migrants in informal labor relations [6]. Factors that contribute to this are as follows: migrants do not know the language and laws of the host country, they have a low social status [2], and they are dependent on the value-cultural characteristics of the host country [3]. Along with such consequences as tax losses [9] and the formation of shadow money circulation, one of the results is high conflictogenity of this area of economy. For example, the informality of labor activities contributes to the enclavization of migrants in certain sectors of the economy (trade, transport, construction), which causes dissatisfaction of the host community, having its own interest [5]. Many authors write about the specifics of the formation of professional groups in the context of the transition to industry 4.0, considering their qualification characteristics [12].

## 2. PROBLEM FORMULATION AND METHODOLOGY

There are different positions of scientists regarding the role of the shadow economy in the literature. The authors stick to the following approach: the shadow economy plays a negative role in the country's economy in the transition to industry 4.0.

We have studied the position of Ekaterinburg residents and the opinions of migrants from Central Asian countries, analyzing the roles of labor migrants in the reproduction of the shadow economy in Russia. In April 2019, the authors of the article interviewed 476 residents of Ekaterinburg (Russia) who have been living in the city for at least 10 years. The survey was conducted using the questionnaire with quota sampling. We also used the results of the standardized interview (N 231) with the migrants from Central Asia, carried out by the authors in 2016–2017 in Ekaterinburg. In 2018, we interviewed 30 migrants from this region. We used the method of statistical analysis to assess the scale and the structure of migration processes and their influence on the social-economic situation in the Ural Federal District. The authors applied the descriptive method of information analysis.

## 3. RESULTS

In 2017, the Government of the Russian Federation adopted the program "Digital economy of the Russian Federation". Digitalization of economy is a strategic priority setting specific requirements towards the social and professional characteristics of employees. Foreign workers (labor migrants) form a significant part of the labor resources of Russia. Thus, according to the results of the study, only 32.2% of working migrants from Central Asia think that they have become accustomed to the life in Ekaterinburg. Only 33.6% have a good command of the Russian language (it means they can not only communicate, but also can read and write in Russian). In most cases, the communications of labor migrants with the citizens of Ekaterinburg are work-related (79.0%). Less than one third of the respondents (28.7%) mentioned the presence of friendly relationships with the local population. We can come to the conclusion that the social characteristics of migrants from Central Asia are the evidence of the fact that they do not conform to the needs of the economy 4.0.

The shadow economy sector does not fit into the logic of the new industrial revolution, because it impedes the development of all modernization processes on the way to industry 4.0. First of all, this concerns the qualification of workers, as the shadow economy is developing, among other things, through the use of low-skilled labor, and, primarily, the labor of migrants. The main problem for the state is the impossibility of statistical accounting in this sector in terms of all economic indicators, which is also associated with the inability to control migration processes. The problem of the amplified conflict between migrants and the host community is another aspect of the existence of the shadow economy, which is significantly supported by the labor of foreign migrants. When speaking about foreign migrants seeking Russian citizenship (62.8% of the respondents), potentially planning to become part of Russian labor resources, this means mainly the conflicts between employers and employees. Most of these conflicts are related to the non-payment of salaries, since migrant labor is in demand in the shadow economy sector. An analysis of appeals to the Migrant Assistance Center (Non-profit Partnership "Interethnic Information Center") in Ekaterinburg (Russia, Sverdlovsk Region) for 2018 showed that 47% out of 1840 complains from Central Asian migrants, were initiated due to the lack of wage payments. On the one hand, our studies in Ekaterinburg show the presence of latent conflicts that promote the formation of an image of a dishonest Russian employer among migrants. This situation is primarily associated with informal employment that fuels the shadow economy.

> *"Do you officially work here? What is it called, a patent?" — "Yes, I had all the documents. I have everything. But she told me: 'I don't need anything. Only a passport'. Then the second month passed. I told her: 'Nadezhda, will you give me the money? I've heard you don't give money'. She replies: 'No, who said that?!' She said so, but she still has not given me any money"* (woman, 53 years old, Kyrgyzstan).

> *"What difficulties did you face when you came here?" — "They don't pay salary. I worked in a big 'OK' store, you know? I worked there, but they didn't give me any money. There is no such thing in Moscow. In general, before, the Russians did not cheat, and after the patent they 'scam' us all the time. When I ask for my money, they say: now we'll call the police and deport you". — "Do you have a contract?" — "No, they say: either work this way, or get out of here". — "Have you tried to contact the law enforcement agencies?" — "No, of course, nobody helps here in Ekaterinburg..."* (woman, 43 years old, Uzbekistan).

On the other hand, citizens of Ekaterinburg are confident that, compared with the locals, migrants from Central Asian countries more often provoke conflicts on their own (30.5% and 8.0%, respectively). First of all, it should be mentioned that one third of the respondents in Ekaterinburg have contact with migrants in the professional sphere (30.3%), because they are their employers or work colleagues. The presence of a large number of professional contacts among all types of interaction between city residents and migrants leads to the actualization of the conflict. Thus, speaking of the unusual nature of such interaction with migrants, the city residents indicated professional sphere as the first reason for interaction, and the contacts in the sphere of education (as the parents of the students) – as the second one.

**Table 1: Assessment of the interaction habitualness with migrants by contact areas**

| In what areas do you interact with non-Russian migrants from Central Asian countries most often? | Are these interactions with migrants habitual to you or still not? | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Yes, for me they are already habitual | % | Still cannot get used to dealing with migrants | % | I don't know, hard to say | % | No answer | % | Total | % |
| **Professional area** | 104 | 32,0 | 27 | 36,5 | 12 | 16,7 | 1 | 20,0 | 144 | 30,3 |
| **Everyday communication area** | 105 | 32,3 | 19 | 25,7 | 13 | 18,1 | 3 | 60,0 | 140 | 29,4 |
| **Leisure and entertainment area** | 69 | 21,2 | 9 | 12,2 | 8 | 11,1 | 3 | 60,0 | 89 | 18,7 |
| **Family-related area** | 16 | 4,9 | 3 | 4,1 | 2 | 2,8 | 0 | 0,0 | 21 | 4,4 |
| **Friendship area** | 60 | 18,5 | 5 | 6,8 | 3 | 4,2 | 1 | 20,0 | 69 | 14,5 |
| **Religion related area** | 6 | 1,8 | 0 | 0,0 | 1 | 1,4 | 0 | 0,0 | 7 | 1,5 |
| **Service sector** | 168 | 51,7 | 30 | 40,5 | 21 | 29,2 | 3 | 60,0 | 222 | 46,6 |
| **Education sector** | 62 | 19,1 | 17 | 23,0 | 4 | 5,6 | 1 | 20,0 | 84 | 17,6 |
| **Medical service sector** | 52 | 16,0 | 11 | 14,9 | 6 | 8,3 | 1 | 20,0 | 70 | 14,7 |
| **Other sector** | 6 | 1,8 | 1 | 1,4 | 4 | 5,6 | 0 | 0,0 | 11 | 2,3 |
| **I do not interact with migrants** | 15 | 4,6 | 12 | 16,2 | 35 | 48,6 | 0 | 0,0 | 62 | 13,0 |
| **I don't know** | 2 | 0,6 | 0 | 0,0 | 2 | 2,8 | 0 | 0,0 | 4 | 0,8 |
| **No answer** | 0 | 0,0 | 0 | 0,0 | 0 | 0,0 | 1 | 20,0 | 1 | 0,2 |
| **Total** | 325 | | 74 | | 72 | | 5 | | 476 | |

In our opinion, the conflictogenic basis of the interaction between the employee and the employer is largely determined by the rejection of the migrant' image as a person equal to the percipient and to his or her fellow citizens. The citizens of Ekaterinburg admitted that the migrants' ignorance of the Russian language (44.7%), their everyday habits (41.8%), low level of civility (38.4%), their inappropriate attitude towards Russian women (31.5%), unwillingness to join the Russian culture (28.4%) and other factors repel them from Central Asian migrants and their behavior and appearance. Only 8.6% of the respondents chose the option "nothing repels me in the behavior of migrants". This situation can lead to the escalation of the latent conflict in the labor sector. Respondents from Ekaterinburg, who recognized the existence of conflict with migrants, indicated that 46.1% of them appear in the professional sphere and another 51% — in the service sector — the main resource of work for migrants from Central Asia.

From the point of view of the latency of the conflict attitude, it can be noted that Ekaterinburg residents associate their feelings with the status of migrants. They conditionally accept the presence of migrants in the service sector in the low position of auxiliary workers, but they completely reject the situations when migrants occupy highly qualified positions.

> *"Well, yes, I do not want to make friends with them, I will not agree if my dentist is Tajik or Kyrgyz". — "Even if he is good?" — "Well yes. Even if he is good. I don't even think that he should be a teacher…"* (man, 27 years old).

Further, the growth of migrant's discontent leads them to join the shadow economy sector or to appeal to human rights organizations and lawyers, which in some cases helps them to protect themselves. However, this is possible only with a good knowledge of the Russian language and confidence in their rights. According to our research, most migrants are poorly aware of the Russian language and Russian laws. That way, one third of visitors from this region admitted that they did not know Russian laws well (29.9%), and only 19.9% of the respondents had known the laws before moving to Russia.

**Table 2: The attitude of migrants from Central Asian countries and residents of Ekaterinburg towards the aspiration for cooperation or competition with each other**

| Identification of aspiration | The attitude of Ekaterinburg residents towards the aspiration for cooperation with migrants | The attitude of migrants towards the aspiration for cooperation with residents of Ekaterinburg |
|---|---|---|
| **For cooperation (integrating efforts)** | 16,8 | 26,3 |
| **For competition in different areas** | 9,1 | 13,9 |
| **For conflict (hidden or open collision on various issues)** | 13,1 | 11,3 |
| **No aspiration for cooperation** | 28,0 | 17,4 |
| **I don't know, hard to say** | 31,8 | 29,4 |
| **No answer** | 1,3 | 1,5 |
| **Total respondents:** | 100,0 | 99,8 |
| **No data** | | 0,2 |

When comparing the opinions of residents of Ekaterinburg and migrants on assessing their own aspiration for conflict or cooperation with the opposite side, it can be concluded that

visitors from Central Asia are more oriented towards cooperation with the host community than residents of Ekaterinburg (26.3% and 16.8% respectively). Respondents from Ekaterinburg, on the contrary, in a greater degree demonstrate a lack of aspiration for cooperation, and in addition, a tendency to conflicts with visitors (13.1%). According to the respondents, members of the host community in a greater degree do not seek to interact with migrants than the visitors themselves (28% and 17.4%, respectively). Moreover, 54% of Ekaterinburg residents are confident in the necessity to tighten the laws and regulations on the reception of migrants from other countries at the state level.

## 4. CONCLUSION

The shadow economy of Russia is a sphere of increased conflict for visitors from the countries of Central Asia. On the one hand, migrants are the reproduction resource of this sphere, and, on the other hand, most of them have no social and qualification opportunities to take jobs in the advanced areas of legal labor. The basis of this situation is the negative perception by both sides: migrants and the host community. Residents of Ekaterinburg do not reject the possibility of professional contacts with migrants due to the fact that migrants are objectively integrated into the sphere of labor relations. However, they are ready to accept migrants in a limited way — only in the areas of low-skilled labor, which deprives visitors from Central Asian countries of the prospect of being in demand at the Russian economy modernization processes. At the same time, migrants from Central Asia, being in demand mainly in the sphere of menial labor and in the extensively developing economic sectors, do not have real possibilities to expand the professional qualities, required under the conditions of the Russian economy being in the course of transition to the Industry 4.0.

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# ZVYŠOVANIE ODOLNOSTI A KONKURENCIESCHOPNOSTI PRIEMYSELNÝCH PODNIKOV NA VONKAJŠIE A VNÚTORNÉ VPLYVY POMOCOU IMPLEMENTÁCIE MANAŽMENTU RIZÍK V PROJEKTOVOM RIADENÍ

# INCREASING THE RESILIENCE AND COMPETITIVENESS OF INDUSTRIAL ENTERPRISES TO EXTERNAL AND INTERNAL IMPACTS THROUGH THE IMPLEMENTATION OF RISK MANAGEMENT IN PROJECT MANAGEMENT

***Michal BRUTOVSKÝ***[20]
***Katarína BUGANOVÁ***[21]

**Abstrakt:** *Vplyv Industry 4.0 a turbulentná situácia v podnikateľskom prostredí vyžaduje rýchle a flexibilné reakcie podnikov na aktuálne požiadavky trhu, zvyšovanie produktivity, efektívnosti a kvality vo výrobnom procese. Požadovaný stav je možné dosiahnuť procesnou optimalizáciou, ktorej cieľom je celkové znižovanie nákladov, času a finančných zdrojov pri dosahovaní požadovaných cieľov a cieľových ukazovateľov v súlade s aktuálnymi požiadavkami na znižovanie negatívnych dopadov. Preto sa čoraz viac podnikov uberá smerom zavádzania požadovaných zmien za pomoci projektov s nadväznosťou na tému a požiadavky Industry 4.0. V snahe o zachovanie trvalo udržateľného vývoja a následne zavedeného stavu sa využívajú rôzne metódy, procesy a produkty projektového riadenia. Cieľom článku je poukázať na mieru využívania manažmentu rizík ako jednu z významných súčastí riadenia projektov v priemyselných podnikoch. Pretože naplnenie cieľov a vysoká úspešnosť realizovaných projektov sú predpokladom úspechu celého podniku.*

**Kľúčové slová:** *projekt, projektové riadenie, riziko, manažment rizík, priemysel*

**Abstract:** *Impact Industry 4.0 and turbulent situation in the business environment requires rapid and flexible business responses to current market requirements, increasing productivity, efficiency and quality in the production process. The desired situation can be achieved by process optimization, which aims to reduce costs, time and financial resources overall while achieving the required objectives and target indicators in accordance with current requirements for reducing negative impacts. Therefore, more and more businesses are moving towards implementing the required changes with the help of projects following the theme and requirements of Industry 4.0. In an effort to maintain sustainable development and subsequently introduced state are used different methods, processes and products of project management. The aim of the article is to point out the use of risk management as one of the important components of project management in industrial companies. Because the fulfillment of goals and the high success rate of realized projects are a prerequisite for the success of the whole company.*

**Key words:** *project, project management, risk, risk management, industry*

**JEL Classification:** *D81, G32, L26, L52, M21*

## 1. ÚVOD

V bežnom živote ako aj v podnikaní sa čoraz častejšie stretávame so zásadným ovplyvňovaním zo strany moderných technológii. Prebiehajúce procesy v projektoch zrýchľujú, časy spracovania dát sa skracujú, informácie sa stavajú dostupnejšími. Avšak

[20] Ing., Žilinská univerzita v Žiline, Fakulta bezpečnostného inžinierstva, Katedra krízového manažmentu, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: brutovsky.michal@gmail.com
[21] doc. Ing. PhD., Žilinská univerzita v Žiline, Fakulta bezpečnostného inžinierstva, Katedra krízového manažmentu, Univerzitná 8215/1, 010 26 Žilina, Slovensko,, e-mail: katarina.buganova@fbi.uniza.sk

všetky tieto zmeny so sebou prinášajú nielen príležitosti ale aj riziká a hrozby. Tento trend neobchádza ani priemyselné podniky. Čoraz častejšie sa stretávame s pojmom "smart" podnik s vysokou mierou automatizácie a s prvkami inteligencie. To podnecuje snahy o neustále zvyšovanie odbornosti pracovníkov v projektovom riadení so zvýšenou mierou orientácie na implementáciu manažmentu rizík v projektoch priemyselných podnikov. Je to nevyhnutnosť z pohľadu ich prežitia, napredovania a zvyšovania konkurencieschopnosti.

Industry 4.0 je synonymom pre rozsiahle zmeny, ktoré prudko vstupujú do súčasných priemyselných podnikov. Nositeľom týchto zmien je digitalizácia. Hovoríme o digitalizácii všetkých druhov finálnych výrobkov a služieb, procesnej, produktovej a technickej optimalizácie. Súčasná vlna týchto turbulentných zmien zasiahla takmer všetky oblasti projektov.

V prípade podnikov spadajúcich pod problematiku Industry 4.0 existuje rozsiahla informačno-komunikačná infraštruktúra, ktorá monitoruje fyzické procesy, vytvára virtuálne kópie fyzického sveta a robí decentralizované rozhodnutia. Prostredníctvom IoT (angl. Internet of things, je v informatike označenie pre komunikáciu zariadení/objektov/ľudí s internetom.) fyzické systémy spoločne navzájom komunikujú a spolupracujú v reálnom čase. (Slovak Business Agency, 2019)

Z hľadiska koncentrácie podporných prostriedkov, prípravy, vzdelávania a výchovy odborníkov v kontexte Industry 4.0 zohráva štát kľúčovú úlohu. Mal by na dnešné požiadavky priemyselných podnikov pružne reagovať a zabezpečiť spoluprácu medzi praktickými a teoretickými (vzdelávacími) organizáciami, teda prepojiť prax a teóriu. Samozrejme v tomto prípade je nutné zohľadniť ekonomickú pripravenosť štátu na požiadavky Industry 4.0.

Množstvo zmien prichádzajúcich v kontexte Industry 4.0 prináša mnoho procesných, produktových, ale aj technologických inovácii. Všetky tieto zmeny sa postupne musia dostať aj do profilov budúcich pracovníkov projektového manažmentu a manažmentu rizík takýchto projektov. Je jedno či ide o interného pracovníka priemyselného podniku v strednom a top manažmente alebo externého projektového manažéra. Manažéri by mali byť schopní implementovať proces riadenia rizík v spoločnostiach s dôrazom na predchádzanie krízam spoločnosti pomocou vhodných metód a nástrojov na včasnú identifikáciu zmien, ak sa podnikateľské prostredie vyvíja negatívne. (Hudáková, Dvorský, 2018; Havierniková, 2014; Kordoš, Habánik, 2018)

Do pozornosti sa dostávajú čoraz viac aj ich mäkké zručnosti. Rozvoj a uplatňovanie takýchto zručností sú pre budúce pôsobenie v projektovom manažmente ako aj manažmente rizík priemyselných podnikov kľúčové. Manažéri majú kľúčové postavenie v procese riadenia rizík.

Ako uviedli Ellery a Hansen (2012), v projekte je najdôležitejší rozmer riziko samotné. Sanchez a kol. (2008) ako prvý prispôsobili manažment rizík v kontexte Industry 4.0 tak, aby podnik dosiahol najdôležitejšie strategické ciele projektov. V snahe preskúmať vzťah medzi manažmentom rizík a úspechom, Teller (2013) navrhol koncepčný rámec a tvrdil, že manažment rizík je najdôležitejšou zložkou projektového manažmentu. Teller a kol. (2014) tvrdí, že formálny manažment rizík na úrovni projektu a integrácia informácií o rizikách sú kľúčovým bodom k celkovému úspechu projektu.

Ustundag a Cevikcan (2018) potvrdzujú, že rozhodovanie o rizikách a rozhodovanie pod tlakom neistoty, tvorivosti a schopnosti prispôsobiť sa rýchlym zmenám sú základnými zručnosťami projektových manažérov v projektovom riadení vo veku projektov Industry 4.0.

## 2. ANALÝZA VYBRANÝCH PROJEKTOVÝCH AKTIVÍT PRIEMYSELNÝCH PODNIKOV

Prostredníctvom procesných, produktových, technických alebo netechnických optimalizácii priemyselné podniky na Slovensku v posledných rokoch zaviedli mnoho projektov zameraných na inovačnú aktivitu z pohľadu zdokonaľovania svojich interných procesov. Táto činnosť sa priamo dotýka nielen projektového manažmentu ale aj manažmentu rizík, ktoré je potrebné flexibilne prispôsobovať novému prostrediu a vplyv Industry 4.0.

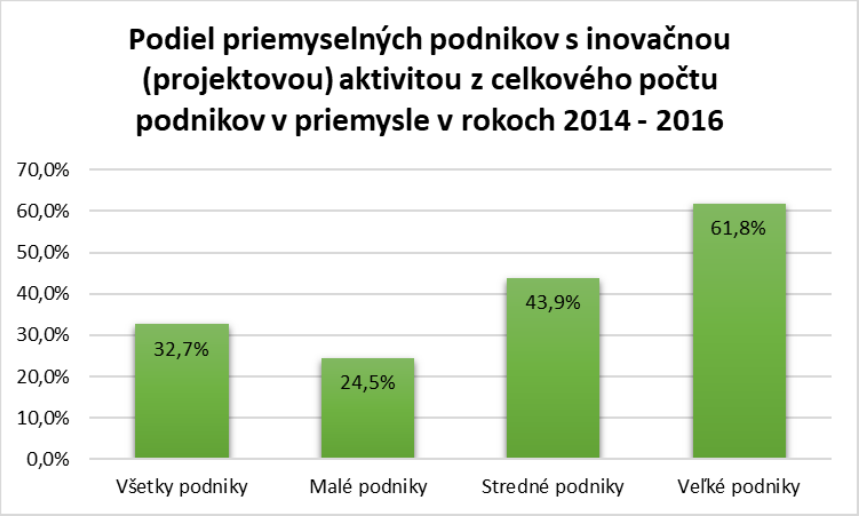
Buganová (2012) uvádza, že príčiny vzniku projektových rizík môžu byť:

- ovplyvniteľné (predvídateľné, vnútorné vplyvy) – veľkosť, rozsah a komplexnosť projektu, projektová a podniková kultúra, kvalifikácia, skúsenosti, termíny, finančná stabilita atď.,
- neovplyvniteľné (vonkajšie vplyvy) – politické podmienky, makroekonomická situácia, legislatíva, spoločenská klíma, kultúra, technický pokrok atď.

V poslednom období preukázali najväčšiu projektovú činnosť zameranú na inovácie a optimalizáciu priemyselné podniky. Práve inovačné aktivity podnikov sú najviac citlivé ako na vnútorné, tak aj na vonkajšie vplyvy a majú celkovo jeden z najväčších vplyvov na konkurencieschopnosť ako aj dlhodobý rozvoj podniku.

Celkovo inovačná činnosť tvorila v odvetviach priemyslu 32,7 %. Z ďalších realizovaných porovnaní predchádzajúcich období sa percentuálny podiel takto aktívnych podnikov postupne zvyšuje. Tak ako sa zvyšuje aktivita podnikov, rovnako sa zvyšuje dôležitosť manažmentu rizík pri rôznych typoch optimalizačných a inovačných projektov. Inovačná aktivita podnikov je priamo úmerná ich veľkosti, a teda aj požiadavke na riadenie rizík v týchto projektoch. Podiel podnikov s inovačnou (projektovou) aktivitou z celkového počtu podnikov v priemysle je znázornený na obrázku 1. (Štatistický úrad SR, 2018)

**Obrázok 1: Podiel priemyselných podnikov s inovačnou (projektovou) aktivitou z celkového počtu podnikov v priemysle v rokoch 2014 – 2016**



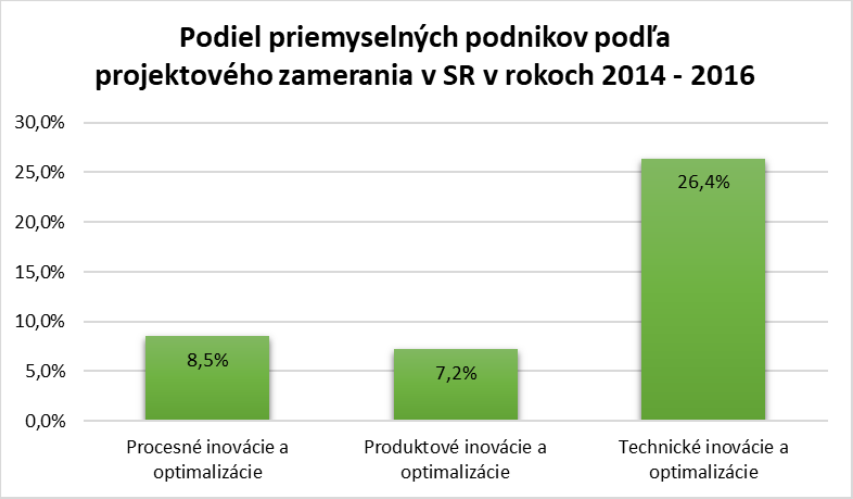

Zdroj: Vlastné spracovanie, upravené podľa Štatistický úrad Slovenskej republiky (2018)

Hlavným problémom pre veľkú väčšinu priemyselných podnikov je nepripravenosť a nedostatok manažérskych skúseností s manažmentom rizík v projektovom manažmente

realizovaných projektov. Problém vychádza zo spôsobu toku informácii a komunikácie, ktoré prebiehajú medzi jednotlivými súčasťami systému v horizontálnej, ale aj vertikálnej štruktúre. To si bude vyžadovať štandardizáciu komunikácie, rozhodovacích procesov a synchronizáciu medzi jednotlivými oddeleniami podnikov na zaistenie takej miery flexibility, na ktorú väčšina podnikov na Slovensku a v Európe nie je v súčasnosti pripravená. (Republiková únia zamestnávateľov, 2017)

Podniky rozdeľujeme do troch skupín podľa toho, o aký typ projektu alebo projektovej inovácie ide. Hovoríme teda o projektoch zameraných na procesnú, produktovú alebo technickú inováciu alebo optimalizáciu. Podiel priemyselných podnikov podľa projektového zamerania v SR zobrazuje obrázok 2.

**Obrázok 2: Podiel priemyselných podnikov podľa projektového zamerania v SR v rokoch 2014 – 2016**

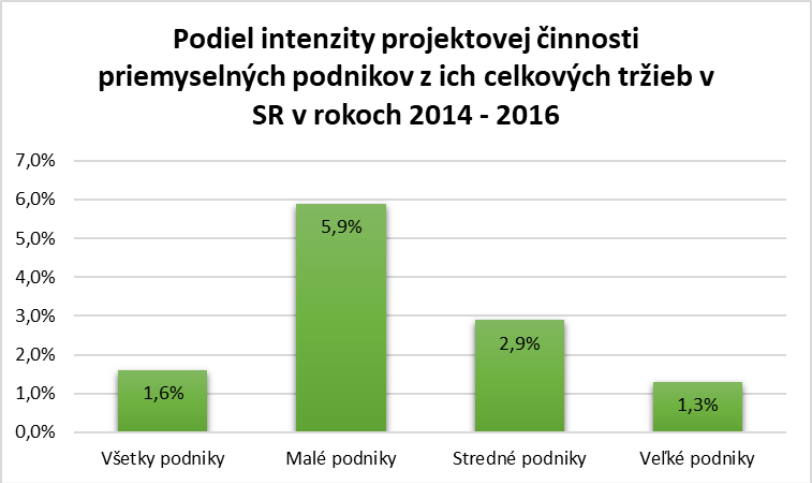



Zdroj: Vlastné spracovanie, upravené podľa Štatistický úrad Slovenskej republiky (2018).

Podľa zrealizovaných prieskumov je viditeľné, že najviac realizovaných projektov sa zameriava na technické inovácie a optimalizáciu. Z celkového počtu projektov tvorili 26,4% pravé aktivity s týmto zameraním. Ako problém vnímame nesystematické rozhodovanie pri výbere typu projektov, čo dokazuje aj tento ukazovateľ. Je to dôkazom absencie manažmentu rizík v projektovom manažmente počiatočnej fázy plánovania a rozhodovania o preferovanom type projektu, projektových aktivitách, vytváraní cieľa a zámeru zo strategického pohľadu podniku.

Intenzita projektov inovačnej a optimalizačnej činnosti, vyjadrená podielom výdavkov na inovácie z celkových tržieb v roku 2016 v priemyselných podnikoch SR predstavovala v priemere 1,6 %. Najvyššiu intenzitu vykázali malé podniky 5,9 %, následne stredné podniky 2,89 % a najnižšiu veľké podniky 1,31 % (Štatistický úrad Slovenskej republiky, 2018) ako je uvedené na obrázku 3.

**Obrázok 3: Podiel intenzity projektov inovačnej a optimalizačnej činnosti priemyselných podnikov z ich celkových tržieb v SR v rokoch 2014 - 2016**




Zdroj: Vlastné spracovanie, upravené podľa Štatistický úrad Slovenskej republiky (2018)

Samotnej realizácii projektov dnes mnohokrát nepredchádza fáza ich detailného plánovania. Nemýľme si prosím rozhodnutie o zavedení projektu v podniku založené na odbornom manažérskom posúdení so skutočným projektovým manažmentom a jeho jednotlivými fázami. Základným problémom je absencia akéhokoľvek posudzovania a riadenia rizík.

Najskôr musíme spoločnosť naučiť jednotne chápať kľúčové pojmy a ich definície. Následne naučiť metodológiu, postupnosť a princípy, na ktorých sa zakladá projektový manažment aj manažment rizík. Iba tak skutočne zabezpečíme projektový manažment s požadovanou mierou manažmentu rizík v projektoch priemyselných podnikov.

## 3. CIEĽ A METODOLÓGIA

Hlavným cieľom príspevku je na základe analýzy súčasného stavu poukázať na mieru využívania manažmentu rizík ako jednu z významných súčastí riadenia projektov v priemyselných podnikoch. Zároveň poukázať na proces projektových činností priemyselných podnikov a projektového manažmentu v riadení projektov v kontexte Industry 4.0.

V súlade so stanoveným cieľom bola zvolená metodológia článku. Na získanie údajov boli použité exploratívne a observačné metódy a v článku sú použité výsledky empirického výskumu a vedecké metódy zamerané na analýzu a syntézu údajov zo štatistických prieskumov.

Posudzované ukazovatele v priemyselných podnikoch, ich projektovej činnosti a riadenia, môžu byť využiteľné v podmienkach zavadzania jednotlivých procesných krokov v prostredí projektového riadenia so súladom kontextu Industry 4.0 a ostatných optimalizačných a inovačných projektov. Vďaka vytvorenému grafickému rámcu, ktorý bližšie špecifikuje jednotlivé kľúčové ukazovatele a dôležité charakteristiky so zreteľom na mieru zavedenia procesu manažmentu rizík v projektovom riadení, môžeme docieliť potrebné efektívne posúdenie a riadenie rizík projektov v kontexte Industry 4.0.

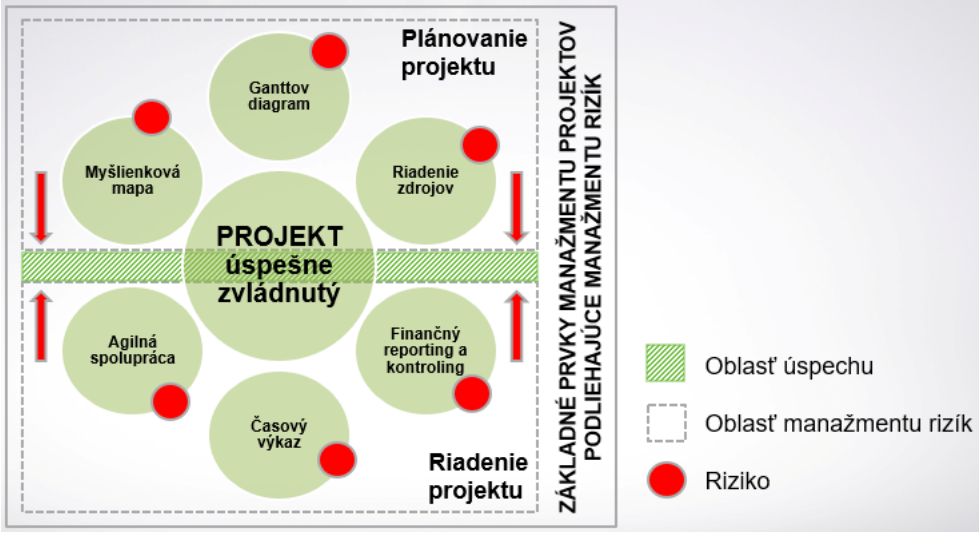
## 4. VÝCHODISKÁ IMPLEMENTÁCIE MANAŽMENTU RIZÍK V PROJEKTOVOM RIADENÍ

Manažment rizík v projektovom riadení je sústavná činnosť, ktorej cieľom je zvýšiť pravdepodobnosť ich úspechu a minimalizovať nebezpečenstvo takého ich neúspechu, ktorý by ohrozil konkurencieschopnosť a ďalší rozvoj podniku, počas celého životného cyklu projektu.

Manažment rizík projektu je súčasťou všetkých fáz projektu, dokonca aj po jeho ukončení na základe trvalo udržateľného stavu, čo je jednou z hlavných podmienok úspešne zvládnutého projektu. Manažment rizika sa realizuje vo všetkých fázach životného cyklu projektu a kladie dôraz na identifikáciu rizika, určenie výšky nebezpečenstva (frekvencia a dopad rizika) a kvantifikáciu rizika, zavedenie konkrétneho systému manažmentu rizika, sledovanie vývoja rizika, vyhodnotenie zmien a realizáciu opatrení. (Buganová, 2012)

Kľúčom k úspechu je predovšetkým prevencia vzniku rizík vo fáze plánovania (plán manažmentu rizík projektu) a schopnosť projektového manažéra včas identifikovať riziká a svojím konaním tak predísť prípadným problémom. Dôležitá je schopnosť ovládať manažment zmeny, teda riadiť zmeny v priebehu projektu, ktoré sú najčastejším zdrojom projektových rizík. Manažment rizík by mal byť súčasťou všetkých kľúčových činností ako vo fáze plánovania, tak aj vo fáze riadenia projektu (obr.4).

**Obrázok 4: Kľúčové činnosti projektového manažmentu vo vzťahu k manažmentu rizík**

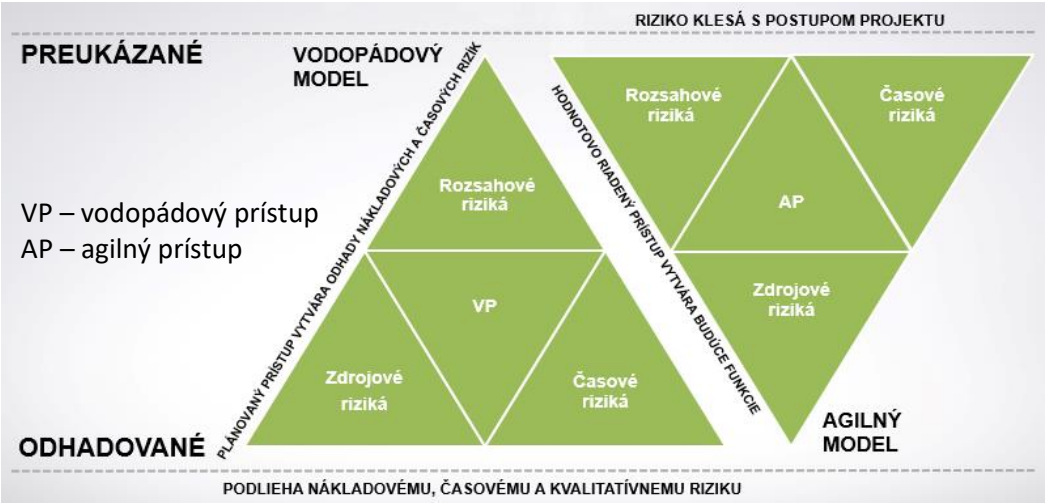



Zdroj: Vlastné spracovanie

Za významné projektové riziká považujeme tie, ktoré ohrozujú cieľ, čas a náklady projektu. Preto sme rozšírili popis magického trojuholníka vo vzťahu k manažmentu rizík. Pre manažéra projektu je tak jednoduchšie zorientovať sa.

V kontexte Industry 4.0 je potrebné využívať aj agilne prístupy, ktoré sú protikladom tradičného riadenia projektov, tzv. Vodopádového prístupu, ako je zobrazené na obrázku 5.

**Obrázok 5: Magický trojuholník projektového manažmentu vo vzťahu k manažmentu rizík**



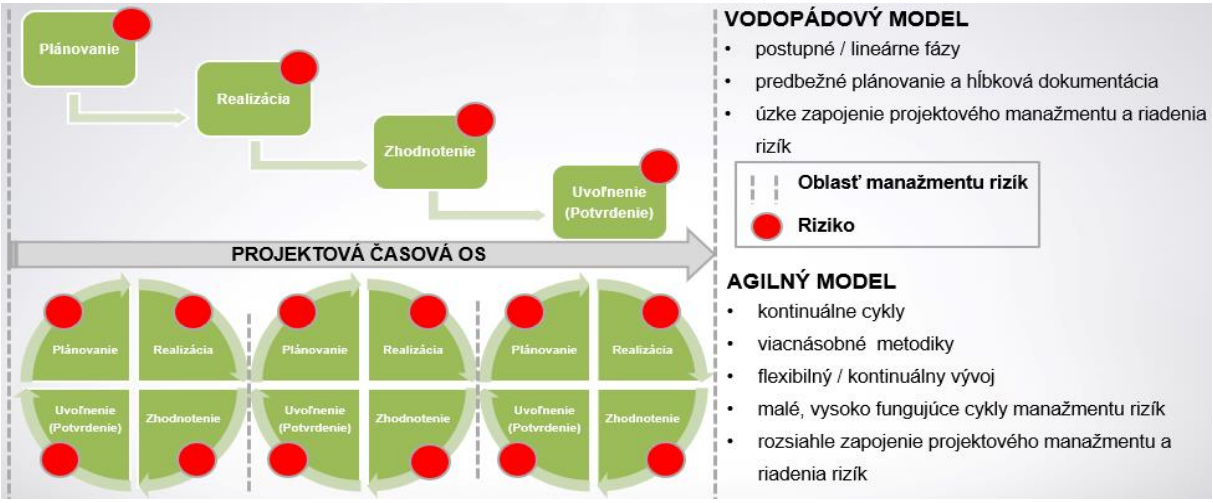

Zdroj: Vlastné spracovanie

Udržanie rovnováhy je najväčším umením manažérov projektu. Je to o skúsenostiach, správnom odhade situácie a predchádzaní rizikám, t. j. negatívnym situáciám, ktoré narušujú harmonogram, rozpočet alebo kvalitu výstupov projektu.

Na výber máme dve cesty riadenia projektu, ktoré ovplyvňujú aj mieru zapojenia manažmentu rizík. Hovoríme o vodopádovom alebo agilnom prístupe. Problémom je, že väčšina riadiacich pracovníkov volí Vodopádový prístup. Ak chceme zvýšiť mieru uplatnenia manažmentu rizík projektov a stáť sa tak úspešnejšími v ich riadení a minimalizovaní možných hrozieb, a následne spĺňať podmienky v kontexte Industry 4.0, je odporúčame zvoliť agilný prístup.

Dôvody sú nasledujúce. **Vodopádový prístup** vychádza z postupnosti jednotlivých fáz, ktoré pretekajú ako voda vodopádom. Je to prístup, ktorý predpokladá vopred jasne daný plán, teda sekvenčný postup od prvotného vstupu (analýzy). **Agilný prístup** je interaktívny, pružný a prírastkový spôsob riadenia. Vytvára priebežné prvky a ich upresňovanie a schvaľovanie. Je protikladom tradičného vodopádového riadenia a jeho výhody znázorňuje obrázok 6.

**Obrázok 6: Výhody agilného prístupu v kontexte k manažmentu rizík**




Zdroj: Vlastné spracovanie

Životný cyklus projektu alebo jeho kruh sa nikdy neuzatvára a tým myslíme skutočne nikdy. Projekt sa nekonči jeho úspešnou realizáciou. Pretože potom nastáva fáza trvalo udržateľného stavu alebo v niektorých prípadoch aj trvalo udržateľného rozvoja.

Najväčší význam pre správnu a úspešnú realizáciu projektov vo vybranej oblasti priemyselných podnikov je kvalifikovane zavedený projektový manažment s implementovaným manažmentom rizík. Jeden z prvých krokov musí byť zameraný na zvyšovanie kvalifikácie manažérov v tomto prostredí a zároveň v prostredí „smart" podniku. Je nutné sa zamerať na postupnú adaptáciu a využiť potenciál zamestnancov.

Postupná adaptácia a zavádzanie procesu manažmentu rizík v projektovom manažmente si vyžaduje transparentnosť. Je to z dôvodu rozširovania povedomia pre osoby, ktoré budú prichádzať s týmto prístupom čoraz častejšie do kontaktu a keďže v dnešnej dobe máme stále nedostatok informácii aj v rámci už fungujúcich systémov, musíme dbať na plynulý informačný tok dôležitých informácií, ktoré privedú projekt do úspešného konca s minimálnymi stratami. Jedná sa o tri hlavné oblasti, v ktorých je potrebné robiť zmeny na plnohodnotné adoptovanie sa v projektoch s kontextom Industry 4.0. Ide o vzdelávanie, zručnosti, legislatívu a samozrejme implementovaný manažment rizík v každej zo spomenutých oblastí, ktoré budú tvoriť jeden celok. Podniky sa musia okrem manažmentu rizika zamerať aj na integritu údajov. Vďaka tomu budú v dostatočnom časovom horizonte predchádzať možným hrozbám.

## 5. ZÁVER

Kľúčom k úspechu každého priemyselného podniku realizujúceho projekty rôzneho typu je snaha o implementáciu prvkov manažmentu rizík v projektovom riadení od počiatku myšlienky vzniku projektu a jeho zámeru, až cez realizáciu a následnú kontrolu a trvalo udržateľný stav.

Predovšetkým skupina tvoriaca malé a stredné podniky bude nutne potrebovať podporu pri príprave nových stratégií rozvoja a implementácie manažmentu rizík ako súčasti projektového manažmentu na to, aby dokázali využiť potenciál Industry 4.0 v ich oblastiach podnikania. Musia sa pripraviť na efektívne a maximálne využitie príležitosti, ktoré im agilný model riadenia projektov a rizík ponúka.

Manažment rizík a rozhodovacie procesy na zabezpečenie flexibilnej reakcie sú riadiace procesy, na ktoré veľká časť podnikov nie je pripravená. Z tohto hľadiska je zavádzanie manažmentu zmien a riadenia rizík, ktoré sú neodmysliteľnou súčasťou projektového manažmentu obrovskou výzvou. Jednoznačné vlastníctvo takýchto procesov umožňuje schopnosť reagovať vo veľmi krátkom čase na akékoľvek riziká v procese prípravy a realizácie projektov.

Ak chceme, aby bol priemyselný podnik úspešný a mohol plynule prejsť na podmienky Industry 4.0, musí jednoznačne začať s optimalizáciou procesov. Najskôr je potrebné vykonať procesné zmeny a aktivity zamerané na procesné inovácie a optimalizácie. Na základe tejto požiadavky je nutné aplikovať manažment rizík vhodný pre tento typ aktivít, ktoré bude zohľadňovať podmienky projektového manažmentu riadenia projektov procesného typu.

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# ZVYŠOVANIE KONKURENCIESCHOPNOSTI PODNIKOV PROSTREDNÍCTVOM IMPLEMENTÁCIE MANAŽMENTU RIZÍK V KONTEXTE KONCEPCIE INDUSTRY 4.0

# INCREASING THE COMPETITIVENESS OF ENTERPRISES THROUGH THE IMPLEMENTATION OF RISK MANAGEMENT IN THE CONTEXT OF THE INDUSTRY 4.0 CONCEPT

***Katarína BUGANOVÁ***[22]
***Jana ŠIMÍČKOVÁ*** [23]

**Abstrakt:** *Globálne ako aj lokálne zmeny podnikateľského prostredia, rastúci tlak na zvyšovanie produktivity, efektívnosti výroby, optimalizáciu procesov a celkové znižovanie spotreby, v súlade s konceptom Industry 4.0, môže mať na podniky nielen pozitívne, ale aj negatívne dopady. V snahe o zachovanie trvalo udržateľného vývoja ako aj pod tlakom spoločensky zodpovedného podnikania je preto potrebné predvídať, riadiť a znižovať riziká a využívať potenciálne príležitosti. Implementácia postupov a nástrojov manažmentu rizika v riadení podnikov a projektov má v súčasnosti svoje nezastupiteľné miesto. Cieľom článku je poukázať na význam a na možnosti implementácie manažmentu rizika v podniku (v projektoch) v súlade s medzinárodnými štandardami a ostatnými manažérskymi systémami. Podceňovanie alebo ignorovanie rizík môže totiž viesť nielen k insolventnosti a strate konkurencieschopnosti podniku, ale až jeho zániku, čo má v konečnom dôsledku vplyv nielen na zamestnanosť, ale na rozvoj celého regiónu.*

**Kľúčové slová:** *industry 4.0, manažment rizík, podnik, projekt, riziko.*

**Abstract:** *Global and local changes in the business environment, increasing pressure to increase productivity, production efficiency, process optimization, and overall consumption reduction, in line with the Industry 4.0 concept, can have both positive and negative impacts on businesses. It is, therefore, necessary to anticipate, manage and reduce risks and exploit potential opportunities in order to maintain sustainable development as well as under the pressure of socially responsible business. The implementation of risk management procedures and tools in the management of businesses and projects currently has an irreplaceable role. The aim of the article is to point out the importance and possibilities of implementation of risk management in the company (in projects) in accordance with international standards and other management systems. Underestimating or ignoring risks can lead not only to the insolvency and loss of competitiveness of the enterprise but also to its disappearance, which ultimately affects not only employment but also the development of the whole region.*

**Keywords**: *enterprise, industra 4.0, project, risk, risk management.*

**JEL Classification:** *L20, M14, D20, G32*

## 1. ÚVOD

Vďaka novým technológiám vstupuje celá spoločnosť do štvrtej priemyselnej revolúcie. Priemysel 4.0 je iniciatíva naprieč Európskou úniou, ktorá sa týka zavedenia nových moderných technológií a urýchlenie automatizácie a robotizácie, ktoré by boli čo najmenej závislé na ľudskej obsluhe. Robotizácia je vo väčšine vyspelých krajín najviac uplatňovaná v automobilovom priemysle. Rozvoj inteligentného priemyslu v kontexte robotizácie a

[22] doc. Ing. PhD., Žilinská univerzita v Žiline, Fakulta bezpečnostného inžinierstva, Katedra krízového manažmentu, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: katarina.buganova@fbi.uniza.sk
[23] Ing., Žilinská univerzita v Žiline, Fakulta bezpečnostného inžinierstva, Katedra krízového manažmentu, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: jana.simickova@fbi.uniza.sk

automatizácie procesov v podnikoch výrazne zvýši produktivitu a konkurencieschopnosť jednotlivých spoločností, ale môže byť aj zdrojom nových rizík a príležitostí. V praxi to znamená, že podniky by nemali nazerať na automatizáciu či rozvoj samotného Industry 4.0 len ako na riziká, ale aj ako na príležitosť ako zvýšiť svoju konkurencieschopnosť (Vojáček, 2016; Stasiak-Betlejewska, 2016; Analýza potrieb MSP, 2019).

Aby bola Slovenská republika naďalej konkurencieschopná, mala by vláda podporovať digitalizáciu a zaujať pozitívny postoj k informačným a komunikačným technológiám. Potenciál rastu sektora informačno-komunikačných technológii je obmedzený kvôli vzdelávaciemu systému, ktorý nedokáže pripraviť vhodných pracovníkov, preto je potrebná reforma vzdelávacieho systému a financovania. Pre úspešnú implementáciu Industry 4.0 by mala vláda vytvárať podmienky, aby bol trh práce zásobovaný kvalifikovanými odborníkmi so špecializáciou na informatiku, robotiku a automatizáciu. Okrem týchto aktivít je však potrebné, aby mali podniky implementovaný efektívny systém manažmentu rizík a príležitostí, ktorý umožní ich trvaloudržateľný rozvoj.

## 2. KONKURENCIESCHONOSŤ SLOVENSKEJ REPUBLIKY A INDUSTRY 4.0

Zo Správy o globálnej konkurencieschopnosti z roku 2019 (Schwab, 2019) vyplýva, že Slovenská republika sa v aktuálnom rebríčku konkurencieschopnosti Svetového ekonomického fóra umiestnila na 42. mieste, z celkového počtu 141 krajín. V porovnaní s predchádzajúcim rokom klesla v rebríčku o jednu priečku a z krajín V4 (Tabuľka 1) sa umiestnila na 3. mieste.

**Tabuľka 1: Porovnanie krajín V4 podľa konkurencieschopnosti**

| Poradie krajín V4 2019 | Celkové poradie 2019 | Ekonomika | Skóre | Celkové poradie 2018 |
|---|---|---|---|---|
| 1. | 32. | Česká republika | 70,9 | 29. |
| 2. | 37. | Poľsko | 68,9 | 37. |
| 3. | 42. | Slovensko | 66,8 | 41. |
| 4. | 47. | Maďarsko | 65,1 | 48. |

Zdroj: upravené podľa Schwab, 2019

Slovenská republika sa nepatrne zlepšila v hodnotení kvality infraštruktúry, používaní informačných technológií, úrovne pracovných zručností a efektívnosti pracovného trhu. Naopak horšie výsledky Slovensko zaznamenalo v hodnotení zdravia obyvateľstva, konkurenčného prostredia, podnikateľskej klímy a schopnosti krajiny inovovať (Schwab, 2019). Práve faktory ako konkurenčné a inovačné prostredie ako aj stabilná podnikateľská klíma sú však jedným z predpokladov úspešného rozvoja podnikov v rámci Industry 4.0.

Na druhej strane mnoho zamestnancov by mohlo byť nahradených robotizovanými alebo automatickými strojmi a prísť tak o svoju prácu. Tým by mohla prudko vzrásť nezamestnanosť a bolo by tak otázkou, aký vplyv by to malo na celú slovenskú ekonomiku. Pozitívnejších dôsledkov by však implementácia Industry 4.0 mala priniesť samozrejme viac, napríklad väčšiu produktivitu a efektivitu výroby a postupom času menšie náklady na ňu. Znamenalo by to napríklad, že slovenské strojárenské firmy by mohli plniť viac zákaziek alebo kvalita vyrobenej strojárskej techniky a zariadení by bola vďaka automatizácii vyššia. Štvrtá priemyselná revolúcia by s novými technológiami dala tiež priestor pre vznik úplne nových pracovných miest, na ktoré by zamestnancovi pravdepodobne museli absolvovať rôzne školenia alebo rekvalifikácie. Úspešné uplatnenie tohto konceptu by pomohlo držať technologický krok so západnými krajinami, naopak neúspešné uplatnenie by mohlo priniesť slovenskému strojárenskému priemyslu nemalé problémy (Albers, 2019).

Práve tu vzniká potreba sústrediť sa na možné riziká a príležitostí podnikov v kontexte Industry 4.0 a implementáciu manažmentu rizika nielen pre zachovanie a udržanie konkurencieschopnosti podnikov, ale aj zamestnanosti a rozvoj regiónov.

Industry 4.0 v súčasnom prevádzkovom kontexte prináša nové aspekty vnímania rizika, pretože už sa neposudzujú len tradičné riziká, ale aj novovznikajúce riziká, ktoré je potrebné správne a včas identifikovať, vyhodnotiť a zvládnuť. Pozornosť treba okrem podnikateľských rizík sústrediť aj na priemyselné riziká, ako aj riziká z povolania, pretože sú silne prepojené. Za hlavné spojenie medzi oboma typmi rizík možno považovať ľudský faktor. Pochopenie rizík vyplývajúcich z ľudských chýb a slabých stránok organizácie ako príčin nehôd a iných porúch v zložitých systémoch si preto vyžaduje vypracovanie sofistikovaných modelovacích prístupov. Z nepripravenosti na nové technológie vyplýva aj následná absencia administratívnej a podnikateľskej pripravenosti na nové podnikateľské modely, ktoré bude potrebné aplikovať pri rozvoji úspešných podnikateľských projektov (Fregan, 2018; Tupá, 2017; Brocal, 2019; Hollá 2016; Kordoš, Habánik, 2018).

Výsledky celoslovenského prieskumu v oblasti vnímania prístupu slovenských firiem k aplikácii konceptu Industry 4.0. ukázali, že slovenské podniky sú pripravené zapojiť sa do konceptu Industry 4.0 a považujú túto métu za dôležitú v pokroku a raste spoločnosti (Industry4um, 2018). Je potrebné apelovať na manažment podnikov, aby realizoval výskum a inovácie a sústredil sa na budúcnosť a konkurencieschopnosť podniku. Vytvorenie vhodnej stratégie je predpokladom pokroku. Všetky podniky, ktoré chcú napredovať, musia hľadať cesty ako najlepšie implementovať koncept Industry 4.0.

V súvislosti s implementáciou Industry 4.0 je potrebné sústrediť sa súbežne aj na implementáciu manažmentu rizík v rámci existujúcich manažérskych systémov. Posúdenie rizík poskytuje mechanizmus na identifikáciu toho, ktoré riziká predstavujú príležitosti a ktoré predstavujú potenciálne úskalia. Efektívny manažment rizík má široký pohľad na identifikáciu rizík, ktoré by mohli spôsobiť, že spoločnosť neplní svoje stratégie a ciele ako aj na vyhľadávanie a využívanie príležitostí (Kadátová, 2012).

## 3. CIEĽ A METODOLÓGIA

Manažment rizík v súčasnosti získava nezastupiteľné miesto v rámci manažérskych systémov podnikov, ktoré vnímajú, že globalizácia podnikateľského prostredia, technická a technologická náročnosť procesov a neustály tlak na zvyšovanie produktivity prináša so sebou rad rizík a príležitostí, na ktoré treba adekvátne reagovať. Podnikateľské riziko predstavuje nebezpečenstvo vzniku pozitívnej alebo negatívnej odchýlky (straty alebo zisku) od stanoveného cieľa. Práve pozitívna stránka rizika v podnikaní je často zdrojom nových rizík, ktoré prichádzajú s využívaním príležitostí.

Cieľom článku je poukázať na význam a na možnosti implementácie manažmentu rizík v podniku (v projektoch) v súlade s medzinárodnými štandardami a ostatnými manažérskymi systémami. V súlade so stanoveným cieľom bola zvolená metodológia článku. Na posúdenie súčasného stavu a vyvodenie záverov bol použitý empirický výskum a analýza, syntéza a komparácia údajov zo štatistických prieskumov. V prvej časti článku bola spracovaná analýza zameraná na posúdenie konkurencieschopnosti SR vo vzťahu k Industry 4.0 a druhá časť je orientovaná na možnosti implementácie manažmentu rizika v súlade s normou ISO 31000:2018 Risk managemet – guidelines v podnikoch v kontexte Industry 4.0.

## 4. IMPLEMENTÁCIA SYSTÉMU MANAŽMENTU RIZÍK DO MANAŽÉRSKYCH SYSTÉMOV PODNIKU

Podnikateľské prostredie je v súčasnosti charakteristické tým, že je zložité predvídať jeho vývoj v určitých cykloch, resp. plánovať budúce aktivity, len na základe údajov z minulosti. Táto nestabilita, ktorú podniky spravidla vnímali ako hrozbu je v súčasnosti považovaná za príležitosť. Ak chcú podniky uspieť, musia byť schopné komplexne posudzovať a riadiť riziká, ktoré zo zmien podnikateľského prostredia vyplývajú. Jedným z kľúčových predpokladov úspechu podniku by mal byť implementovaný systém manažmentu rizika.

Kruliš (2011) hovorí, že systém manažmentu rizika je založený na predpoklade, že riziká (vrátane ich vzájomných väzieb a interakcií) sú v organizácii posudzované priebežne, celostne, proaktívne a systematicky a súčasne sa rovnako identifikujú príležitosti na zlepšovanie procesov.

Súčasťou systému manažmentu rizika je stanovenie celkového smerovania (politiky), stratégie a cieľov manažmentu rizika. Taktiež je potrebné zosúladiť rámec, princípy a štruktúru, ako aj vymedziť postupy a metódy procesu manažmentu rizika. Veľký význam má pridelenie zodpovednosti konkrétnym osobám za činnosti v manažmente rizík. Zodpovedné osoby (vlastníci rizika) musia mať jasne zadefinované úlohy a právomoci za všetky aktivity (procesy) v rámci manažmentu rizík. V neposlednom rade je nutné všetky súčasti systému manažmentu rizík monitorovať, vyhodnocovať ich účinnosť a efektívnosť a neustále hľadať príležitosti na ich zlepšovanie. Podniky, ktoré si uvedomujú význam práce s rizikami, nepristupujú k tejto problematike jednotne, pretože existuje viacero noriem, štandardov a prístupov k manažmentu rizík. Tieto majú v oblasti podnikateľskej činnosti zväčša odporúčajúci charakter. Na základe charakteru podnikateľskej činnosti, potrieb a možností podniku je potrebné zvážiť, ktorý z prístupov je najvhodnejší. Veľké podniky implementujú manažment rizík vo väčšej miere ako malé a stredné podniky, aj keď existenciu podnikateľského rizika si v súčasnosti uvedomujú už všetky druhy podnikov. Často chýbajúci systém manažmentu rizika súvisí najmä s nedostatkom manažérskych kompetencií vedúcich pracovníkov v tejto oblasti (Havierniková, 2019; Majerník, 2018; Hudáková 2019; Buganová, 2018).

Využívanie štandardov a noriem v oblasti riadenia podnikateľského rizika v slovenských podnikoch je ovplyvnené mierou záväznosti týchto predpisov, ktoré majú len odporúčajúci charakter. Veľké podniky pri aplikovaní procesu manažmentu rizík vychádzajú z charakteru ich podnikateľských záujmov, strategických cieľov, zázemia, medzinárodných aktivít a požiadaviek zainteresovaných strán (Hudáková, 2018).

Manažment rizík môžeme chápať ako komplexný systém posudzovania rizík a následnej práce s nimi s cieľom minimalizovať škody a maximalizovať príležitosti, resp. ako metodiku manažmentu rizík, jeho jednotlivé fázy a procesy. Pri implementácii manažmentu rizík je potrebné uplatňovanie širšieho pohľadu na riziko (pozitívna a negatívna stránka), stanovenie zodpovednosti vedenia (osôb) za proces manažmentu rizika a vytvorenie kontrolných nástrojov, zabezpečenie plnohodnotnej integrácie manažmentu rizík do štruktúry podniku.

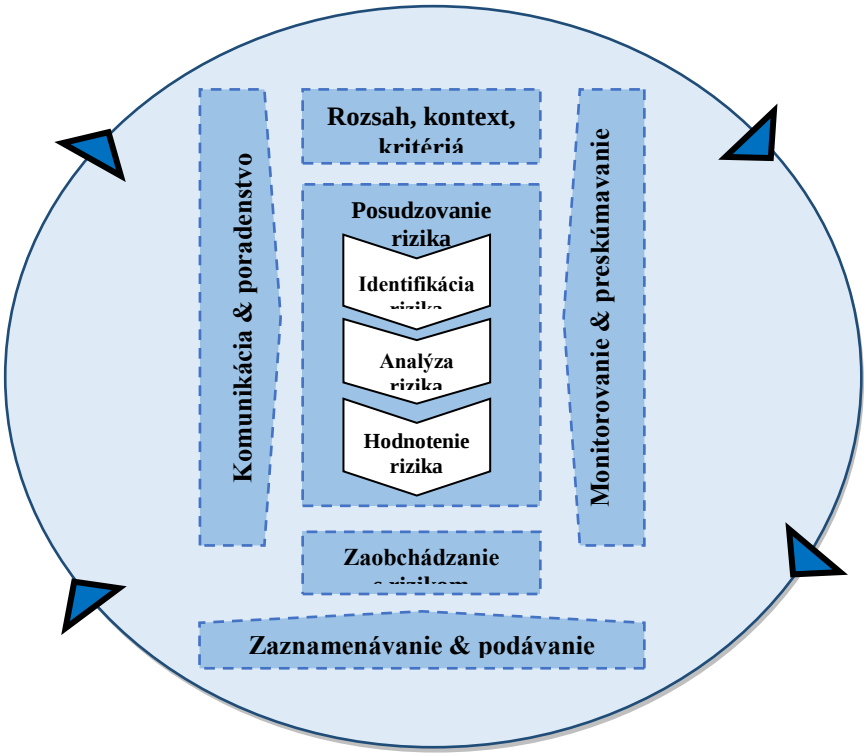
Využívanie noriem a štandardov v oblasti manažmentu rizík na Slovensku sa v súčasnosti najčastejšie spája s normou ISO 31 000:2018 Risk management - quidelines. Slovenská verzia tejto medzinárodnej normy bola vydaná ako STN ISO 31000:2019 Manažérstvo rizika - návod. Z pohľadu techník posudzovania rizika je uplatňovaná norma IEC 31010:2019 Risk management – Risk assessment techniques, t. j. Manažérstvo rizika - techniky posúdenia rizika. Obidve tieto normy, tak ako aj väčšina štandardov manažmentu rizika, využívajú na

zjednotenie terminológie slovník manažmentu rizika ISO Guide 73:2009 Risk management – Vocabulary (Buganová, 2018).

Výhodou normy ISO 31000 je jej komplexnosť a využiteľnosť vo všetkých procesoch uskutočňovaných v manažmente rizík. Rámec manažmentu rizík podľa normy ISO 31000 pozostáva z pochopenia vnútorných a vonkajších vzťahov podniku, tvorby politiky manažmentu rizika, integrácie manažmentu rizika do podnikových procesov, vymedzenia zodpovednosti, alokácie zdrojov na manažment rizika, stanovenia nástrojov na internú a externú komunikáciu a podávania správ.

Proces manažmentu rizika, t. j. posudzovania a riadenia rizík a príležitostí, ktorý uvádza norma ISO 31000:2018 Risk management – quidelines, pozostáva zo 6 hlavných etáp (predmet, súvislosti, kritéria; posudzovanie rizika; zaobchádzanie s rizikom; zaznamenávanie a podávanie správ; komunikácia a monitorovanie rizika). V etape posudzovanie rizika je zahrnutá identifikácia, analýza a hodnotenie rizika ako je uvedené na Obrázku 1.

**Obrázok 1: Proces manažmentu rizika**




Zdroj: upravené podľa ISO 31000:2018 Risk management, 2018

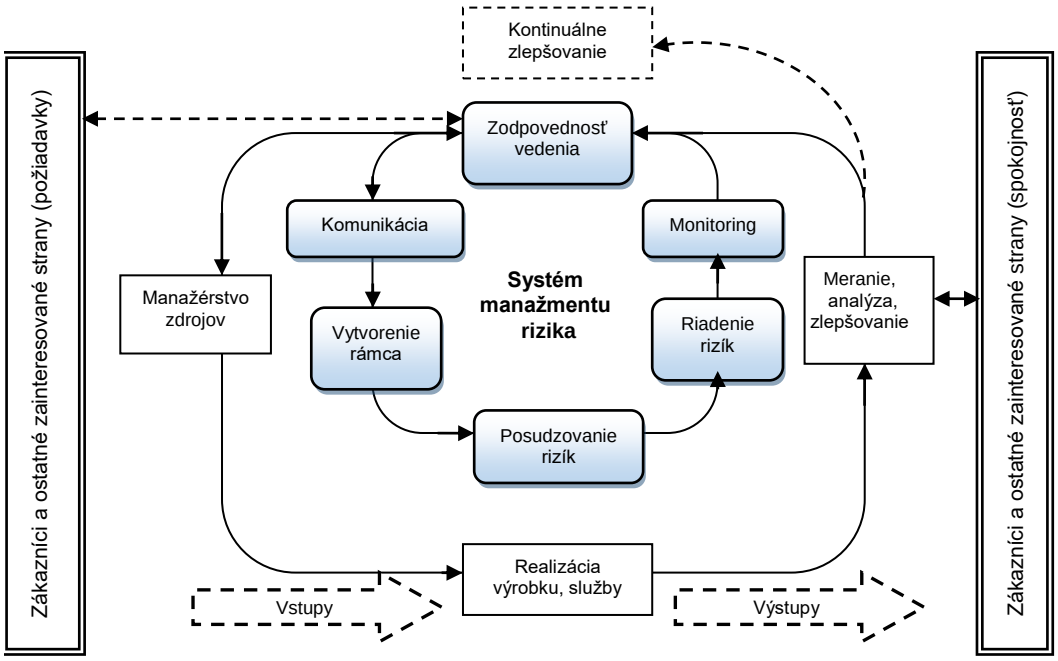
Manažment rizík sa v podnikoch implementuje následne tak, že proces manažmentu rizika sa realizuje na strategickej aj prevádzkovej úrovni podniku, ako súčasť realizačných podnikových procesov a smerníc. Aby mohol byť proces manažmentu rizika efektívny, musia byť dodržiavané stanovené princípy, resp. zásady manažmentu rizika na strategickej a prevádzkovej úrovni organizácie a musia tam byť zohľadnené zmeny prostredia, ľudské faktory, ako aj kultúra organizácie.

V kontexte Industry 4.0 môže ISO 31 000:2018 pomôcť podnikom zlepšiť vykonávané procesy a posilniť rozhodovacie činnosti. Je taktiež odporúčaná ako základná norma pre aplikovanie požiadaviek ISO noriem pre systémy manažérstva v rámci noriem ISO 9001:2015

Systému manažérstva kvality, ISO 14001:2015 Systém environmentálneho manažérstva, ISO 45001:2018 Systémy manažérstva bezpečnosti a ochrany zdravia pri práci a ďalších a je preto vhodná ako základný rámec pre nastavenie integrovaného systému manažérstva rizika a zjednotenie rôznych prístupov v riadení rizík.

Implementáciu manažmentu rizík do manažérskych systémov v rámci koncepcie 4.0 je možné zrealizovať aj v kontexte na manažérstvo kvality a trvalé zlepšovanie (Obrázok 2). Dôležité je, aby ciele manažmentu rizík boli v súlade s cieľmi organizácie, a aby bola úspešná jeho implementácia do manažérskych systémov podniku. Pri formalizovanom systéme riadenia môže byť manažment rizík konfigurovaný ako samostatný subsystém.

**Obrázok 2: Implementácia systému manažmentu rizika do manažérskych systémov podniku**




Zdroj: upravené podľa ONR 49000:2014, 2014

V kontexte Industry 4.0 implementácia manažmentu rizík do strategického plánovania, ale aj prevádzkových procesov je predpokladom, že preventívne opatrenia sú prijímané automaticky, čo znižuje negatívne dopady a podporuje zámer neustáleho zlepšovania. V neposlednom rade je potrebné vyzdvihnúť aj myslenie založené na rizikách, ktoré sa zameriava aj na pozitívne vplyvy, t. j. príležitosti. Príležitosti na zlepšenie by mali byť identifikované, posúdené z pohľadu dopadu a realizovateľnosti a využité. Včasná prevencia vzniku krízy a adekvátna reakcia môžu byť predpokladom neustáleho zlepšovania kvality v podnikoch a zároveň uspokojovania potrieb všetkých zainteresovaných strán.

## 4. ZÁVER

Manažment rizík ako systematický a koordinovaný spôsob práce s rizikom a neistotou, realizovaný v celom podniku pokrýva všetky druhy rizika. Súčasné konkurenčné prostredie, moderné technológie, digitalizácia a automatizácia výroby, ako aj tlak vlády na udržiavanie

zamestnanosti, kladú na podniky vysoké nároky na zvyšovanie bezpečnosti ich podnikateľských aktivít.

Manažment rizika poskytuje podnikom potrebnú podporu z pohľadu postupov a metód, ktoré im umožnia účinnejšie predvídať možné zmeny ako aj ich vplyvy na ciele podniku. V kontexte Industry 4.0 umožňuje posúdiť slabé a silné stránky riadiacich, tvorivých, prevádzkových, technologických a informačných procesov a činností a skvalitniť ich riadenie a fungovanie.

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# THE IMPACT OF DIGITAL ECONOMY ON THE EMPLOYMENT AND CAREER PROSPECTS OF MANAGEMENT SPECIALISTS

***Aleksey CHECHULIN***[24]
***Ekaterina USACHEVA***[25]

**Abstract:** *The study raises several issues: to analyze the existing research of the labor market, reflecting changes associated with the transition to digital economy and to assess the impact on the generated employer requirements to competencies of specialists in marketing, advertising and PR, and conditions of their employment. The content analysis of the leading job search websites, as well as professional communities websites and themed resources in social networks revealed a number of growing trends. In particular: a decrease in the employer's attention to the presence of diploma; the increase in the number of employers that guarantee opportunities for corporate training and continuous professional development; part-time employment and remote work, recruitment through social networks.*

**Key words:** *career, digital economy, employment, professional skills, soft skills*

**JEL Classification:** *J23, J24, M39*

## 1. INTRODUCTION

It should be recognized that in the new realities of the fourth industrial revolution the labor market and employment are undergoing unprecedented changes. In view of the rapidly changing environment, the ability to anticipate future employment trends in terms of professional knowledge and skills is critical. Although the current trends of the labor market depend on geographical and industry features, with the widespread of technological innovation, digitalization and automation impact on all professional activities and types of jobs without exception [6, 10, 12,14,15].

In the book “The Fourth Industrial Revolution” , that has become a classic, K. Schwab argues that, “…in the foreseeable future, low-risk jobs in terms of automation will be those that require social and creative skills…”[12]. Among them are management specialists, whose responsibilities include promotion, the development of novel products, customer engagement strategies, and creating content that sells. However, the current changes are so fundamental that it can be safely said that for management specialists these risks are also considerable. This necessitates the transformation and adaptation of creative professionals to new working conditions and new requirements not only of the labor markets, but also of a society as a whole.

In our view, today we can identify the following key trends affecting the labor market, employment, HR technologies, and career growth strategies of management specialists:

- Ubiquitous automation and digitalization including areas that are not previously affected by this trend such as communication with customers, consulting or creating selling content;

- Development of on-demand economy and new sharing economy that provide a convenient online way to provision goods and services as needed and their subsequent provision offline.

[24] Professor, PhD., North-West Institute of Management, branch of RANEPA, Sredny prospect VO, 57/43, Saint-Petersburg, 199178, Russia, e-mail: chechulin-av@ranepa.ru
[25] Associate professor, PhD. in Economics, North-West Institute of Management, branch of RANEPA, Sredny prospect VO, 57/43, Saint-Petersburg, 199178, Russia, e-mail: usacheva-ea@ranepa.ru

- Increasing the importance and the share of project activities requires new competences and skills not only for senior managers, but also for mid-career professionals. Employers increasingly prefer to break down current tasks into specific projects and take them to the "human cloud", a virtual collaborative space of ready-made performers, located anywhere in the world. [12] Thus, the practice of outsourcing is expanding, the number of employees working remotely or part-time is increasing, and the freelancing market is growing [2].

- The importance of social networks increases, not only for the purposes of professional development, but also as a space for group cooperation, and communication between employers and employees, as well as between producers and consumers. The active use of not only theme-based websites, but also social networks, "communities of practice" or “communities of interest” for job search and recruitment is an established trend of the labor market [1, 4].

- New requirements for management of labor potential and human development are constructed. New requirements include continuously updating professional, social and psychological skills, expanding one’s worldview, soft skills, interdisciplinary training and work. Concurrently the tasks of professional development, especially in the component of soft skills are delegated to the employee's level [14].

Marketing, advertising and public relations are among those professional areas where the changes caused by the digitalization and new kinds of online interaction are most clearly manifested.

Despite the fact that for professionals in the field of marketing, advertising and PR creativity, erudition and interdisciplinary knowledge are still important, such new job requirements as online communication skills, the ability to create and consume positive content, and web analytics knowledge seriously change the perception of the profession and the requirement of employers [7, 8, 11, 15,18].

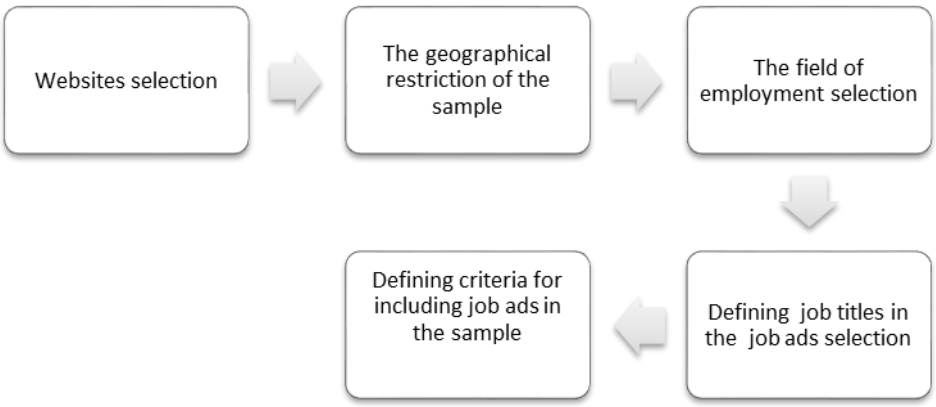
## 2. PROBLEM FORMULATION AND METHODOLOGY

In addressing the issue of the influence of digitalization and automation on various professional areas, such traditionally highly creative professions in the field of marketing, advertising and PR are of particular interest. Under the impact of Internet technologies, traditional types of consumers and consumer's behavior models are changing fundamentally, as well as forms of producer-consumer interactions, and ways of promoting the product. The tomorrow's specialists cannot be highly specialized. They must be comprehensive multidisciplinary specialist to understand not only traditional and creative marketing, but also digital marketing, social networks and new technologies, and to be able to work with big data [9].

The hypothesis for the applied research was that it is possible to trace how the above trends affect the expectations of employers to specialists in the field of marketing, advertising and PR through content analysis of job ads posted by employers.

Operational definition of the general totality is - job advertisements in the field of "Marketing, advertising and PR". The time interval of the study is January-September, 2019. For the study, a multi-stage sampling was made (Figure 1). Initially, the most popular job placement and job search websites in Russia were identified: hh.ru, SuperJob.ru, rabota.ru. The total sample size was 750 job ads.

**Figure 1: The stages of the multi-stage sampling**




The geographical restriction of the sample is job ads, posting by employers of Moscow and St. Petersburg. This restriction is explained by the fact that the labor market of the two largest cities of Russia has a number of significant differences: the salary gap compared to the regions, the greater activity of employers and applicants on the Internet, a greater number of job offers from foreign companies, traditionally high demand for IT-competence.[5]

The sample was restricted to the professional field "Marketing, advertising, PR". Jobs ads, the title of which were a direct indication of IT-competences, for example, "Internet marketer", "Digital specialist", "SMM specialist", etc. were deliberately excluded from the sample. Job ads at the request of positions: "Marketer", "PR specialist" ("PR Manager"), "Advertising manager" were included in the sample. Monitoring was conducted every two weeks; duplicate ads were excluded from the sample, as well as ads duplicated by employers on different websites.

According to the generated list of units of analysis, a preliminary list of coding categories was developed [2]. The preliminary list of coding categories was further refined as new information became available. The problem was that individual employers used semantically different concepts to define one competence or skill. The finalized system of units and coding categories of content analyses is presented in the Table 1.

**Table 1: The system of units and coding categories of content analyses**

| **Gradation of a unit** | **Codes** | |
|---|---|---|
| 1. Position | Manager – 1<br>Employee – 2 | |
| 2. Field | Marketer – 3<br>Specialist in PR – 4<br>Specialist in advertising and promotion – 5 | |
| 3.Work experience | 1 .3-; 1.4-; 1.5- | 2.3 -; 2.4-; 2.5- |
| | No experience (NoEx)<br>Between 1 and 3 years (1-3)<br>Between 3 and 6 years (3-6)<br>More than 6 years (>6) | No experience (NoEx)<br>Between 1 and 3 years (1-3)<br>Between 3 and 6 years (3-6)<br>More than 6 years (>6) |
| 4. Education | 1.1. Degree is required<br>1.2. Degree is not required | 1.3. Degree is required<br>1.4. Degree is not required |

| | | |
|---|---|---|
| 5. Key skills | 1.5. Contextual advertising,<br>1.6. knowledge of Yandex Direct, Google AdWords<br>1.7. Social media advertising<br>1.8. SMM<br>1.9. Lead generation<br>1.10. E-mail newsletters<br>1.11. Analytics Services (Google Analytics, Yandex.Metrics)<br>1.12. Creation, development sites<br>1.13. SEO promotion<br>1.14. Content development, copywriting<br>1.15. Landing page<br>1.16. Knowledge of programming languages (HTML, CSS)<br>1.17. Confident use of graphic programs (Adobe Illustrator, CorelDRAW, Adobe Photoshop) | 1.18. Contextual advertising,<br>1.19. knowledge of Yandex Direct, Google AdWords<br>1.20. Social media advertising<br>1.21. SMM<br>1.22. Lead generation<br>1.23. E-mail newsletters<br>1.24. Analytics Services (Google Analytics, Yandex.Metrics)<br>1.25. Creation, development sites<br>1.26. SEO promotion<br>1.27. Content development, copywriting<br>1.28. Landing page<br>1.29. Knowledge of programming languages (HTML, CSS)<br>1.30. Confident use of graphic programs (Adobe Illustrator, CorelDRAW, Adobe Photoshop) |
| 6. Soft skills | 1.31. Creativity<br>1.32. Initiative<br>1.33. Ability to work with people /clients<br>1.34. Skills in projects<br>1.35. Teamwork skills | 1.36. Creativity<br>1.37. Initiative<br>1.38. Ability to work with people /clients<br>1.39. Skills in projects<br>1.40. Teamwork skills |
| 7. Condition of employment | 1.41. vocational training<br>1.42. project management | 1.43. vocational training<br>1.44. project management |

Additionally, the monitoring of job ads and projects offered in professional communities of marketers and PR specialists in the two most popular social networking platforms in Russia was carried out (Vcontakte.com, Facebook.com). The analysis was carried out in the same units and coding categories as for job search websites.

## 3. RESULTS / DISCUSSION

The results of the study gave rise to a number of conclusions about how the trends highlighted by the experts of the labor market are relevant in establishing requirements for specialists in the field of marketing, advertising and PR.

First, it is clear that job ads involving flexible employment and project work occupy a very small place in the total number of vacancies. Analyzing the ratio of job ads posted on job search websites weekly, shows that vacancies with flexible employment are in total from 2 to 4 percents. At the same time, in social networks, most job offers related to participating in projects and freelancing. This distinction is largely due to the format of interaction between professional communities in social networks, where individual professional issues and problems are discussed. Employers using traditional HR management prefer full control over the employee and fulltime.

Analyzing job ads in the category of "experience" it should be noted that the requirements for the experience of specialists in the field of advertising and PR are slightly higher than for marketers, they often require a portfolio, mass media base, established business contacts. Indicating the presence of a diploma is also more common in the job ads for PR-managers, although the range of professions is quite wide from Marketing to Philology. At the same

time, in job ads for marketers, experience in a particular field and knowledge of the industry were most often mentioned.

The change in the requirements for key skills of specialists in the field of marketing, advertising and PR, associated with widespread automation and digitalization, is most clearly traced. About 11% of job ads in the section "Professional requirements and skills" do not mention digital skills. Despite the fact that job ads of different employers show a wide spread of responsibilities and tasks for similar positions, the list of professional competencies expected from an employee are largely similar.

**Table 2: Differences in professional skills required for the positions analyzed**

| Key skills most frequently mentioned for all positions | Key skills most frequently mentioned for the position of “Marketer” | Key skills most frequently mentioned for the positions of "PR specialist" ("PR Manager"), "Advertising manager" |
|---|---|---|
| - Contextual advertising,<br>- Knowledge of Yandex Direct, Google AdWords<br>- SMM<br>- E-mail newsletters<br>- Analytics Services (Google Analytics, Yandex.Metrics)<br>- Creation, development sites<br>- SEO promotion | - Lead generation<br>- Analytics Services (Google Analytics, Yandex.Metrics)<br>- Landing page<br>- Knowledge of programming languages (HTML, CSS) | - Social media advertising<br>- SMM<br>- Content development, copywriting<br>Confident use of graphic programs (Adobe Illustrator, CorelDRAW, Adobe Photoshop) |

The difference between the lists of professional requirements is easy to explain by the difference in the tasks facing different specialists in different professional fields. At the same time, the list of professional skills common to all studied positions is very indicative. Technical and digital skills are increasingly prevailed over traditional competencies. We are absolutely convinced that this trend should not be perceived as a decrease in the creativity or devaluation of traditional skills in the development of strategies and tactics of promotion (including offline). It has to be accepted that the ongoing generational change means the corresponding changes in the behavior and needs of consumers who are more mobile, focused on active interaction at all buying decisions. Consumer expectations are being redefined into experiences [13].

One of the most authoritative experts in the field of modern media M. Stelzner argues that success in the market is provided by two key factors: understanding the needs of customers and the ability to win their trust by providing the widest possible information about the ways of solving the customer's problem. Thus, it is quite natural that the vector of professional skills in the field of Marketing, advertising and PR is shifted towards the analysis of "customer experience", content development and efforts towards implementing new ways of communicating [17].

A little over half of job ads that been analyzed contain requirements for soft skills. Communication and presentation skills, teamwork skills, and the ability to build their own work in the most effective way matter to the most employers.

The number of job ads that promise the possibility of corporate and professional training is not large enough. At the same time, almost half of the analyzed job ads require skills or in some cases, an experience in project work, as well as soft skills, which are necessary for working in project teams such as learning ability, and personal proordination [16].

Within the framework of our research, the difference between the vacancies of mid-level and lower-level employees and senior specialists in the field of marketing, advertising and PR is traced. Most of the job ads posted on the websites are related to the search for middle-and lower-level employees. It can be noted that managers are required to have the same set of professional skills, although they are more often required to have vast knowledge and analytical skills, as well as the ability to lead project teams. In addition, more and more job ads for senior managers contain requirements to the skill to draw up technical tasks for creative workers (designers, copywriters). Professional skills of senior specialists have changed significantly and they influenced by digitalization greatly, however the functions of strategic planning, control and interaction with external and internal significant groups prevail.

## 4. CONCLUSION

The demand for specialists in the field of marketing, advertising and PR among employers is still high. The employer expects for the employee who capable to solve classical problems on product promotion, but already on the basis of digital intelligence. The decreasing attention afforded to the university degree and at the same time the growth of requirements for digital skills should be taken into account by specialists who are focused on a successful career in marketing, advertising and PR. Understanding what skills are currently most in demand for employers helps to build one's career strategy and to determine what skills should be improved. At the same time, the modern employer and his employees should not ignore the opportunities for professional development, discussing and solving problems that offered by professional communities on the Internet, including "communities of practice" on social networks.

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# THE IMPACT OF THE INDUSTRIAL REVOLUTION ON THE POPULATION EMPLOYMENT STRUCTURE IN THE AGRARIAN ECONOMY SECTOR

***Nadiya DAVYDENKO***[26]
***Olena LEMISHKO***[27]

***Abstract:*** *The article deals with the impact of the Industrial Revolution on the absolute and structural changes in the employment of the population in the agricultural sector of the Ukrainian economy. It is indicated that globalization changes have negatively affected on the life cycle of the population in the agrarian sector of the economy and, accordingly, on the structure of its employment. The results of the analysis of the dynamics of the number and structure of the employed population in the agricultural sector of the Ukrainian economy are presented. It is proved that insufficient sustainability of agricultural production, low real wages of rural population, high inflation have a direct impact on rural development and distribution of labor resources. The ways of using the stimulating influence of the industrial revolution on the employment of the population in the agrarian sector of the economy are suggested.*

***Key words:*** *industrial revolution; agricultural sector of economy; structure of employment of the population, labor resources in the village.*

**JEL Classification:** *O14, O13, Q18.*

## 1. INTRODUCTION

Ukraine is drastically changing its economic and financial system, and has set itself the task of integrating into the European space as soon as possible. This requires the development of new technologies and business models in all industries. This trend is increasing the pace of change in the area of liquidation and job creation. Particularly painful globalization changes affect the life cycle of the population in the agar sector of the economy and, accordingly, the structure of its employment, as well as the development and distribution of rural labor resources. It is undeniable that the industrial revolution prompted the rapid growth of urbanization and influenced the strategic vectors of economic policy making and implementation. At the same time, the low level of rural labor productivity, the lack of a system of education and training, which have not developed for decades due to lack of investment, are not able to meet the new needs and, accordingly, the new philosophy of economic policy of Ukraine, including in the sphere of financial relations.

## 2. PROBLEM FORMULATION AND METHODOLOGY

In the context of transition to an innovative path of development in the agricultural sector of the Ukrainian economy, the problems of effective employment of rural population, optimal allocation of labor resources are particularly acute and require diverse approaches and solutions. An important role is given to the formation and effective functioning of the labor market in the regions, and the need for skilled labor is increasing. Therefore, it is important to analyze the dynamics of the number and structure of the employed population in the agricultural sector of the Ukrainian economy.

[26] Finance Department , National University of Life and Environmental Sciences of Ukraine, Ukraine, Kyiv, Heroyiv Oborony st., 15, E-mail: davidenk@nubip.edu.ua
[27] Finance Department , National University of Life and Environmental Sciences of Ukraine, Ukraine, Kyiv, Heroyiv Oborony st., 15, E-mail:elena.lemishko@gmail.com

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

According to the State Statistics Committee of Ukraine, we have the following information: in 1990–2017, the rural population decreased by 3.8 million people - from 16.9 to 13.1 million, or by 22.4% versus 15.9% in cities; the natural reduction rate of peasants is 6.8%, which is twice as high in urban areas (3.2%); the total fertility rate per rural woman decreased from 2,286 in 1991 to 1,642 in 2016, with the mortality rate in rural areas being 17.6 deaths per 1,000 population, compared to 13.2 in urban settlements; the infant mortality rate in rural areas (up to 1 year) is 20% higher than in urban areas; As of January 1, 2017, the demographic burden for the ages of 0-15 years per 1,000 people aged 15-59 was 299 people and 391 people aged 60 and over, significantly higher than in the cities of 250 and 358, respectively. [8].

Mohylyny O.M. emphasizes: "Due to the devastating socio-economic processes and demographic crisis, 468 rural settlements were removed from the account for the analyzed period, their average population is constantly decreasing [9]. The marginalization of rural settlements, threats and challenges to the modern balanced development of rural territories cannot be justified only by the tragic history of agrarian relations, radical reforms in the countryside, the laws of scientific and technological and technological innovations in agriculture, the inelasticity of the demand for foodstuffs, and the nutrition process of foodstuffs. [3], [10].

Our calculations proved that during 2013-2017 the number of employed population in the national economy decreased from 20404.1 thousand people to 16156.4 thousand people - by 4247.7 thousand people, or by 20.82%. In agriculture, forestry and fisheries, the decrease occurred from 3577.5 thousand people to 2860.7 thousand people - by 716.8 thousand people, or by 20.04%, which corresponds to the average trend (Table 1). Therefore, the share of industry in the national economy has hardly changed - it increased by 0.2% and amounted to 17.7%.

**Table 1: Dynamics of number and structure of employed population by types of economic activity**

**(thousands of people)**

| **Type of economic activity** | **2013** | **2014** | **2015** | **2016** | **2017** | **absolute growth 2017/ 2013** | **growth rate, %** |
|---|---|---|---|---|---|---|---|
| **Total** | 20404,1 | 18073,3 | 16443,2 | 16276,9 | 16156,4 | -4247,7 | -20,82 |
| **Agriculture, forestry and fisheries** | 3577,5 | 3091,4 | 2870,6 | 2866,5 | 2860,7 | -716,8 | -20,04 |
| **Industry** | 3274,8 | 2898,2 | 2573,9 | 2494,8 | 2440,6 | -834,2 | -25,47 |
| **Construction** | 888,8 | 746,4 | 642,1 | 644,5 | 644,3 | -244,5 | -27,51 |
| **Wholesale and retail trade; repair of motor vehicles and motorcycles** | 4556,2 | 3965,7 | 3510,7 | 3516,2 | 3525,8 | -1030,4 | -22,62 |
| **Transportation, warehousing, postal and courier activities** | 1221,2 | 1113,4 | 998,0 | 997,2 | 991,6 | -229,6 | -18,80 |
| **Temporary accommodation and catering** | 357,8 | 309,1 | 277,3 | 276,7 | 276,3 | -81,5 | -22,78 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Other economic activities** | 6527,8 | 5949,1 | 5570,6 | 5481,0 | 5417,1 | -1110,7 | -17,01 |
| **as a percentage of the total** | | | | | | | |
| **Total** | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 0 | |
| **Agriculture, forestry and fisheries** | 17,5 | 17,1 | 17,5 | 17,6 | 17,7 | 0,2 | |
| **Industry** | 16,0 | 16,1 | 15,7 | 15,3 | 15,1 | -0,9 | |
| **Construction** | 4,4 | 4,1 | 3,9 | 4,0 | 4,0 | -0,4 | |
| **Wholesale and retail trade; repair of motor vehicles and motorcycles** | 22,3 | 21,9 | 21,3 | 21,6 | 21,8 | -0,5 | |
| **Transportation, warehousing, postal and courier activities** | 6,0 | 6,2 | 6,1 | 6,1 | 6,1 | 0,1 | |
| **Temporary accommodation and catering** | 1,8 | 1,7 | 1,7 | 1,7 | 1,7 | -0,1 | |
| **Other economic activities** | 32,0 | 32,9 | 33,8 | 33,7 | 33,6 | 1,6 | |

Source: author's calculations [7]

One of the main tasks in studying the trends in the development and distribution of labor resources is to assess the regional demographic characteristics of the employed population in agriculture, forestry and fisheries. Studies of regional demographic features have shown that the highest share of employed population in agriculture, forestry and fisheries by region is in Vinnitsa region (7.12%), Lviv (6.69%) and Kharkiv (6.02%). The share of the employed population, which exceeds 5%, has the following areas: Ivano-Frankivsk, Odessa, Cherkasy. The lowest share is in Kyiv (1.71%) and Lugansk (1.33%) regions (Table 2).

**Table 2: Number of employed population in agriculture, forestry and fisheries, by region**

| **Regions** | **2015** | **2016** | **2017** | **2015** | **2016** | **2017** | **absolute growth 2017/2015** | **growth rate, %** |
|---|---|---|---|---|---|---|---|---|
| | **тис. Осіб** | | | **структура, %** | | | | |
| **Ukraine together** | 2870,6 | 2866,5 | 2860,7 | 100 | 100 | 100 | -9,9 | -0,34 |
| **Vinnytsia region** | 207,9 | 205,8 | 203,7 | 7,24 | 7,18 | 7,12 | -4,2 | -2,02 |
| **Volyn region** | 89,2 | 79,6 | 68,0 | 3,11 | 2,78 | 2,38 | -21,2 | -23,77 |
| **Dnepropetrovsk region** | 116,6 | 107,4 | 106,7 | 4,06 | 3,75 | 3,73 | -9,9 | -8,49 |
| **Donetsk region** | 65,2 | 63,6 | 62,9 | 2,27 | 2,22 | 2,20 | -2,3 | -3,53 |
| **Zhytomyr region** | 75,1 | 73,6 | 74,8 | 2,62 | 2,57 | 2,61 | -0,3 | -0,40 |
| **Transcarpathian region** | 128,9 | 125,4 | 126,0 | 4,49 | 4,37 | 4,40 | -2,9 | -2,25 |
| **Zaporozhye region** | 120,0 | 122,2 | 117,8 | 4,18 | 4,26 | 4,12 | -2,2 | -1,83 |
| **Ivano-Frankivsk region** | 159,9 | 160,1 | 162,1 | 5,57 | 5,59 | 5,67 | 2,2 | 1,38 |
| **Kyiv region** | 49,3 | 47,2 | 48,8 | 1,72 | 1,65 | 1,71 | -0,5 | -1,01 |
| **Kirovohrad region** | 109,4 | 103,4 | 106,0 | 3,81 | 3,61 | 3,71 | -3,4 | -3,11 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Lugansk region** | 37,9 | 38,2 | 38,0 | 1,32 | 1,33 | 1,33 | 0,1 | 0,26 |
| **Lviv region** | 184,0 | 191,5 | 191,5 | 6,41 | 6,68 | 6,69 | 7,5 | 4,08 |
| **Mykolaiv region** | 142,5 | 138,6 | 137,1 | 4,96 | 4,84 | 4,79 | -5,4 | -3,79 |
| **Odessa region** | 167,9 | 165,9 | 158,6 | 5,85 | 5,79 | 5,54 | -9,3 | -5,54 |
| **Poltava region** | 119,8 | 120,6 | 125,9 | 4,17 | 4,21 | 4,40 | 6,1 | 5,09 |
| **Rivne region** | 86,1 | 85,5 | 80,9 | 3,00 | 2,98 | 2,83 | -5,2 | -6,04 |
| **Sumy region** | 103,6 | 111,9 | 113,6 | 3,61 | 3,90 | 3,97 | 10 | 9,65 |
| **Ternopilska region** | 126,8 | 132,9 | 118,4 | 4,42 | 4,64 | 4,14 | -8,4 | -6,62 |
| **Kharkiv region** | 161,9 | 167,5 | 172,1 | 5,64 | 5,84 | 6,02 | 10,2 | 6,30 |
| **Kherson region** | 128,8 | 130,3 | 135,1 | 4,49 | 4,55 | 4,72 | 6,3 | 4,89 |
| **Khmelnytsky region** | 133,3 | 137,0 | 144,2 | 4,64 | 4,78 | 5,04 | 10,9 | 8,18 |
| **Cherkasy region** | 144,0 | 147,2 | 145,0 | 5,02 | 5,14 | 5,07 | 1 | 0,69 |
| **Chernivtsi region** | 102,0 | 108,3 | 110,7 | 3,55 | 3,78 | 3,87 | 8,7 | 8,53 |
| **Chernihiv region** | 107,0 | 99,2 | 108,3 | 3,73 | 3,46 | 3,79 | 1,3 | 1,21 |
| **city** | | | | | | | | |
| **Kyiv** | 3,5 | 3,6 | 4,5 | 0,12 | 0,13 | 0,16 | 1 | 28,57 |

Source: author's calculations [7]

In 2017, the number of employees of enterprises, institutions and organizations in Ukraine decreased from 9330.2 thousand people to 9112.6 thousand people, or 2.33%. In agriculture, forestry and fisheries, the dynamics are similar - it decreased from 562.3 thousand people to 554.5 thousand people, or by 1.39% (Table 3). However, in the study area the share of employees is slightly more than 6%, almost three times less than the number of employees (more than 17%).

**Table 3: Dynamics of the number of employees of enterprises, institutions, organizations**

| **Regions** | **Total** | | | **agriculture, forestry and fisheries** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **thousand people** | | **growth rate. %** | **thousand people** | | **growth rate. %** | **specific weight, %** | | **growth rate. %** |
| | **2016** | **2017** | | **2016** | **2017** | | **2016** | **2017** | |
| **Ukraine** | 9330,2 | 9112,6 | -2,33 | 562,3 | 554,5 | -1,39 | 6,03 | 6,08 | 0,97 |
| **Vinnytsia region** | 342,8 | 337,7 | -1,49 | 43,1 | 40,9 | -5,10 | 12,57 | 12,11 | -3,67 |
| **Volyn region** | 214,5 | 213,2 | -0,61 | 11,9 | 11 | -7,56 | 5,55 | 5,16 | -7,00 |
| **Dnepropetrovsk region** | 917,2 | 901,7 | -1,69 | 32,1 | 36,1 | 12,46 | 3,50 | 4,00 | 14,39 |
| **Donetsk region** | 514,1 | 466,2 | -9,32 | 17,7 | 16,5 | -6,78 | 3,44 | 3,54 | 2,80 |
| **Zhytomyr region** | 278,2 | 269,3 | -3,20 | 23,1 | 22,9 | -0,87 | 8,30 | 8,50 | 2,41 |
| **Transcarpathian region** | 196,9 | 191,1 | -2,95 | 5,9 | 5,9 | 0,00 | 3,00 | 3,09 | 3,04 |
| **Zaporozhye region** | 429,8 | 426,5 | -0,77 | 25,6 | 23,3 | -8,98 | 5,96 | 5,46 | -8,28 |
| **Ivano-Frankivsk region** | 239,9 | 234,6 | -2,21 | 9,4 | 8 | -14,89 | 3,92 | 3,41 | -12,97 |
| **Kyiv region** | 590,7 | 587,1 | -0,61 | 39,6 | 40,4 | 2,02 | 6,70 | 6,88 | 2,65 |
| **Kirovohrad region** | 209,9 | 207,5 | -1,14 | 26,3 | 27,1 | 3,04 | 12,53 | 13,06 | 4,23 |
| **Lugansk region** | 172,8 | 151,1 | -12,56 | 12,2 | 11,5 | -5,74 | 7,06 | 7,61 | 7,80 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Lviv region** | 569,1 | 560,3 | -1,55 | 12,9 | 13,5 | 4,65 | 2,27 | 2,41 | 6,29 |
| **Mykolaiv region** | 245,7 | 238,6 | -2,89 | 19,4 | 18,7 | -3,61 | 7,90 | 7,84 | -0,74 |
| **Odessa region** | 533,6 | 535,9 | 0,43 | 30,7 | 29,5 | -3,91 | 5,75 | 5,50 | -4,32 |
| **Poltava region** | 352,1 | 346,2 | -1,68 | 41,2 | 41,1 | -0,24 | 11,70 | 11,87 | 1,46 |
| **Rivne region** | 226,5 | 220,8 | -2,52 | 13,1 | 12,2 | -6,87 | 5,78 | 5,53 | -4,47 |
| **Sumy region** | 258 | 250 | -3,10 | 26,9 | 24,3 | -9,67 | 10,43 | 9,72 | -6,77 |
| **Ternopilska region** | 183,5 | 181,7 | -0,98 | 12,4 | 13,2 | 6,45 | 6,76 | 7,26 | 7,51 |
| **Kharkiv region** | 669,1 | 647,9 | -3,17 | 31,1 | 28,8 | -7,40 | 4,65 | 4,45 | -4,37 |
| **Kherson region** | 198,7 | 194,1 | -2,32 | 22,1 | 22 | -0,45 | 11,12 | 11,33 | 1,91 |
| **Khmelnytsky region** | 262 | 253,9 | -3,09 | 25,8 | 24,2 | -6,20 | 9,85 | 9,53 | -3,21 |
| **Cherkasy region** | 278,1 | 277,6 | -0,18 | 39,6 | 39,8 | 0,51 | 14,24 | 14,34 | 0,69 |
| **Chernivtsi region** | 138,4 | 135,2 | -2,31 | 8,2 | 7,9 | -3,66 | 5,92 | 5,84 | -1,38 |
| **Chernihiv region** | 244,4 | 239,1 | -2,17 | 29 | 31,8 | 9,66 | 11,87 | 13,30 | 12,09 |
| **city** | | | | | | | | | |
| **Kyiv** | 1064,2 | 1045,3 | -1,78 | 3 | 3,9 | 30,00 | 0,28 | 0,37 | 32,35 |

Source: author's calculations [7]

It should be emphasized that the analysis of the number of employees of enterprises in the study of trends in the development and distribution of labor resources is not enough: changing the economic situation entails an increase in intensity and change in the nature of the labor force in different forms, between enterprises of different forms of ownership, different industries and individual regions. In recent years, the number of unemployed in the region has been steadily declining, but the situation in the rural labor market is slowly improving. Insufficient sustainability of agricultural production, low real wages of rural population, high inflation have a direct impact on employment and lead to an increase in the number of unemployed. It is necessary to take into account the fact that peasants cannot afford to earn a decent income through their own farms. The Industrial Revolution and the NTP are very slowly moving in the countryside: only 19.5% of private farms own agricultural machinery. Leading Ukrainian scientists explain the identified tendencies in agriculture by falling levels of capital output, rising material costs, lower wages, and the fact that resource prices increase faster than enterprise prices for their products (the formation of prices for agricultural production is monopolistic to the market, so there is a problem of price disparity) [2, c. 276; 5; 6, c. 20].

We support the findings of scientists on the need to create a regulator of the processes of social production, exchange, distribution and consumption. But with regard to wage cuts in agriculture, note the following. Despite the typology of reproduction (simple, narrowed, expanded), its essential factor is labor, and, accordingly, payment for labor expended. In the structure of agricultural production costs, wages vary from 50% to 40% - from the total amount of production costs (depending on the specialization of agricultural production - crop production, animal husbandry, etc.), that is, the proportion is quite considerable. However, according to official data, the wage in agriculture is one of the smallest (the average wage in 2017 per employee is UAH 5,277, less than it is by type - health and social services [1]. Also, it was proved that the level of tax burden in the agricultural sector of the economy is not optimal, which also has a negative impact on the economic state of the industry [4]. However, the fact remains that the Ukrainian village and its population play a significant role in the economic and spiritual development of our country. It should be emphasized that the industrial revolution is changing the nature of agricultural production, namely: high-efficiency tillage technologies are less labor intensive and do not require a significant amount of labor.

Therefore, the rural population is losing the economic basis of its existence. At the same time, the Industrial Revolution provides an impetus for rapid reforms that are designed to provide widespread benefits to new technologies and new opportunities, including in the agricultural sector.

## 4 .CONCLUSION

To use the stimulating influence of the Industrial Revolution on employment in the agricultural sector, we propose the following. First, in order to mobilize a range of tools for expanding new opportunities in the agricultural sector, it is first and foremost necessary to improve the legal and regulatory framework. Agrarian enterprises that use innovative advanced technologies and are socially responsible for hired labor, to provide state preferences in all areas - in tax breaks, in direct support, in access to the latest knowledge, in improving the level of vocational training and continuing vocational education. Secondly, to promote investment support in the countryside, to take measures aimed at creating favorable conditions for investment, including the creation of a favorable social climate in rural areas. At the same time, it should be guided that the main strategic resource of the state - human and social capital, rural territories - should become attractive for investment. In this context, decentralization of power decentralization reforms started in Ukraine. Creating favorable conditions for innovation and investment climate in the countryside will help to increase the number of jobs and provide opportunities for long-term development of the agrarian sector of the Ukrainian economy.

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# VPLYV VYBRANÝCH ASPEKTOV NA PRACOVNÚ MOBILITU A DOPADY INDUSTRY 4.0 NA PROCESY ZAMESTNANOSTI V RÁMCI PARTNERSTVA EURES-T BESKYDY

# IMPACT OF SELECTED ASPECTS ON LABOR MOBILITY AND IMPACTS OF INDUSTRY 4.0 ON EMPLOYMENT PROCESSES WITHIN THE EURES-T BESKYDY PARTNERSHIP

***Miriama DUBOVSKÁ***[28]
***Eva RIEVAJOVÁ***[29]

**Abstrakt:** *Pracovná mobilita je v súčasnej dobe ovplyvnená viacerými pozitívnymi či negatívnymi faktormi. Údaje o životných a pracovných podmienkach v krajinách cezhraničného partnerstva EURES-T Beskydy nám pomohli pri identifikácii stimulov a bariér v procese pracovnej mobility v spomínanej oblasti. Na základe dostupných získaných údajov o pracovných podmienkach v Slovenskej republike, Českej republike a Poľskej republike sme vybrané ukazovatele porovnali a identifikovali určité bariéry a stimuly vplývajúce na pracovnú mobilitu. Automatizácia a digitalizácia na jednej strane vytvárajú priestor pre zjednodušenie bežného života i zefektívnenie výroby, no zároveň vystupujú ako ohrozenie existujúcich pracovných miest, a to nielen vo výrobnom procese. V súvislosti s týmto fenoménom druhá časť príspevku identifikuje vplyv Industry 4.0 na procesy zamestnanosti, ktoré sa týkajú i krajín partnerstva EURES-T Beskydy. Príspevok tiež pojednáva o dopadoch Priemyslu 4.0 na bežný život ľudí i na zmeny vyskytujúce sa v celej spoločnosti.*

**Kľúčové slová:** *pracovná mobilita, EURES-T Beskydy, Industry 4.0*

**Abstract:** *Occupational mobility is currently influenced by several positive or negative factors. The data on living and working conditions in the EURES-T Beskydy cross-border partnership countries helped us to identify the incentives and barriers to the labor mobility process in the area. Based on the available data on working conditions in the Slovak Republic, the Czech Republic and the Republic of Poland, we compared selected indicators and identified barriers and incentives affecting labor mobility. On the one hand, automation and digitization create scope for simplifying daily life and making production more efficient, but at the same time they pose a threat to existing jobs, not only in the production process. In connection with this phenomenon, the second part of the paper identifies the impact of Industry 4.0 on employment processes, which also affect the EURES-T Beskydy countries. The paper also discusses the impact of Industry 4.0 on people's daily lives and on changes occurring throughout society.*

**Key words:** *labour mobility, EURES-T Beskydy, Industry 4.0*

**JEL Classification:** *J62, J23, J24,O32, O33*

## 1. ÚVOD

V dnešnej dobe predstavuje pohyb obyvateľstva neoddeliteľnú súčasť života, kedy sa denne presúvame z miesta na miesto za pracovnými alebo rodinnými povinnosťami. V oblasti trhu práce označujeme tento pohyb za pracovnými povinnosťami ako mobilitu pracovnej sily, ktorá je ovplyvnená rôznymi pozitívnymi i negatívnymi javmi. Na odhalenie bariér a stimulov v procese pracovnej mobility sme sa v príspevku zamerali na pracovné podmienky v krajinách

[28] Ing., Ekonomická univerzita v Bratislave, Národohospodárska fakulta, Katedra sociálneho rozvoja a práce, Dolnozemská cesta 1, Bratislava, 852 35, Slovensko, e-mail: miriama.dubovska@euba.sk
[29] Prof., Ing., PhD., Ekonomická univerzita v Bratislave, Národohospodárska fakulta, Katedra sociálneho rozvoja a práce,Dolnozemská cesta 1, Bratislava, 852 35, Slovensko, e-mail: eva.rievajova@euba.sk

cezhraničného partnerstva EURES-T Beskydy, ktoré pohyb obyvateľstva za prácou v tejto oblasti tiež do určitej miery ovplyvňujú.

Snaha Európskej únie o odstránenie prekážok brániacich v pracovnej mobilite obyvateľov Únie sa prejavuje vo vytváraní cehraničných partnerstiev medzi členskými krajinami na podporu mobility pracovnej sily. Jedným z týchto cezhraničných partnerstiev je partnerstvo EURES-T Beskydy, ktoré je súčasťou siete Európskych služieb zamestnanosti (EURES). Hlavným cieľom siete EURES je uľahčiť voľný pohyb pracovnej sily v členských krajinách Európskej únie, Nórsku, Islande, Lichtenštajnsku a vo Švajčiarsku. Významnú úlohu zohráva EURES v regiónoch týkajúcich sa cezhraničných partnerstiev, kde ľudia žijú v jednej krajine ale za prácou dochádzajú do druhej krajiny. Počas pracovnej mobility narážali obyvatelia týchto regiónov na rôzne prekážky, najmä právneho, daňového a administratívneho charakteru. Sieť EURES vznikla, aby pomohla pracovníkom, ale i zamestnávateľom v týchto oblastiach prekonať prekážky súvisiace s dochádzaním za prácou. Na Slovensku sú momentálne vytvorené dve takéto partnerstvá, EURES-T Danubius (cezhraničné partnerstvo vytvorené na podunajských slovensko-maďarských hraniciach) a EURES-T Beskydy (cezhraničné partnerstvo pre hraničné oblasti krajín Slovenska, Česka a Poľska).

Automatizácia a digitalizácia predstavujú zmeny vo výrobnom procese, ktoré so sebou prináša štvrtá priemyselná revolúcia, inak nazývaná ako aj digitálna revolúcia. Tieto zmeny vo výrobnom procese majú zjednodušiť výrobný proces prostredníctvom automatizovanej výroby či zavádzaním nových digitálnych technológií do výroby. Okrem zmien v pracovnom prostredí prináša Industry 4.0 so sebou i zmeny v bežnom živote ľudí, kde sú rôzne činnosti nahradené technológiami, ktoré majú človeku zjednodušiť život. Na jednej strane prináša Priemysel 4.0 so sebou množstvo pozitívnych aspektov, ktoré zjednodušujú život a zefektívňujú výrobný proces, no na druhej strane tento fenomén vplýva na procesy zamestnanosti, konkrétne na pracovné miesta. S nástupom moderných technológií zanikajú mnohé pracovné miesta vo výrobných procesoch, ktoré sú nahradené automatizovanou výrobou či strojmi. Dopady, ktoré so sebou prináša štvrtá priemyselná revolúcia v oblasti pracovných procesov sme sa pokúsili identifikovať v príspevku.

## 2. CIEĽ A METODOLÓGIA

Cieľom príspevku je charakterizovať odlišnosti v oblasti vybraných pracovných podmienok v rámci cezhraničného partnerstva EURES-T Beskydy, ktoré možno tiež považovať za stimuly alebo bariéry procesu pracovnej mobility a identifikovať dopady na zamestnanosť a prístupy krajín Partnerstva k procesom Industry 4.0. Prvý krok pri písaní príspevku spočíval v charakteristike oblasti EURES-T Beskydy. Následne sme čerpali informácie zo zákonníkov práce jednotlivých krajín o pracovných podmienkach ako vznik a zánik pracovného pomeru, pracovný čas, prestávky v práci a doby odpočinku od práce či o podmienkach upravujúcich mzdové ohodnotenie zamestnancov. V ďalšom kroku sme sa venovali charakteristike regiónom krajín zapojených do Partnerstva a zisťovali sme, aké sú predpoklady pre pracovnú mobilitu v daných regiónoch.

Druhá časť príspevku je venovaná štvrtej priemyselnej revolúcii a na jej dopady na procesy zamestnanosti, nielen v krajinách partnerstva EURES-T Beskydy. Táto časť definuje Industry 4.0 a situácie, ktoré so sebou prináša ako v pracovnom tak aj bežnom živote jednotlivca. Následne sme nadviazali na pracovné procesy a zmeny v štruktúre práce, ktoré so sebou Priemysel 4.0 prináša. V ďalšej časti sme sa venovali novodobým požiadavkám na trhu práce, ktoré požadujú obe strany pracovnoprávneho vzťahu, zamestnanci i zamestnávatelia. Nakoniec sme venovali pozornosť, ako k nadchádzajúcemu Industry 4.0 pristupujú i skúmané krajiny partnerstva EURES-T Beskydy.

## 3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

### *3.1 Charakteristika regiónov a predpoklady pracovnej mobility v rámci partnerstva EURES-T Beskydy*

**Región Českej republiky**

Oblasti spadajúce do Partnerstva na území Českej republiky tvoria tri kraje, Moravskoslezský, Olomocoucký a Zlínský kraj. Z Moravskoslezského kraja sú do Partnerstva zapojené okresy Bruntál, Frýdek-Místek, Karviná, Nový Jičín, Opava a Ostrava. Predpokladmi pre vytvorenie cezhraničnej spolupráce medzi Českom, Slovenskom a Poľskom spočívali najmä vo vhodnej polohe medzi spomínanými prihraničnými krajinami a v kvalitnej technickej infraštruktúre. Ďalší predpoklad rozvoja kraja predstavuje pozícia krajiny pre dopravu a infraštruktúru smerom do východnej Európy. Olomoucký kraj predstavuje vhodné miesto pre podnikanie vďaka svojej polohe, cestnému a železničnému prepojeniu či napojeniu na logistické centrá. V rámci Olomouckého kraja sú do Partnerstva zapojené dva okresy, okres Jesník a okres Šumperk. Okres Vsetín predstavuje jediný okres zo Zlínskeho kraja, ktorý je zapojený do cezhraničnej spolupráce EURES-T Beskydy. Zlínsky kraj predstavuje z väčšej časti vidiecky región, ktorý si vďaka impulzom z doby vzniku firmy Baťa vytvoril na území Česka pozíciu s rozvinutým priemyslom. V súčasnosti sa kraj usiluje o vybudovanie technickej infraštruktúry, najmä cestnej siete. Partnerstvo na území Českej republiky zaberá približne 11,05 % z celkovej plochy územia Českej republiky.

**Región Poľskej republiky**

EURES-T Beskydy zahŕňa do svojho partnerstva na strane Poľskej republiky časť Opolského a Sliezskeho vojvodstva. Na ploche Sliezskeho vojvodstva tvorí partnerstvo EURES-T na približne 25,5 % rozlohy a na ploche Opolského vojvodstva tvorí Partnerstvo približne 26,2 % rozlohy územia. V priemyselnom odvetví patrí Sliezske vojvodstvo medzi najindustrializovanejší región v rámci Poľskej repbuliky. Najviac je zastúpený automobilový priemysel svetovými firmami, napr. Opel. Okrem iného sa na území nachádzajú uhoľné bane tvoriace viac ako 90 % predajnej produkcie čierneho uhlia na území Poľska. V súčasnej dobe sa región tiež sústreďuje na rozvoj nových technológií a tradičný priemysel začína upadať, čím sa i v tomto prípade aplikuje do praxe nástup štvrtej priemyselnej revolúcie, ktorá sa vyznačuje digitalizáciou či robotizáciou.

**Región Slovenskej republiky**

Rozloha slovenskej časti regiónu EURES-T Beskydy sa rozprestiera na severozápade Slovenska, konkrétne na území Žilinského samosprávneho kraja. Tento kraj má spoločnú hranicu na severozápade s Poľskom a Českom a podľa územno-správneho usporiadania sa člení na 11 okresov, pričom do cezhraničnej spolupráce ich je zapojených len 6, a to Bytča, Čadca, Kysucké Nové Mesto, Námestovo, Tvrdošín a Žilina.

Žilinský kraj ovplýva vysokým investičným potenciálom od prostredia pre vzdelávanie až po pracovné príležitosti. Prístup k vzdelaniu zabezpečuje Žilinská univerzita, ktorá poskytuje vzdelanie v študijných odboroch ako sú informačné a komunikačné technológie, doprava, softvérové inžinierstvo, strojárstvo a iné. Pracovná sila so vzdelaním v spomenutých študijných odboroch predstavuje základ pre trh práce v odvetví informačných a komunikačných technológií, čím sa stáva atraktívnou pre zamestnávateľov v dobe nastupujúcej digitálnej revolúcie. Atraktívnosť Žilinskému regiónu prídáva i dlhoročná tradícia v strojárenskom priemysle, ktorá prilákala na toto územie zahraničnú investíciu v

podobe výstavby automobilového závodu KIA Motors. Nový zamestnávateľ sa do určitej miery podielal na rozvoji v oblasti služieb, najmä v oblasti výskumu a vývoja, logistiky a financií. Cestovný ruch zaznamenal tiež rozmach v oblasti wellness služieb či kúpeľníctva, k čomu dopomohli viaceré minerálne pramene s liečivými účinkami. V neposlednom rade spomenieme, že plochu regiónu tvorí viac ako 50 % lesov, vďaka čomu prosperuje drevospracujúci priemysel vo výrobe papiera a celulózy.

### *3.2 Vybrané pracovné aspekty vplývajúce na mobilitu pracovnej sily*

Na mobilitu pracovnej sily vplývajú do istej miery pracovné podmienky v jednotlivých krajinách. Pracovnoprávne vzťahy medzi zamestnávateľom a zamestnancom v daných krajinách upravuje Zákonník práce príslušnej krajiny. Pre účely tohto príspevku sme sa v zákonníkoch práce venovali vybraným aspektom, ktoré podľa nášho usúdenia na pracovnú mobilitu vplývajú. Podrobnejšie sme preštudovali časti týkajúce sa pracovného pomeru, jeho vzniku a zániku, pracovného času, prestávok v práci a doby odpočinku od práce či podmienok upravujúcich mzdové ohodnotenie zamestnancov.

Pracovný pomer vzniká vo všetkých troch krajinách partnerstva EURES-T Beskydy pomerne rovnako, a to na základe podpísania pracovnej zmluvy medzi dvoma zmluvnými stranami, zamestnávateľom a zamestnancom. V jednotlivých pracovných zmluvách si zmluvné strany určia podstatné náležitosti súvisiace s výkonom danej práce, ako je druh vykonávanej práce, miesto pre výkon práce, deň nástupu do práce, mzdové podmienky a iné. Výmera skúšobnej doby vo všetkých troch skúmaných krajinách nesmie presiahnuť dobu dlhšiu ako sú tri mesiace. Spôsob, akým môžu zmluvné strany ukončiť pracovný pomer, je tiež vo všetkých troch krajinách rovnaký. Pri pracovnom pomere uzatvorenom na dobu neurčitú majú zamestnanci či zamestnávateľ možnosť zvoliť skončenie pracovného pomeru obojstrannou dohodou, výpoveďou jednej strany pracovnoprávneho vzťahu, okamžitým skončením v príprade porušenia podmienok ukotvených v pracovnej zmluve či skončením pracovného pomeru v skúšobnej dobe. V prípade, že sa pracovnoprávny vzťah uzatvoril na dobu určitú, jeho zánik zväčša nastáva po uplynutí doby, na ktorej sa zmluvné strany dohodli.

Z hľadiska pracovného času majú všetky tri krajiny Partnerstva ustanovený týždenný pracovný čas na 40 hodín, v prípade práce odpracovanej nadčas je to 48 hodín. V rámci jedného roka nesmie práca nadčas presiahnuť hranicu 150 hodín. Zamestnávatelia všetkých troch krajín majú možnosť rozvrhnúť pracovný čas zamestnancov podľa povahy prevádzky na rovnomerné rozvrhnutie či nerovnomerné rozvrhnutie pracovného času, ako je napr. konto pracovného času či pružná pracovná doba.

Analógiu pracovných podmienok v Poľsku, Česku a Slovensku sme si všimli v častiach zákonníkov práce ustanovujúcich prestávky v práci a dobu odpočinku. Zamerali sme sa však na časti, v ktorých sa tento druh pracovných podmienok mierne diferencoval. V podmienkach Slovenskej a Českej republiky majú zamestnanci nárok na prestávku v dĺžke 30 minút po šiestich odpracovaných hodinách. Treba poznamenať, že prestávky v práci sa nezapočítavajú do pracovného času. V podmienkach Poľskej republiky sa dĺžka tejto prestávky skracuje na 15 minút, pričom sa v plnej miere započítava do pracovného času. Medzi dvoma pracovnými zmenami patrí zamestnancovi nárok na dobu odpočinku medzi zmenami. V podmienkach Slovenskej republiky je dĺžka tohto druhu odpočinku v dĺžke 12 hodin nepretržite. V podmienkach Českej a Poľskej republiky ustanovujú zákonníky práce dobu odpočinku medzi zmenami na 11 hodín nepretržite. Najdlhšiu týždennú výmeru nepretržitého odpočinku uzákoňuje slovenský zákonník práce, konkrétne v dĺžke dvoch voľných dní. Český a poľský zákonník práce stanovuje dobu na oddych a regeneráciu pracovnej sily vo výmere aspoň 35 hodín za pracovný týždeň.

Na dovolenku za kalendárny rok vo výmere 4 týždne majú nárok tí zamestnanci, ktorí u toho istého zamestnávateľa odpracovali aspoň 60 dní v kalendárnom roku. Takéto znenie jednej zo skúmaných pracovných podmienok je definované v zákonníkoch práce všetkých troch krajín Partnerstva. Stručný prehľad pracovných podmienok týkajúcich sa prestávok v práci a doby odpočinku znázorňuje tabuľka č. 1.

**Tabuľka 1: Prehľad vybraných pracovných podmienok týkajúcich sa prestávok v práci a doby odpočinku**

| Krajina / Prestávka | Slovenská republika | Poľská republika | Česká republika |
|---|---|---|---|
| **Prestávka po 6 odprac. hodinách** | 30 min. | 15 min. | 30 min, |
| **Doba odpočinku medzi zmenami** | 12 hod. | 11 hod. | 11 hod. |
| **Nepretržitý odpočinok** | 2 dni | 35 hod | 35 hod. |
| **Dovolenka za kalendárny rok** | 4 týždne | 20 dní | 4 týždne |

Zdroj: vlastné spracovanie na základe údajov zo Zákonníkov práce príslušných krajín

Posledný aspekt, ktorému sme sa v rámci skúmania pracovných podmienok v parterstve EURES-T Beskydy venovali, boli mzdové podmienky v jednotlivých krajinách. Zamerali sme sa na výšku minimálnej a priemernej mzdy v roku 2019, ktorá sa v jednotlivých krajinách líšila a dospeli sme k takýmto zisteniam. V porovnaní so všetkými tromi krajinami Partnerstva je najvyššia minimálna mzda na rok 2019 stanovená v podmienkach Poľskej republiky, a to vo výške 532 € a podľa dostupných štatistických údajov má najvyššiu priemernú mzdu zamestnanec v Českej republike, vo výške 34 105 CZK, čo je po prepočte na menu EUR približne 1 333,79 €. Prehľad minimálnej a priemernej mzdy v jednotlivých krajinách je znázornený v tabuľke č. 2.

**Tabuľka 2: Minimálna a priemerná mzda v jednotlivých krajinách Partnerstva.**

| Obdobie | Slovenská republika | Poľská republika | Česká republika |
|---|---|---|---|
| **Minimálna mzda v roku 2019** | 520 € | 532 € | 519 € |
| **Priemerná mzda za 2.štvrťrok 2019** | 1101 € | 1198,11 € | 1333,79 € |

Zdroj: vlastné spracovanie na základe údajov z Eurostat, Ústredného štatistického úradu Poľskej republiky, Českého štatistického úradu, Štatistického úradu Slovenskej republiky. Priemerná mzda je prepočítaná kurzom Národnej banky Slovenska zo dňa 22.10.2019, 1 €=25,570 CZK, 1 €=4,2778 PLN.

Mzdové zvýhodnenia za prácu nadčas, za nočnú prácu, prácu v sobotu, v nedeľu či vo sviatok sú znázornené v tabuľke č. 2. Zamestnanec v Poľskej republike dostane za prácu vykonanú nadčas najvyššie mzdové zvýhodnenie výške 50 % priemerného zárobku zamestnanca. Ak zamestnanec v podmienkach Českej republiky pracuje vo sviatok, patrí mu

zvýhodnenie za túto prácu vo výške 10 % jeho priemerného zárobku. Rovnaká výmera platí i pre prácu vykonávanú v sobotu a v nedeľu. Zamestnanci zamestnaní v Poľsku a na Slovensku získajú za prácu vo sviatok mzdové zvýhodnenie vo výške 100 % svojho priemerného zárobku. Za prácu v sobotu patrí zamesntnacovi v podmienkach Slovenskej republiky mzdové zvýhodnenie vo výške 50 % jeho minimálnej hodinovej mzdy. Za prácu v nedeľu sa výška mzdového zvýhodnenia zvýšila na 100 % minimálnej hodinovej mzdy. Najnižší príplatok k mzde za nočnú prácu dostane podľa Zákonníka práce zamestnanec Českej republiky vo výške 10 % priemerného zárobku zamestnanca.

**Tabuľka 3 : Mzdové zvýhodnenia v krajinách partnerstva EURES-T Beskydy**

| | **Slovenská republika** | **Poľská republika** | **Česká republika** |
|---|---|---|---|
| **práca nadčas** | 25 % priemerného zárobku zamestnanca | 50 % priemerného zárobku zamestnanca | 25 % priemerného zárobku zamestnanca |
| **práca vo sviatok** | 100 % priemerného zárobku zamestnanca | 100 % priemerného zárobku zamestnanca | 10 % priemerného zárobku zamestnanca |
| **nočná práca** | 40 % minimálnej mzdy v SR | 20 % minimálnej mzdy v Poľsku | 10 % priemerného zárobku zamestnanca |

Zdroj: vlastné spracovanie na základe údajov zo Zákonníkov práce príslušných krajín

### *3.3 Dopady Industry 4.0 na procesy zamestnanosti*

Významným fenoménom šúčasnosti, ale najmä budúcnosti sa stáva štvrtá priemyselná revolúcia, inak známa aj ako Priemysel 4.0. V procese zavádzadnia Priemyslu 4.0 sa spoločnosť stretáva s významýni zmenami, ktoré na jednej strane vytvárajú priestor pre zjednodušenie bežného života ľudstva či zefektívnenie výroby podnikov. Na druhej strane predstavujú ohrozenie na trhu práce, najmä čo sa týka existujúcich pracových miest, a to nielen vo výrobnom procese. Zmeny, ktoré takto zasahujú do spoločnosti sú známe pod pojmami robotizácia či automatizácia a digitálna revolúcia. V minulosti boli zmeny počas prvej až tretej priemyselnej revolúcie podmienené vynájdením nových vynálezov. Nástup štvrtej priemyselnej revolúcie neprináša so sebou žiadny nový vynález, ide skôr o systémovú reformu vo výrobnom procese. Tá má zjednodušiť a zefektívniť výrobný proces prostredníctom automatizovanej výroby, zavedením digitálnych technológií či ovládaním určitých prvkov výroby prostredníctvom internet.

Štvrtá priemyselná revolúcia prináša so sebou zmeny vo vzájomnej komunikácii v rámci systému medzi počítačmi, prístrojmi, ale aj dodávateľmi či odberateľmi. Táto prepojenosť medzi fyzickým systémom a digitálnym systémom sa vykonáva na základe komunikácie prostredníctvom internetu vecí. Internet vecí predstavuje komunikačnú sieť prístrojov, kde je prístup človeka obmedzený na minimmálny zásah a prístroje nastavené na samostatné zosúladenie bez akýchkoľvek ľudských zásahov. Vzor fungovania internetu vecí môžeme pozorovať napr. v monitorovaní srdcových implantátov, kde sú prepojené tri dôležité objekty pre fungovanie, a to stroj, softvér a internet umožňujúci zber a výmenu údajov. Internet vecí je známy aj vďaka novým „smart"technológiám. Medzi najznámejšie patria smart budovy (senzory pohybu) smart doprava (elektromobily) či smart životný štýl (práčka, sušička, robotické vysávače) a pod. (Pauhofová I, 2018).

Všetky tieto smart technológie či internet vecí spôsobujú takisto zmeny na trhu práce. V bežnom živote nám tieto nové vymoženosti pomáhajú šetriť čas či už v pracovnej alebo súkromnej sfére nášho života. No v prípade trhu práce sa vynárajú otázniky nad pracovnými miestami, kde sa uvažuje o nahradení pracovnej sily novodobou technológiou, ktorá zefektívni výrobný process či ušetrí náklady na pracovnú silu. Zánik určitých druhov pracovných miest sme mali možnosť začať pozorovať už v priebehu tretej priemyselnej revolúcie, kde bola prítomnosť človeka s nížšou kvalifikáciou nahradená robotmi na výkon toho istého druhu práce.

Nové trendy v nástupom Priemyslu 4.0 ako je robotizácia či automatizácia výroby si pre obsluhu týchto prístrojov vyžadujú pracovnú silu s odbornou znalosťou v oblasti vedy, techniky či riadenia týchto nových technológií. Tu sa začínajú kreovať nové pracovné miesta bazírujúce po určitom stupni odbornosti či kvalifikácie v oblasti informačných technológií. V tomto bode začíname pozorovať dopyt zamestnávateľov pri obsadení novovytvorených miest po pracovnej sile s požadovanou kvalifikáciou v oblasti informačných technológií (Masárová T., Kordoš M., Sokol J., 2019).

***Štruktúra práce a zmena potreby práce***

Situácia na trhu práce sa v súčasnosti vyznačuje nerovnosťou medzi štruktúrou ponuky práce a dopytom po práci. Následkom tejto nerovnováhy vzniká negatívny jav ekonomiky s negatívnym dopadom na rôzne sféry spoločnosť, nezamestnanosť. Tento jav vzniká i v dôsledku nesprávne zadefinovaných potrieb pracovnej sily pre trh práce, ktoré sú sprevádzané zavádzanou automatizáciou výroby či robotizáciou.

V dôsledku nástupu štvrtej priemyselnej (digitálnej revolúcie) je potrebné zadefinovať celkovú zmenu potreby práce v spoločnosti. Postupné obmedzovanie pracovnej sily alebo jej nahrádzanie vedie k spoločenským i vedným diskusiám o nadbytočnosti tejto pracovnej sily, či populácie samotnej. Druhý otáznik, ktorý sa vynára s nadbytočnosťou pracovnej sily, predstavuje finančné zabezpečenie tejto nepotrebnej pracovnej sily. Ak nahradená pracovná sila nebude dostávať príjem za výkon práce, nebude mať prostriedky na adekvátne životné podmienky, potom tu vzniká skupina ľudí, o ktorú sa bude musieť postarať štát prostredníctvom rôznych foriem sociálnej pomoci.

Prienik technológií digitálnej revolúcie do života ľudstva, či už pracovného alebo súkromného, prináša so sebou nejeden problem, ktorý je potrebné vyriešiť. Prvý problem spočíva v nedostatočne kvalifikovanej pracovnej sile. Dovolíme si tvrdiť, že súčasné požiadavky trhu práce nie sú v súlade s učebnými osnovami žiakov stredných škôl. Učebné osnovy nie sú každoročne aktualizované, nezodpovedajú požiadavkam potenciálnych zamestnávateľov. Ďalej žiakom stredných odborných škôl chýba dostatočná prax pre uplatnenie v budúcom povolaní. Tento problem je možné do čiastočnej miery vyriešiť plošnejším zavádzaním duálneho vzdelávania. Prostredníctvom duálneho vzdelávania, ktorého základ spočíva v prepojení teórie s praxou, kde je však vyšší dôraz kladený na praktickú stránku vyučovacieho procesu, sa do praktickej časti vzdelávania zapája zamestnávateľ. Praktické vyučovanie sa realizuje v priestoroch zamestnávateľov, ktorí si prostredníctvom duálneho vzdelávania vyškolia svojich budúcich pracovnívkov. Títo žiaci, zúčastňujúci sa duálneho vzdelávania, si po absolvovaní strednej školi nájdu pracovné miesto a uplatnenie v danej oblasti štúdia, najčastejšie u toho istého zamestnávateľa, kde absolvovali duálne vzdelávanie. Zamestnávateľ tak získa kvalifikovanú pracovnú silu a zároveň zníži náklady na zaškolenie nových zamesnancov. V súčasnosti takýmto spôsobom fungujú automobilové závody na území Slovenskej republiky (Pauhofová I., 2018).

Najširší dopad bude mať digitálna revolúcie na pracovné miesta v oblasti výroby a služieb. Najväčší pokles pracovných miest sa predpokladá vo výrobných procesoch, kde budú určité pracovné miesta postupne nahradené automatizovanou výrobou. Naopak nárast pracovných miest predpokladajú odborníci v sektore služieb, kde automatizácia či digitalizácia nemá až taký rozsiahly dopad ako je to v prípade procese výroby. Podľa štúdie vypracovanej v rámci Operačného programu Ľudské zdroje *Analýza dopadov digitálnej transformácie na podnikateľov v súkromnom a verejnom sektore* sa predpokladá najvyšší pokles pracovných miest vo výrobnej sfére, a to z dôvodu už spomínanej efektívnejšej výroby či menšej kazovosti produktov, ak sa ľudský factor nahradí strojom. Ďalej sa v tejto štúdii uvádza, že nárast pracovných miest sa očakáva najmä v oblasti informačných technológií, vedeckých pracovných pozícií a služieb ( právne poradenstvo, umelecké profesie).

***Nové požiadavky na trhu práce***

Ešte pred pár rokmi vyžadovali zamestnávatelia od svojich potenciálnych zamestnancov zväčša praktické skúsenosti, tzv. tvrdé zručnosti. S nástupom digitálnej revolúcie sa menia i požiadavky na zamestnancov, ale aj na zamestnávateľov. Tento trend nesúvisí len s digitálnou revolúciou. Do zmien v požiadavkach na zamestnanca či zamestnávateľa vstupujú vo veľkej miere noví zamestnanci z Generácie Z, ktorá sa vyznačuje svojím neustálym pripojením na internet a sociálne siete. Kým v minulosti zamestnancov zaujímalo najmä meno a výsledky firmy, dnes noví zamestnanci preferujú podnikovú sociálnu politiku firmy, či activity firmy na sociálnych sietiach. Ešte pred niekoľkými rokmi boli jazykové zručnosti niečo, čo robilo zamestnanca výnimočným a odlišoval sa od svojich spolupracovníkov. Dnes sú jazykové zručnosti z anglického jazyka niečo, v čom by mal mať nejaké základy každý zamestnanec a ovládanie ďalších cudzích jazykov robí zamestnanca v podniku výnimočným. Počítačové zručnosti sú tiež niečo, čo by mal aspoň na začiatočníckej úrovni ovládať každý potenciálny zamestnanec. Naopak pred pár rokmi, ten kto ovládal balíček MS OFFICE mal väčšie predpoklady na prijatie do zamestnania ako tí, ktorí túto zručnosť vo svojom životopise neuvideli.

Na základe zisťovania informácií z internetových portálov zaoberajúcich sa ponukou a dopytom po pracovnej sile sme zistili nové požiadavky na trhu práce zo strany zamestnancov. Podľa pracovného portálu Profesia.sk požaduje najmladšia generácia zamestnancov od svojich budúcich zamestnávateľov flexibilitu, a to najmä v oblasti pracovného času, či už ide o rôzne formy organizácie pracovného času v podobe zdielaného pracovného miesta, home office, pružný pracovný čas a pod. V porovnaní so staršími generáciami prejavujú väčší záujem o spoločenské podujatia ako sú firemné akcie, večierky či spoločné raňajky, kde by mohli nadviazať sociálne vzťahy s ostatnými zamestnancami firmy. Z oblasti benefitov radi využívajú techniku od zamestnávateľa na pracovné, ale aj na súkromné účely, a to najmä notebooky, mobily či automobily. Generácia Z sa vyznačuje svojou dychtivosťou po nových a nových informáciách a potrebuje sa neustále vzdelávať. Preto od svojho zamestnávateľa vyžadujú benefit vo forme finančného príspevku na vzdelávanie. V neposlednom rade očakávajú od svojho zamestnávateľa spravodlivé odmeňovanie za vykonanú prácu a zručnosti, ktoré mu ponúkajú.

Nové požiadavky na trhu práce sú aj zo strany zamestnávateľov. Tí v súčasnosti od svojich zamestnancov vyžadujú širšie jazykové zručnosti. Anglický jazyk musí na požadovanej úrovni v dnešnej dobe ovládať každý zamestnanec. Zamestnávateľa skôr zaujíma aké iné jazykové zručnosti zamestnanec má, ktoré môže danej firme ponúknuť. Okrem jazykových zručností vyžadujú zamestnávatelia tiež znalosť balíka MS OFFICE (Word, Excel, Outlook, PowerPoint) na rôznych úrovniach podľa druhu pracovnej pozície. Z osobnostných

charakteristík zamestnávatelia uprednostňujú zamestnancov, ktorí vedia pracovať samostatne, ale vedia byť aj súčasťou tímu, a k svojej práci pristupujú zodpovedne. Pozitívny prístup k práci, ochota či odolnosť voči stresu sú tiež požiadavky na zamestnancov, ktoré požadujú zamestnávatelia

### *3.4 Prístup krajín Partnerstva k procesom Industry 4.0*

V kontexte štvrtej priemyselnej revolúcie predstavila Európska komisia v roku 2016 stratégiu s názvom Digitalizácia európskeho priemyslu. Cieľom iniciatívy bolo posilniť konkurencieschopnosť Európskej únie a zabezpečiť každému podniku v Európe prístup k čerpaniu výhod digitálnych inovácií. Pre potreby výskumu tohto príspevku sme sa zamerali na vybrané krajiny partnerstva EURES-T Beskydy, a to na Slovenskú republiku, Českú republiku a Poľskú republiku.

**Česká republika**

V podmienkach Českej republiky bola v roku 2014 schválená Stratégia vzdelávacej politiky Českej republiky do roku 2020 a kladie dôraz na priority v znižovaní nerovností vo vzdelávaní, v podporovaní kvalitnej výučby a učiteľa, či zodpovednom a efektívnom riadení vzdelávacieho systému. Vízia tohto digitálneho vzdelávania by mala spočívať v zabezpečovaní vzdelávacieho systému v prvom rade prostredníctvom podpory učiteľom, keďže oni zohrávajú hlavnú úlohu pri procese tejto transformácie. Prvý krok transformácie spočíva v poskytnutí ponuky a možnosti vzdelávania pre učiteľov a zabezpečiť im dostatok metodických pomôcok a materiálov na výčubu digitálneho vzdelávania. Druhým krokom transformácie bude vybudovanie digitálnej infraštruktúry na školách a vytvoriť rovnaký prístup k zdrojom výučby pre všetkých žiakov a študentov, či už v prostredí školy alebo mimo nej (Strategie vzdělávací politiky České republiky do roku 2030, 2019).

**Poľská republika**

Platforma pre budúci priemysel v podmienkach Poľskej republiky nesie názov Iniciatíva pre poľský priemysel 4,0. Táto platforma bola vyhlásená ministerstvom financií a rozvoja a predstavovala súčasť Plánu zodpovedného rozvoja, tzv. Morawieckiho plan, ktorý poskytuje financovanie priemyslu počas 25 rokov sa zameriava na program reindustrializácie prostredníctvom nových partnerstiev, podporné opatrenia zamerané na vývoz a komplexný regionálny rozvoja. Myšlienka tejto platformy sa zrodila v spolupráci súkromného sektora a Ministerstva obrany Slovenskej republiky v rámci ekonomického vývoja krajiny. Poľská vláda túto iniciatívu spojila s Operačným programom Digitálne Poľsko 2014 – 2020. Hlavným cieľom platformy je zlepšovanie dostupnosti a funkčnosti internetu a konkurencieschopnosti poľského priemyslu pri stanovovaní podmienok pre Priemysel 4.0 v rámci prosperity v krajine (Iniciatíva pre Poľský priemysel 4.0 – Platforma pre budúci priemysel, 2019).

**Slovenská republika**

Rámcovou nadrezortnou vládnou stratégiou v podmienkach Slovenskej republiky je Stratégia digitálnej transformácie Slovenska 2030. Táto stratégia definuje politiku a konkrétne priority Slovenska v kontexte už dejúcej sa digitálnej transformácie spoločnosti vplyvom zavádzania nových technológií digitálnej doby. Vízia tejto stratégie do roku 2030 spočíva v nájdení rovnováhy na uspokojenie potrieb a priorít v oblastiach ako je hospodárstvo SR, spoločnosť a vzdelávanie, verejná správa, rozvoj územia či veda, výskum a inovácie. Všetky tieto oblasti by mali do spomínaného roku prejsť zásadnou digitálnou transformáciou a Slovensko by sa

malo do tej doby stať modernou krajinou s inovačným a ekologickým priemyslom ťažiacim zo znalostnej a dátovej ekonomiky. Ďalšou z vízií digitálnej transformácie Slovenska je zefektívniť verejnú správu, ktorá by zabezpečovala inteligentné využívanie územia a infraštruktúry SR. V neposlednom rade by sa malo Slovensko stať krajinou s informačnou spoločnosťou, kde občania Slovenskej republiky využívajú svoj potenciál naplno a žijú život v digitálnej dobe kvalitne a bezpečne (Stratégia digitálnej transformácie Slovenska 2030, 2019).

## 4. ZÁVER

Po preštudovaní dostupných informácií v oblasti pracovných podmienok a ich komparácii v rámci cezhraničného partnerstva EURES-T Beskydy sme dospeli k nasledovným záverom a konštatovaniam. Dĺžka pracovného času, výmera dovolenky či mzdové podmienky v jednotlivých krajinách predstavujú stimul a zároveň i bariéru v procese pracovnej mobility. Výška minimálnej mzdy v podmienkach Slovenskej republiky predstavuje stimul pracovnej mobility pre pracovníkov z Česka a zároveň bariéru pre pracovníkov z Poľska. Podobnú analógiu vidíme vo všetkých skúmaných častiach v oblasti pracovných podmienok. To, čo pre pracovnú silu jednej krajiny predstavuje motív dochádzania za prácou, v druhej krajine je tento aspekt pre pracovnú silu vnímaný ako prekážka v dochádzaní za prácou a naopak.

Štvrtá priemyselná revolúcia a moderné technológie, ktoré so sebou prináša, majú ľudstvu zjednodušiť okrem práce vo výrobnom procese i bežný život. Revolúcia ponúka na jednej strane veľa pozitívnych vecí, no na druhej strane sa vynárajú i negatívne stránky tohto trendu, a to najmä v oblasti pracovných miest. Automatizácia vo výrobnom procese nahrádza ľudskú pracovnú silu strojmi, čím sa znižuje počet pracovných miest, čoho dôsledkom je rastúca nezamestnanosť. Naopak na druhej strane podniky potrebujú na obsluhu týchto moderných zariadení kvalifikovanú pracovnú silu so špecifickými zručnosťami a poznatkami, čím sa vytvára priestor pre vznik nových pracovných miest.

V krajinách cezhraničného partnerstva EURES-T Beskydy sa tiež vytvárajú podmienky pre prichádzajúcu štvrtú priemyselnú revolúciu prostredníctvom rôznych národných stratégií. Tie sú zamerané predovšetkým na zlepšenie podmienok v oblasti vzdelávacej politiky, konkurencieschopnosti priemyslu jednotlivých krajín či v oblasti zlepšovania dostupnosti a funkčnosti internetu. Prostredníctvom stratégií by mali krajiny Partnerstva jednoduchšie a efektívnejšie prejsť nadchádzajúcou digitálnou transformáciou, ktorú so sebou prináša Priemysel 4.0.

### *Dodatok*

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# IMPACT OF POST-GLOBAL PROCESSES ON THE REGIONAL LABOUR MARKET

***Alena FROLOVA*** [30]
***Tatyana TCHILIMOVA*** [31]
***Irina SOFRONOVA*** [32]

**Abstract.** *The paper considers the problems of economics and management in the post-global world both on the macro-level (including regional levels), and on the micro-level, revealing the essence of such a feature as uncertainty of the external environment in the new system of needs of the 4-th Industrial Revolution. The authors give an assessment of the degree of dependence of post-global processes and changes in the labor market in the form of dynamics in the sphere of employment. The analysis covers the labor market of the Sverdlovsk region of the Russian Federation, which is considered to be an industrial highly innovative centre, its structure gradually changing. The authors describe the strategy of innovative development aiming at creating conditions for generating new ideas and their effective introduction in different markets. Post-global processes lead to changing employment levels in terms of managing staff costs. A particular attention is paid to the tools used to optimize personnel costs, namely outsourcing and outstaffing. The authors analyze pros and cons of these instruments and show how they can be used in cost management in uncertain environments.*

**Key words:** *post-globalization processes, industrialization 4.0, artificial intelligence, labor market, employment, outsourcing, outstaffing, personnel costs.*

**JEL Classification:** *J24, O14, R11*

## 1. INTRODUCTION.

Lately the concept of post global world has become more widely spread than the concept of the global world. [10,7,8] In our opinion, it was introduced to emphasize the new features of the modern world. Thus, after the world public forum “Dialogue of Civilizations” V.I. Yakunin stated," The events of the last 25-30 years still have to be carefully analyzed, but it is obvious that the world as a whole has entered another colossal socio-political and economic transformation "[10]. We often focus on the macro level, for example, we explore the problems of public administration in the new world [8], paying little attention to the level of the enterprise. Out of the list of research on this problem, we would like to name the monograph "Economics and Management in the Post-Global World" [3]. The authors consider the problems of economics and management in the post-global world both on the macro-level (regional level included), and on the micro-level. On the regional level, the authors consider not only the issues of integrated system, digitization, artificial intelligence, but also the factor of "labor". Let us dwell on the latter in more detail. The purpose of this paper is to study whether there have been introduced economic innovations in the Sverdlovsk region. If the answer is positive, the following questions arise -“Have these innovations contributed significantly to the change in the structure of labor market and what is the future vector of the direction of these changes?” The Sverdlovsk region is the region of Russia that

[30] Assoc.Prof., Ural State University of Economics, Narodnoy Voli 45, Yekaterinburg, 620144,Russia, fro_@mail.ru
[30] Assoc.Prof., Ural State University of Economics, Narodnoy Voli 45, Yekaterinburg, 620144,Russia, tachil77@mail.ru
[31] Assoc.Prof., Ural State University of Economics, Narodnoy Voli 45, Yekaterinburg, 620144,Russia, i.sof@mail.ru

is directly interested in mass introduction of cyberphysical systems in production, automation of most production processes, artificial intelligence devices and many other modern technologies because the industrial sector needs diversification and industrial competences. During the period of "isolation" of the country, the industrial sector of Russia showed the highest growth rate in the world. In the late 1960s, American economists feared that we would overtake the US in terms of GDP. One can come to the conclusion that with the collapse of the USSR, we have lost everything that directly led us to success. However, the constant technological backwardness we have already got used to is not our natural characteristic feature. It is a consequence of the adopted foreign policy. The impact of modern technologies should be studied in terms of determining the possibility of changing the structure of labor by economic activity. The period under study is 2006-2018.

**1.1. The essence of the post-global world and the evolution of the employment rate.** Speaking about the post-global world environment, we would like to enlarge the research of the above authors and introduce a feature defining the quality of the modern world economic space, namely its "innovative and technological nuance" [6]. Absolute novelty and high technological efficiency of products, resulting from innovation and increasing competitiveness, are typical of the innovative reproduction. Thus, technologies that change the subject of human labor and, consequently result in the direct driving force of the evolution of mankind, form the framework of the world order. In the post-global world, such economic and managerial problems as lack of financial resources leading to low salaries, insufficient managerial competence of employees in matters of current activities, and poorly developed investment and financial policies come to the forefront. And the main point is that attention is focused on the system of management of innovation processes of territories and individual enterprises [5].

The characteristic feature of the post-global world is uncertainty. Uncertainty is one of the main problems affecting the end result of the company activities. Globally, it is "incomplete and inaccurate information about the company activities that, in most cases, results in additional costs or losses" [9]. When adapting the economic structure innovative processes can also influence the labor market, changing the demand of the economy for labor. The latter, in its turn, requires adjustments in labor supply. The direct effect of innovation is the changing structure of employment both in terms of personnel education and often also in terms of age and gender.

The influence of innovations in labor market can be considered from two points of view, namely as " decrease effect" and "compensation effect’’ of employment. In the first case it assumes replacement of human labor with the capital reducing number of labor force. As for "compensation effect" of employment, innovations are expected to cause a neutralized decrease in employment trends, i.e. with the emergence of new products/ services and new markets due to technological progress, new jobs will be created. A special role is assigned here to technological progress, informatization and computerization of production and services. Introducing innovations in regions will lead to employment reduction, especially they will affect workers of low qualification. As a result, there may be an overflow of workers from one industry to another. There will be a demand for employees developing technologies and consequently a growth of employment in the companies they work for. The above will influence periodic level variations of unemployment and, therefore, affects structure of labor market.

One of the elements influencing the assessment of the innovation level of enterprises both in industry and in service is the level of expenses incurred for the development of this type of activities. They include expenses on patents, software used to introduce innovations, machines and equipment, their installation included, as well as construction, reconstruction

and modernization of premises accomplished in order to use innovations in production. Besides, they include costs of personnel training connected with innovation activities, marketing new or advanced products and their advertizing.

As for the Sverdlovsk region, costs of the innovation activities of industrial enterprises at current prices of 2006-2018 remained at the same level, and accounted for 61,753 million rubles in 2006 and 61,467 million rubles in 2018. At the same time the structure of these expenses changed. In 2006 expenses on research and development were about 5.22% of the total costs of innovations at industrial enterprises, whereas in 2018 they reached the figure of 22.2%. The cost of servicing innovation increased steadily from 8,520 million rubles in 2006 to 11,712 million rubles in 2018 (reaching a peak of 14,992 million rubles in 2012). The expenditure pattern changed: in 2006 research and development accounted for 7.5% of the total expenditure on innovation, and in 2018 it was 17.9%. This change can be attributed to the strong expansion of the sphere of services and the rapid technological progress in the field of high-tech and knowledge-intensive services [6].

## 2. PURPOSE AND METHODOLOGY.

Increasing innovation activities of the region and its transition to the innovative development path require an integrated strategy of innovative development aimed at creating conditions for generating new ideas and their effective introduction into production and further consumption at national and world markets (Figure 1).

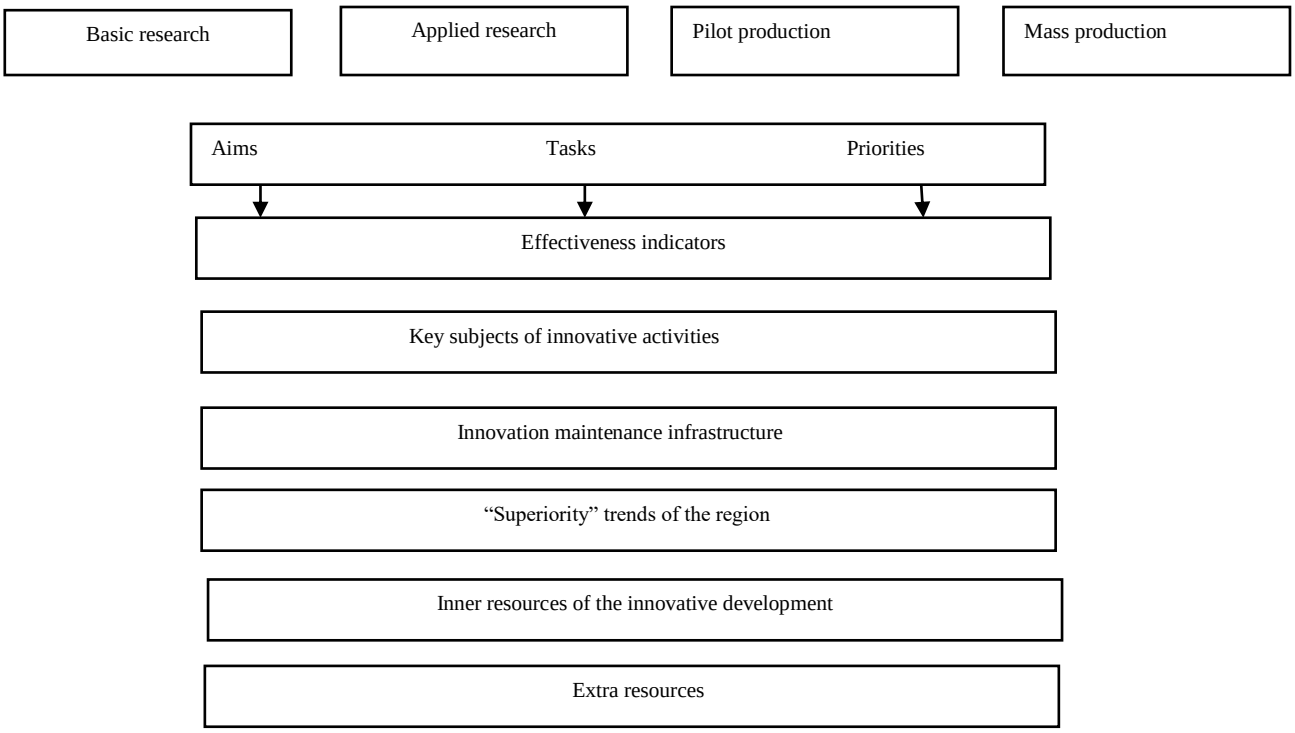



**Fig. 1: Integrated strategy of innovative development**

Innovative products go through four main stages: basic research, applied research and development, pilot and small-scale production, mass production. Violation of the innovation chain on any of the stages limits possibilities of the innovative development of economy. Target reference points are formulated so as not only to reach the indicators given in the Strategy of the Innovative Development of the Russian Federation at the level of the region, but to exceed them, having increased the region’s contribution. Structural changes in labor

market are analyzed, as a rule, according to such criteria as: patterns of ownership on means of production, features of economic activities, qualifications, professions and education [11]. The impact of technological progress can be seen at changing the employment structure in the activities profile which in its turn influences requirements of employers to applicants in terms of education. Thus, low-skilled jobs are getting less required; with interest in high-skilled, often unique, jobs increasing. Development of electronics and the Internet leads to a growing number of teleworkers. Employees needn't go to the office, they need to be available. As a result, the number of people engaged in the service sector is rising.

**Table 1: The Average Annual Number of People Engaged in the National Economy by Types of Economic Activities in 2008-2017, in thousands**

| Types of economic activities | 2008 | 2017 | Changes |
|---|---|---|---|
| Total | 2093,0 | 2068,2 | -24,8 |
| Agriculture, hunting and forestry | 120,2 | 72,8 | -47,4 |
| Mining | 39,8 | 28,3 | -11,5 |
| Manufacturing | 512,5 | 413,7 | -98,8 |
| Electric power, gas, water | 64,0 | 71,0 | 7,0 |
| Construction | 140,1 | 125,8 | -14,3 |
| Wholesaling and Retailing | 351 | 417,9 | 66,9 |
| Hotels and restaurants | 38,4 | 45,0 | 6,6 |
| Transport and communications | 150,1 | 184,4 | 34,3 |
| Financial activities | 33,8 | 39,0 | 5,2 |
| Real estate, leasing and services | 149,8 | 181,4 | 31,6 |
| Public administration, defense sector,compulsory social welfare services | 105,6 | 109,0 | 3,4 |
| Education | 177,8 | 171,9 | -5,9 |
| Public health care and social services | 134,7 | 132,6 | -2,1 |
| Municipal and personal services** | 71,5 | 70,2 | -1,3 |
| Household services | 3,3 | 5,0 | 1,7 |

The table shows that there is a decline of employment in the manufacturing sector and agriculture, a stable level of employment in wholesaling and retailing, an increase in the transport and communications sector and real estate. According to the Office for Migration of the Head Department of the Ministry of Internal Affairs of the Russian Federation in the Sverdlovsk region on January 1, 2019 88.5% foreigners employed in the Sverdlovsk region do not need a visa to get to the country. Of these, 39.8% are foreign workers having a license and 48.7% are foreign citizens working without any permits (the share of citizens of the Eurasian Economic Union member states is 79.7%). The migrant-intensive industries in the Sverdlovsk region traditionally are the following: wholesaling and retailing, service centers, manufacturing, construction, hotels and public catering. As soon as the Government of the Russian Federation adopts additional restrictions on the share of foreign workers in economic activities, foreign labor is expected to be redistributed.

## RESULTS AND DISCUSSION

Tools to optimize personnel costs. One of the problems of management in the post-global world, according to experts, is personnel management [6]. In human resources management, we cannot ignore such a subjective factor as making decisions in cost management and accordingly choosing a tool to optimize personnel costs. Outsourcing is quite common in the global economy. We would like to consider the use of such tools as outsourcing, outstaffing, and analyze their impact on enterprise costs. In order to understand the problem in more depth, we will carry out a comparative analysis of such tools as outsourcing and outstaffing (Table 2).

**Table 2: Advantages and Disadvantages of Outsourcing and Outstaffing [10, page 85]**

| | Advantages | Disadvantages |
|---|---|---|
| Outstaffing | Staff offload, cost savings (reduced staff costs and taxes) | Risks related to unscrupulous agencies, lack of corporate spirit, lack of clear control, no guarantee of the result of work. |
| Outsourcing | Lower company costs, tax optimization | Dependency on the staff provider, unplanned costs on outsourcing |

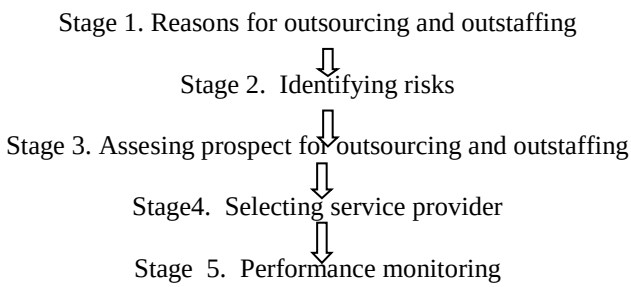
Before analyzing the data given in this table, it is necessary to give definitions of these tools [1]:

- outsourcing means transferring business functions or parts of business process of the company to the third party for a certain term;

- outstaffing means hiring a freelance specialist (freelance) who has relevant knowledge, professional skills and experience to fulfil a certain project.

The table shows that these tools are aimed at optimizing the costs associated with staff costs. In practice outstaffing is used by more employers because of economic feasibility of this instrument. However, it should be noted that both of the tools are used to reduce the personnel costs. In conditions of uncertainty, outsourcing and outstaffing could lead to increasing efficiency of budget expenditures [4]. According to the management terminology, personnel management is the competence of the HR manager. The process of optimized management decision-making in the personnel costs management can be divided into stages (Figure 2).

**Figure 2: Decision-making Diagram for Using Outsourcing and Outstaffing in Cost Management in Uncertain Environments**




According to this scheme, first one should analyze the needs in outsourcing and outstaffing. The main reasons for the implementation of these tools are as follows: optimization of the staffing table, vacancies during the holiday period, load reduction, reluctance of the company to expand its staff, tax optimization. However, we cannot but mention risks involved: e.g. poor performance, which can lead

to economic losses. Therefore, when choosing a supplier, the price/quality ratio is the determining factor. Sometimes it can be more expensive than having your own employees, but it saves strength and time. In such a case, the transition to outsourcing or outstaffing is justified, and there is no risk in it. Due to the redistribution of resources, the company can increase the efficiency of activities, concentrate on the main production, as well as assess fully its own production and economic potential.

## CONCLUSION

We would like to stress the idea that we have already considered transformations, but now we mean global transformation. At present, new rules are being sought, new trends in global governance are emerging, the modern era is characterized as the "era of reversing trends in world development" [4], with a new world order and "post-global patterns" formed [8]. In particular, it is necessary to agree with the opinion of A. A. Slynko and E. V. Strogaya [7] that "in the emerging post-global world" new features are emerging, e.g. "major world players are united to fight against international terrorism ... they support the idea of strengthening national economies and national consolidation, leaving global development behind brackets." Jan Bremmer, in an interview about G-Zero to magazine "Foreign Police" on April 30, 2012, says that "speaking of geopolitical issues, there is already no global leadership on the planet" [2]. In his opinion, the world is in a "period of creative destruction." He supports the idea of the "new world order" in which every major country will play a role - not geopolitical in the full sense of the word, but regional, acting in its region.

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# DÔVODY ZAVÁDZANIA INDUSTRY 4.0 V SLOVENSKEJ REPUBLIKE

## REASONS FOR INTRODUCING INDUSTRY 4.0 IN THE SLOVAK REPUBLIC

***Adriana GRENČÍKOVÁ***[33]
***Karol KRAJČO***[34]

**Abstrakt:** *Slovenský priemysel je úzko naviazaný na priemysle členských štátov EÚ, najmä na priemysel v Nemecku, kde veľa slovenských podnikov dodáva svoje výrobky v podobe komponentov, preto je celkom logické, že koncepcia zavedenia Industry 4.0 sa dotýka aj slovenských podnikov. Hlavnou myšlienkou, prečo sa táto filozofia vznikla je očakávaný nárast produktivity, výrobnej efektivity, zníženie energetickej a surovinovej náročnosti výroby, optimalizovanie logistických trás, inteligentná infraštruktúra a mnohé iné s tým spojené, Cieľom predkladanej štúdie je analyzovať dôvody zavádzania uvedenej koncepcie v slovenských podnikoch. Vybrané výsledky ktoré sú prezentované v predkladanej štúdií boli zistené dotazníkovým šetrením v slovenských podnikoch.*

**Kľúčové slová:** *Industry 4. Inteligentný priemysel, vzdelávanie, zavádzanie*

**Abstract:** *Slovak industry is closely tied to the industry of EU Member States, especially to industry in Germany, where many Slovak companies supply their products in the form of components, so it is quite logical that the concept of introducing Industry 4.0 also affects Slovak companies. The main idea behind this philosophy is the expected increase in productivity, production efficiency, reduction of energy and raw material intensity of production, optimization of logistics routes, intelligent infrastructure and many others related to it. The aim of this study is to analyze the reasons for introducing this concept in Slovak companies. Selected results presented in the present study were found out by questionnaire survey in Slovak companies.*

**Key words:** *(Industry 4.0, Smart Industry, education, introduction*

**JEL Classification:** *3-5 kódov JEL, Times New Roman 11pt, Kurzíva, zarovnané do bloku, oddelené čiarkami; viď na: www.aeaweb.org/jel/guide/jel.php*

## 1. ÚVOD

V roku 2011 prišiel nemecký výskumný zväz pre vedu a ekonomiku (ForschungsunionWirtschaft-Wissenschaft) s programom a cieľom udržať Nemecko na vysokej technologickej úrovni a program nazvali Industriálna revolúcia 4.0, resp. Industry. Podľa nich Industry 4.0 odzrkadľuje spoločenskú zmenu spôsobenú prepojovaním fyzického, virtuálneho a sociálneho sveta. V dôsledku prudkého rozvoja digitálnych technológií sa pracovné prostredie mnohých podnikov v budúcich dvadsiatich rokoch významne zmení (Hecklau, Orth, Kidschun, & Kohl, 2017). Hlavnou myšlienkou, prečo sa táto filozofia vznikla je očakávaný nárast produktivity, výrobnej efektivity, zníženie energetickej a surovinovej náročnosti výroby, optimalizovanie logistických trás, inteligentná infraštruktúra a mnohé iné s tým spojené, prepojené veci súvisiace s rastúcou konkurenciou a tlakom na znižovanie spotreby pri výrobe v spojení s využívaním nových technológií. Hlavné zmeny, na ktorých je koncept Priemyslu 4.0 postavený zahŕňajú: komunikačné prepojenie, tzv. internet

[33] Doc., Ing., PhD. Trenčianska univerzita A. Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 2, Trenčín, 911 50, Slovenská republika, e-mail: adriana.grencikova@tnuni.sk
[34] Ing. Trenčianska univerzita A. Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 2, Trenčín, 911 50, Slovenská republika, e-mail: karol.krajco@tnuni.sk

vecí, schopnosť identifikácie prostredia prístrojmi, používanie inteligentných robotov, zber extenzívnych dát, využívanie umelej inteligencie na isté vlastné rozhodnutia prístrojov (Bruchaník, 2016). Charakteristickými znakmi koncepcie Industry 4.0 sú vertikálna integrácia výrobných systémov ide o informačne previazanie všetkých systémov naprieč celou štruktúrou podnikov. Smart – produkčné systémy, závody, produkty, prepojené logistické systémy, marketing, služby orientované na individuálne potreby špecifických požiadaviek klientov – personalizácia. K vertikálnej integrácií výrobných systémov patrí IT Integrácia, Analýza a datamanagement, Claudové riešenia, Operačná efektivita 2.0. Ďalej ide o horizontálnu integráciu - previazanie naprieč dodávateľským reťazcom – prepojenie dodávateľov – odberateľov, od výrobcu až po koncovú distribúciu k zákazníkovi, servis. Ide o novú generáciu globálnych, hodnotu pridávajúcich prepojení, sietí, zahŕňajúcich integráciu partnerov a zákazníkov. K horizontálnej integrácií výrobných systémov patrí optimalizácia biznis modelu, smart“ dodávateľský reťazec, smart“ logistika, management IT bezpečnosti, nové modely zdaňovania, nový IP management. Integrácia inžinierskych procesov predstavuje integráciu v rámci celého životného cyklu ( plánovania životného cyklu, vývoj, realizáciu, testovanie, až po popredajné služby).K integrácií inžinierskych procesov patrí10 typov inovácií, model inovácie efektivity, efektívny management produkt. Akcelerácia cez exponenciálne technológie kde nejde o úplne nové technológie, len sa stávajú prístupnejšie pre širšie využitie a ich hlavnou úlohou je umožnenie individuálnych riešení, zvýšenie flexibility a šetrenie nákladov v procese industrializácie. K akcelerácií cez exponenciálne technológie patria nové modely obchodného podnikania a organizácia vzdelávania. Priemysel 4.0 predstavuje proces, kedy budú stroje prijímať informácie v reálnom čase. Digitalizácia a robotizácia bude tiež viesť k zániku jednotlivých pracovných pozícií, ale zároveň sa budú vytvárať aj nové, čo bude prispievať k znižovaniu nezamestnanosti. Na druhej strane existuje fakt, že postupom času bude dochádzať k zániku nenáročných pracovných pozícií, tým pádom je veľmi pravdepodobné, že dôjde k nárastu percenta nezamestnanosti. Tento fakt podporuje skutočnosť, že ekonomicky aktívne obyvateľstvo s nízkym vzdelaním príde o prácu. Podľa Staněka a Ivanové (2016) v súčasnej dobe čelíme veľkému množstvu diskusií o tom, či je rýchly technologicky pokrok vhodný pre civilizáciu. Podľa nich existujú 2 rady táborov autorov či vedcov, ktorí majú rozdielne pohľady na skúmanú problematiku.Na jednej strane stoja zástupcovia resp. odborníci teórie o pozitívnych vplyvoch a pozitívnych zmenách pre civilizáciu. Na strane druhej stoja odborníci, ktorí sú zástancami teórie o negatívnych dopadoch na civilizáciu. Tvrdia, že najväčšia hrozba vychádza práve v oblasti umelej inteligencie, ďalej tvrdia že počas niekoľkých desiatok rokov môže nastať skutočnosť, v ktorej nastane konflikt medzi civilizáciou a technickou časťou spoločnosti. Žijeme v dobe, ktorá sa veľkou rýchlosťou mení a neustále napreduje. Mení sa prostredie v ktorom žijeme a pracujeme. Kým si v jednom roku kúpime najnovšiu vymoženosť, o rok neskôr je to už neaktuálny tovar. Spoločnosť sa mení tak isto aj vo veľkom množstve priemyselných odvetví. Ak si uvedieme ako príklad marketing, môžeme vidieť, že v poslednej dobe sa menia trendy prostredníctvom ktorých podniky realizujú svoje marketingové stratégie. Ako príklad môžeme uviesť využívanie širokej ponuky sociálnych sietí ako je napríklad Facebook či Instagram. Podľa niektorých autorov bude práve 4. Priemyselná revolúcia najzásadnejšia zo všetkých.

## 2. CIEĽ A METODOLÓGIA

Zaujímali nás názory majiteľov a manažérov podnikov na uvedenú problematiku. Predsedníctvom dotazníka sme mailom, osobne, alebo aj telefonicky oslovili podniky na Slovensku a požiadali ich o vyjadrenie sa k jednotlivým otázkam dotazníka. Každý podnik ktorý dostal pozvánku sa zúčastniť výskumu musel byť zapísaný v obchodnom registri niektorého zo súdov slovenskej republiky. Kontakty sme získavali zo zdrojov a databáz

verejne dostupných. Boli to najmä webové stránky profesných združení a záujmových skupín. Najviac respondentov sme vybrali z nasledujúcich zdrojov:

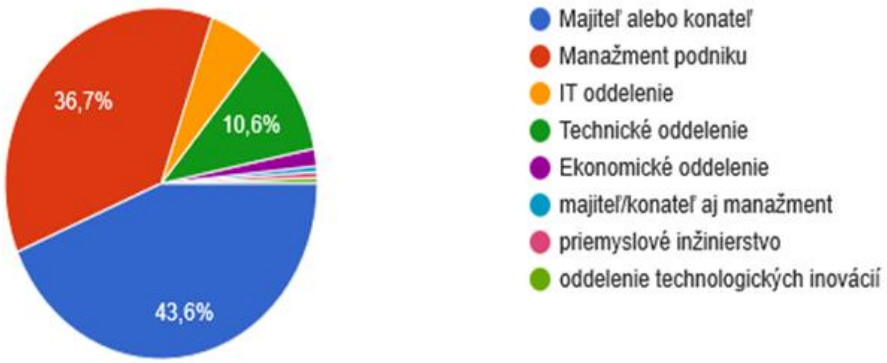
- Asociácie zamestnávateľských zväzov a združení SR na stránke http://www.azzz.sk/o-nas/clenovia/
- Zväzu automobilového priemyslu na stránke: https://www.zapsr.sk/about/clenovia/
- Databáz webového portálu finstat.sk
- Osobne známych manažérov priemysle

Oslovili sme 300 priemyselných podnikov. Odpovede na dotazník zaslalo 228 podnikov. Dotazník obsahoval 12 otázok a zber odpovedí trval 5 mesiacov, od februára 2019 do konca júna 2019. Cieľom bolo zistenie aktuálneho stavu poznania koncepcie priemyslu 4.0 v priemyselných podnikoch Slovenskej republiky, mieru jeho aplikovania, zistenie súčasnej štruktúry výrobných a nevýrobných pracovníkov a pohľad týchto podnikov na budúcu potrebu pracovníkov v súvislosti s nástupom Priemyslu 4.0. Z výsledkov dotazníkového šetrenia v tejto štúdií uvádzame len niektoré.

## 3. VÝSLEDKY

Zavádzanie koncepcie Priemyslu 4.0 v slovenských podmienkach vyžaduje od manažérov, majiteľov a konateľov firiem dostatočné množstvo znalostí s uvedenej oblasti. Čím viac takýchto znalosti majú, tým intenzívnejšie sa o koncepciu Industry 4.0 zaujímajú a to najmä vo vzťahu k produktivite práce a k úspore nákladov na pracovnú silu. V našom šetrení nás zaujímalo, kto iniciuje zavádzanie prvkov inteligentného priemyslu vo vzťahu k riadeniu firmy. Výsledky šetrenia uvádzame v nasledovnom grafe. Najčastejšími iniciátormi zavádzania koncepcie Priemyslu 4.0 sú jednoznačne majitelia alebo konatelia firiem a manažment, ktorí majú záujem na optimalizácií nákladov a výrobných procesov vo svojom podniku.

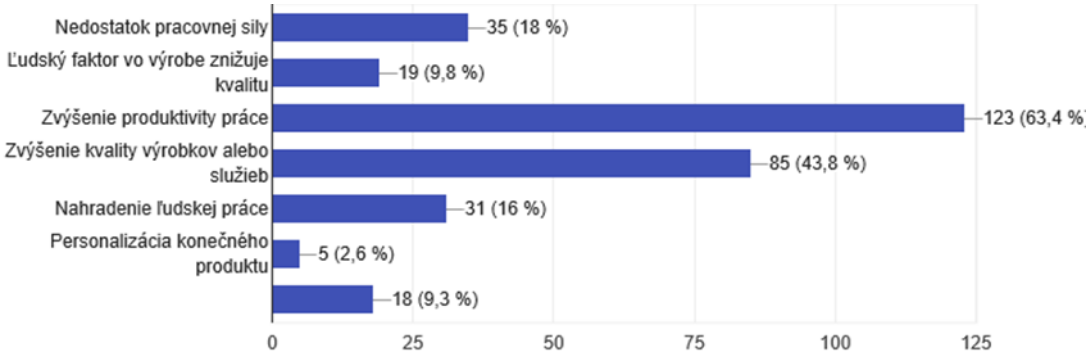
**Graf 1: Kto iniciuje zavádzanie prvkov inteligentného priemyslu**




Zdroj: Vlastné spracovanie.

V našom šetrení sme sa zamerali na dôvody zavádzania koncepcie Industry 4.0. Ako hlavný dôvod uvádzali manažéri zvýšenie produktivity, zvýšenie kvality výrobkov a nedostatok pracovnej sily. Výsledky sú uvedené v nasledujúcom grafe. Zvýšenie produktivity sa stáva kľúčovou otázkou a znamená, že dokazované podniky majú dobrý odbyt svojej produkcie, na druhej strane pôjde zrejme optimalizáciu výrobných procesov a zníženie nákladov.

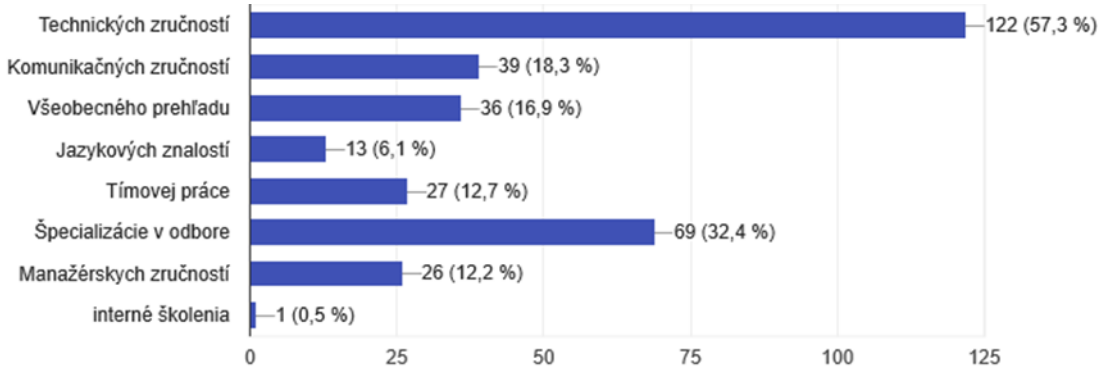
**Graf 2: Aký je hlavný dôvod zavádzania prvkov inteligentného priemyslu vo Vašom podniku**




Zdroj: Vlastné spracovanie.

V súvislosti so zavádzanými zmenami predpokladáme aj zmenu požiadaviek na držiteľov pracovných miest a v tej súvislosti nás zaujímali názory zamestnávateľov na prípravu pracovnej sily a čo očakávajú od systému vzdelávania, na čo by sa mal zamerať. Z nášho šetrenia jednoznačne vyplynulo, že sú to technické zručnosti a špecializácia v odbore. Zrejme pri očakávanom personalizovaní produktov sa bude požadovať aj vyššia špecializácia v určitých odboroch. Komunikačné zručnosti sú stále žiadanou vlastnosťou u zamestnávateľov ale školský systém im stále podľa nášho názoru nevenuje dostatočnú pozornosť. Prekvapila nás požiadavka ma všeobecné znalosti, čo poukazuje na to, že všeobecné znalosti budú potrebné najmä pre flexibilnú pracovnú silu, ktorá bude pripravená na zmeny so schopnosťou učiť sa. Prehľad požiadaviek zamestnávateľov uvádzame v nasledovnom grafe.

**Graf 3: Nový obsah vzdelávania v súvislosti s Industry 4.0, by sa mal dotýkať najmä**




Zdroj: Vlastné spracovanie

V dôsledku zavádzania konceptu inteligentého priemyslu sa bude výrazne meniť aj spôsob a najmä metódy vzdelávania. Učiteľ sa bude stávať koučom v orientácií big dat. Dôležitá bude schopnosť vyhľadať čo najrýchlejšie požadované informácie. Nové komunikačné technológie umožnia zmeniť klasický spôsob výuky a vzdelávanie sa tak isto stane viac personalizované a bude sa viac prispôsobovať záujemcom o možnosť vzdelávať sa. Internet vecí, priemyselný internet, výroba v cloude ale aj inteligentná výroba, často súhrnne označované aj ako štvrtá priemyselná revolúcia (INDUSTRY 4.0) sa stanú štandardom a preto významne ovplyvňujú očakávania zamestnávateľov vo vzťahu k absolventom škôl (Erol, Jäger, Hold, Ott, & Sihn, 2016).

## 4. ZÁVER

Môže vznikať otázka, či je 4. Priemyselná revolúcia taká dôležitá. Vo veľa oblastiach môže priniesť pozitívne prínosy. Podľa ContentFruiter (2018) sa vo svete čo raz viac začínajú vyskytovať situácie, v ktorých dochádza k premenlivosti trhov, taktiež dochádza ku skracovaniu životného cyklu výrobkov alebo dochádza k posilňovaniu vplyvu veľkých globálnych dodávateľských reťazcov. ContentFruiter (2018) tvrdí, že v západných krajinách nastáva situácia, v ktorej vzniká pokles rastu produktivity práce. Reakcia firiem na podobnú situáciu predstavuje realizáciu krokov, ktoré im zabezpečia vyššiu pružnosť, aby mohli lepšie a efektívnejšie reagovať na vzniknuté zmeny, ktoré vznikajú v dôsledku premenlivosti trhov, snažia sa o minimalizáciu nákladov na prevádzku, aby lepšie reagovali na nové prichádzajúce trendy a podobne. Ak sa podnikateľské subjekty nachádzajú v podobnom prostredí, môže vplyv priemyslu 4.0 mať pozitívne dopady a poskytne im možnosti, ktoré môžu pozitívne využívať vo svoj prospech na odvrátenie spomínaných situácií. Ako ďalšie pozitíva môžeme uviesť digitalizáciu. Digitalizácia znamená proces, pri ktorom dochádza k transformácií fyzických predmetov či dokumentov digitálnej resp. elektronickej podoby. Prínos digitalizácie nespočíva len vo zvýšení efektívnosti, ale aj k urýchleniu zavádzania inovácií. Postupom času a s narastajúcim množstvom získaných vedomostí a poznatkov, budú aj stroje, ktoré používa civilizácia v domácnosti alebo vo výrobe čím ďalej tým dokonalejšia. Vo výrobnom prostredí by postupom času mala zaniknúť práca, ktorá je zložená len z manuálnych úkonov. Pozícia výrobného pracovníka sa zmení na koordinátora, ktorého hlavnou pracovnou náplňou bude zabezpečovanie hladkého chodu výrobného procesu a bude zasahovať len v prípadoch, keď to pracovný stroj bude vyžadovať. Takéto zmeny budú viesť k zániku jednotlivých pracovných pozícií a k zvýšeniu požiadaviek na konkrétne pracovné pozície. Priemysel 4.0 prinesie zmeny aj v oblasti Environmentalistiky. Problémy v tejto oblasti nabrali globálny charakter. 4. priemyselná revolúcia by mohla v tejto oblasti výrazne prispieť pri riešení spomínaných problémov. Vďaka inováciám a zvýšenej efektivite vo výrobných procesoch budú klesať aj náklady na celkovú výrobu, čo bude mať pozitívny vplyv aj na životné prostredie čo môže výrazne vplývať na trvalo udržateľný rozvoj. Podľa Staněka a Ivanové (2016) 4. Priemyselná revolúcia by mala zmeniť celkovú štruktúru obyvateľstva. Hlavná oblasť zmien je produkčná oblasť, ale paradoxne by malo dôjsť aj k zmene spotrebiteľskej oblasti od formovania nových aplikácií či nových produktov a služieb až po inteligentné domy či domácnosti. Nezodpovedaná otázka týkajúca sa 4. Priemyselnej revolúcie je zamestnanosť. Podľa Diczházy (2016) sa skupina oxfordských vedcov v roku 2013 rozhodla spraviť výskum v danej oblasti a došli k záveru, že v priebehu nasledujúcich 10 až 20 rokov by malo dôjsť k zániku až 47% súčasných pracovných pozícií. Niektoré pracovné pozície budú len z časti ovplyvnené technologickým pokrokom, niektoré budú zase kompletne automatizované. Otázne je, či sa vytvorí rovnaký počet voľných pracovných miest, ktorých požiadavky na pracovníka budú zodpovedať zaniknutým pracovným miestam, alebo či sa požiadavky na nové pracovné miesta zvýšia. Publikované výskumy však už dnes naznačujú nárast nesúladu medzi očakávaniami zamestnávateľov a kompetenciami zamestnancov a to ako celosvetovo, tak aj v Európskej únii (Bughin et al., 2018; OECD, 2016). Jedným z dôvodov je aj nedostatočná implementácia metód rozvoja profesijných digitálnych kompetencií do foriem a metód výučby vo vysokoškolskom vzdelávaní (Jackson, 2016). Tlak na zmenu tak vyvíjajú predovšetkým zamestnávatelia (Otten, Bradford, Stover, Hill, Osborne, Getts, Seixas, 2019).

### *Dodatok*

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# ZAMESTNANIE CUDZINCOV PODĽA VYKONÁVANEJ PROFESIE V SR

## EMPLOYMENT OF FOREIGNERS BY PROFESSION IN THE SLOVAK LABOUR MARKET

***Eva GRMANOVÁ***[35]

**Abstrakt:** *Hlavným cieľom príspevku je špecifikovať stav a vývoj počtu zamestnaných cudzincov podľa vykonávanej profesie na trhu práce v SR. V súlade s hlavným cieľom budú diskutované zmeny z pohľadu Industry 4.0. V príspevku bude porovnávané zamestnanie občanov krajín EÚ/EHP s informačnou kartou, štátnych príslušníkov tretích krajín s udeleným povolením na zamestnanie a štátnych príslušníkov tretích krajín s informačnou kartou. Počet zamestnaných cudzincov sa v analyzovanom období výrazne zvýšil a zároveň došlo aj k zmene v štruktúre zamestnaných cudzincov podľa ich povolenia na prácu a podľa toho, či sú občanmi krajín EÚ/EHP. V príspevku sú použité výskumné metódy: indukcia, dedukcia, analýza, syntéza dostupných bibliografických odkazov a korelčný diagram.*

**Kľúčové slová:** *cudzinci, korelačný diagram, migrácia, zamestnávanie*

**Abstract***: The main aim of this article is to specify the state and development of the number of foreign employees by profession in the Slovak Republic. In accordance with the aim of the article, will be specified the reasons for the changes from the perspective of Industry 4.0. There will be compared the development of employment of EU / EEA citizens with an information card of nationals from the third countries with a work permit and nationals from third countries with an information card. The number of foreigners employed increased significantly in the analyzed period. At the same time, there was a change in the structure of employed foreigners according to their work permit and whether they are citizens of EU / EEA countries. Research methods used in the paper are: induction, deduction, analysis, synthesis of available bibliographic references and correlation diagram.*

**Key words:** *correlation diagram, foreigners, employment, migration*

**JEL Classification:** *F22, F23*

## 1. ÚVOD

Podľa autorov Docquier, Frederic, Kone, Zovanga L., Mattoo, Aaditya, et al. (2009) pracovnú silu každej priemyselnej krajiny formujú tri sily: starnutie, vzdelanie a migrácia. Slovenská republika neparí medzi krajiny, ktoré sú hlavným cieľom imigrantov. Aj keď podiel cudzincov v SR po vstupe do Európskej únie neustále rastie aj tak je ich počet v porovnaní s inými štátmi Európskej únie relatívne nízky.

Imigranti sú pri zamestnaní sa v cudzine motivovaní viacerými faktormi. Podľa Tupej, Vojtoviča a Strunza (2018) sú najväčšími motivátormi pre imigrantov vyššia mzdová úroveň a riešenie nezamestnanosti, ktoré im vysťahovalecká krajina neumožňuje.

Imigrácia pracovnej sily má viacero výhod. Podľa Klufovej a Polákovej (2010) prisťahovalecká krajina rieši nedostatok pracovných síl pre povolania, ktoré nie sú atraktívne. Zabezpečuje obsadenie pracovných pozícií s nízkym platom alebo tých, ktoré nie sú spoločensky docenené.

Podobná situácia je na slovenskom pracovnom trhu. Podľa Tupej, Vojtoviča a Strunza (2018) prácou v SR získavajú imigranti príležitosť vstúpiť do schengenského priestoru, získať vyššiu

[35] doc. RNDr., PhD., Trenčianska univerzita A. Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, 911 50 Trenčín, Slovenská republika, e-mail: eva.grmanova@tnuni.sk

mzdu ako vo vysťahovaleckej krajine, riešiť nezamestnanosť a podobne. Zamestnávania cudzincov z tretích krajín v SR otvára priestor pre imigráciu z chudobnejších krajín, kde úroveň miezd je nastavená hlboko pod priemernou mzdou na Slovensku.

Trh práce sa formuje v širšom ekonomickom a spoločenskom prostredí. Podľa Masárovej, Kordoša a Sokola (2018) EÚ stojí na začiatku novej priemyselnej revolúcie, ktorá je označovaná ako štvrtá priemyselná revolúcia alebo digitálna revolúcia. Vyznačuje sa nástupom kyberfyzikálnych systémov, ktorých veľké množstvo súčiastok je napojených na Internet. Dôležitou súčasťou štvrtej priemyselnej revolúcie je Internet vecí. Je to sieť objektov ako napríklad zariadení, strojov, vozidiel a iných predmetov so vstavanou elektronikou, softvérom, senzormi a pripojením k počítačovej sieti, ktoré umožňuje týmto objektom zber, analýzu a výmenu údajov. Nástup kyberfyzikálnych systémov prinesie zmeny v tom, že výroba riadená počítačom bude pokračovať zrýchlením procesov. Internet vecí vyvolá zmeny aj na trhu práce. Dôjde k posunu z hľadiska pracovného prostredia aj z pohľadu kvalifikácie. Robotnícke povolania budú zamerané hlavne na dohľad nad zariadeniami. Predpokladá sa, že niektoré profesie už nebudú potrebné a budú vznikať nové.

## 2. CIEĽ, DATA A METODOLÓGIA

### *2.1 Cieľ a dáta*

Hlavným cieľom príspevku je špecifikovať stav a vývoj počtu zamestnaných cudzincov podľa vykonávanej profesie na trhu práce v SR, následne určiť a porovnať zmeny v skupinách profesií. V súlade s hlavným cieľom budú diskutované zmeny z pohľadu Industry 4.0. V príspevku bude porovnávané zamestnanie občanov krajín EÚ/EHP s informačnou kartou, štátnych príslušníkov tretích krajín s udeleným povolením na zamestnanie a štátnych príslušníkov tretích krajín s informačnou kartou.

Realizácia tohto cieľa predpokladá:

- Porovnanie vývoja podielu zamestnaných občanov EÚ/EHP s informačnou kartou, podielu zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením a podielu zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou.
- Analýzu zmien v štruktúre zamestnaných cudzincov podľa profesií u občanov EÚ/EHP s informačnou kartou, štátnych príslušníkov tretích krajín s udeleným povolením a štátnych príslušníkov tretích krajín s informačnou kartou.
- Analýzu zmien v počte zamestnaných cudzincov podľa profesie u občanov EÚ/EHP s informačnou kartou, štátnych príslušníkov tretích krajín s udeleným povolením a štátnych príslušníkov tretích krajín s informačnou kartou pomocou korelačného diagramu.

Analyzovaným obdobím sú roky 2013 až 2019.

Údaje sú čerpané zo štatistík Ústredia práce, sociálnych vecí a rodiny (ÚPSVR, 2019).
Štruktúru podľa profesie sme analyzovali podľa nasledujúcich skupín:
0 príslušníci ozbrojených síl,
1 zákonodarcovia,
2 riadiaci pracovníci,
3 špecialisti, technici a odborní pracovníci,
4 administratívni pracovníci,
5 pracovníci v službách a v obchode,
6 kvalifikovaní pracovníci v poľnohospodárstve, lesníctve a rybárstve,
7 kvalifikovaní pracovníci a remeselníci,
8 operátori a montéri strojov a zariadení,

9 pomocníci a nekvalifikovaní pracovníci,
10 neurčené profesie.

### *2.2 Metódy*

#### *Korelačný diagram*

Korelačný diagram sa často používa ako súčasť analýzy konergencie. Je používaný v prípade, že analýzou nie je vysoko preukázaná konvergencia ani divergencia. Jeho využitie môže byť však aj širšie. Umožňuje rozdeliť analyzované subjekty do štyroch skupín podľa ich hodnôt na začiatku analyzovaného obdobia (počiatočných hodnôt) a na základe ich priemerného koeficienta rastu.

Podľa Minaříka, Borůvkovej a Vystrčila (2013) je korelačný diagram bodový graf, kde os x vyjadruje logaritmus počiatočných hodnôt a os y je logaritmus priemerných koeficientov rastu. Body v grafe sú oddelené priamkami, ktoré sú kolmé na osy. Jedna prechádza aritmetickým priemerom logaritmu počiatočných hodnôt. Druhá prechádza aritmetickým priemerom logaritmu priemerného koeficienta rastu. Vytvorením dvoch osý v grafe sa všetky body rozdelia do štyroch skupín. Sú to skupiny s podpriemernou, resp. nadpriemernou hodnotou logaritmu počiatočných hodnôt a s podpriemernou, resp. nadpriemernou hodnotou logaritmu priemerného koeficienta rastu.

## 3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

### *3.1 Komparácia zamestnania cudzincov podľa profesií*

Podľa Ministerstva práce, sociálnych vecí a rodiny Slovenskej republiky (2019, 1) začína nedostatok kvalifikovanej pracovnej sily v SR predstavovať pre činnosť podnikov SR značnú hrozbu. Slovensko prísun pracovníkov z tretích krajín reguluje. Ministerstva práce, sociálnych vecí a rodiny Slovenskej republiky (2019, 2) vypracovalo stratégiu pracovnej mobility cudzincov, ktorá má napomôcť k riešeniu situácie s nedostatkom pracovných miest v okresoch s mierou nezamestnanosti pod 5%. K profesiám, kde je nedostatok pracovnej sily patria predovšetkým technickí pracovníci pracujúci predovšetkým v automobilovom priemysle a mechanici (Zachová et al., 2018). Štátna podpora pracovnej mobility cudzincov a rast miezd prispievajú k rastúcemu trendu počtu pracujúcich cudzincov. Z roku 2013 do roku 2019 vzrástol ich počet 6,23 krát. Nezmenil sa len počet zamestnaných cudzincov v SR ale došlo aj k zmene v ich štruktúre podľa ich povolenia na prácu a podľa toho, či sú občanmi krajín EÚ/EHP. Poklesol podiel zamestnaných občanov EÚ/EHP s informačnou kartou (zo 61,84% na 52,47%) a podiel zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením (z 30,03 na 25,81%). Výrazne vzrástol podiel zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou (z 8,13% na 21,71%). Medzi zamestnanými cudzincami jednoznačne prevládali muži.

Podiel zamestnaných občanov z krajín EÚ/EHP s informačnou kartou tvoril z celkového počtu zamestnaných cudzincov v roku 2013 30,03%. Ich počet vzrástol od januára 2013 do januára 2019 5,29 krát. V oboch analyzovaných rokoch mali v štruktúre zamestnaných cudzincov podľa profesií najväčší podiel operátori a montéri strojov a zariadení. Z hľadiska štátnej príslušnosti bol veľký podiel občanov z krajín EÚ/EHP s informačnou kartou z Rumunska. Podiel nad 10% mali v oboch analyzovaných rokoch aj kvalifikovaní pracovníci a remeselníci, ako aj pomocníci a nekvalifikovaní pracovníci a špecialisti. Okrem príslušníkov ozbrojených síl mali výrazne malý podiel kvalifikovaní pracovníci v poľnohospodárstve, lesníctve a rybárstve. Počty a podiely zamestnaných občanov krajín EÚ/EHP s informačnou kartou podľa profesií sú v tabuľke 1 (v roku 2013) a 2 (v roku 2019).

**Tabuľka 1: Zamestnanie občanov krajín EÚ/EHP s informačnou kartou, január 2013**

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Spolu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **počet** | 0 | 494 | 807 | 721 | 500 | 135 | 63 | 1136 | 2148 | 744 | 89 | **6837** |
| **podiel v %** | 0 | 7,23 | 11,80 | 10,55 | 7,31 | 1,97 | 0,92 | 16,62 | 31,42 | 10,88 | 1,30 | **100%** |

Zdroj: štatistiky ÚPSVR a vlastné výpočty

**Tabuľka 2: Zamestnanie občanov krajín EÚ/EHP s informačnou kartou, január 2019**

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Spolu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **počet** | 0 | 2028 | 3624 | 2844 | 2098 | 2753 | 94 | 4502 | 11880 | 4408 | 1917 | **36148** |
| **podiel v %** | 0 | 5,61 | 10,03 | 7,87 | 5,80 | **7,62** | 0,26 | 12,45 | **32,86** | **12,19** | **5,30** | 100,00 |

Zdroj: štatistiky ÚPSVR a vlastné výpočty

Podiel zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením tvoril z celkového počtu zamestnaných cudzincov v roku 2013 30,03%. Počet zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením vzrástol od januára 2013 do januára 2019 5,35 krát. V roku 2013 v štruktúre zamestnaných cudzincov podľa profesií mali najväčší podiel zákonodarcovia a riadiaci pracovníci a špecialisti. V roku 2019 mali najväčší podiel operátori a montéri strojov (60,51%). Z hľadiska štátnej príslušnosti boli zamestnaní štátni príslušníci vykonávajúci profesiu operátor a montér strojov a zariadení vo veľkej miere obyvatelia Ukrajiny a Srbska. Podiel nad 10% mali v oboch rokoch aj kvalifikovaní pracovníci a remeselníci. Z uvedenej analýzy vyplýva, že zamestnaní štátni príslušníci z tretích krajín s udeleným povolením pracujú predovšetkým ako operátori a montéri strojov a zariadení. Počty a podiely zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením podľa profesií sú v tabuľke 3 (v roku 2013) a 4 (v roku 2019).

**Tabuľka 3: Zamestnanie štátnych príslušníkov tretích krajín s udeleným povolením na zamestnanie, január 2013**

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Spolu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **počet** | 0 | 692 | 676 | 465 | 76 | 613 | 63 | 372 | 293 | 38 | 32 | **3320** |
| **podiel v %** | | 20,84 | 20,36 | 14,01 | 2,29 | 18,46 | 1,90 | 11,20 | 8,83 | 1,14 | 0,96 | 100,00 |

Zdroj: štatistiky ÚPSVR a vlastné výpočty

**Tabuľka 4: Zamestnanie štátnych príslušníkov tretích krajín s udeleným povolením na zamestnanie, január 2019**

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Spolu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **počet** | 0 | 484 | 1238 | 364 | 415 | 1013 | 134 | 2191 | 10761 | 1182 | 1 | **17783** |
| **podiel v %** | | 2,72 | 6,96 | 2,05 | **2,33** | 5,70 | 0,75 | **12,32** | **60,51** | **6,65** | 0,01 | 100,00 |

Zdroj: štatistiky ÚPSVR a vlastné výpočty

Podiel zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou tvoril z celkového počtu zamestnaných cudzincov v roku 2013 8,13%. Počet zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou vzrástol od januára 2013 do januára 2019 16,64 krát. V roku 2019 bol podiel zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou už 21,71%. V štruktúre podľa profesií mali v roku 2013 najväčší podiel operátori a montéri strojov. Veľký podiel zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou, ktorí boli zamestnaní ako operátori a montéri strojov boli obyvatelia

Srbska. Veľký podiel v štruktúre podľa profesií mali aj technici a odborní pracovníci. Z nich bol veľký podiel obyvateľov Kórejskej republiky a Srbska. V roku 2019 mali najväčší podiel pomocní a nekvalifikovaní pracovníci (31,53%). Z nich bol veľký podiel obyvateľov Srbska a Ukrajiny. Počty a podiely zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou podľa profesií sú v tabuľke 5 (v roku 2013) a 6 (v roku 2019).

**Tabuľka 5: Zamestnanie občanov tretích krajín s informačnou kartou, január 2013**

| | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Spolu** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **počet** | 0 | 121 | 157 | 152 | 40 | 67 | 7 | 43 | 161 | 128 | 23 | **899** |
| **podiel v %** | | 13,46 | 17,46 | 16,91 | 4,45 | 7,45 | 0,78 | 4,78 | 17,91 | 14,24 | 2,56 | 100,00 |

Zdroj: štatistiky ÚPSVR a vlastné výpočty

**Tabuľka 6: Zamestnanie občanov tretích krajín s informačnou kartou, január 2019**

| | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Spolu** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **počet** | 0 | 312 | 1264 | 576 | 592 | 1216 | 79 | 1544 | 4349 | 4715 | 309 | **14956** |
| **podiel v %** | | 2,09 | 8,45 | 3,85 | 3,96 | **8,13** | 0,53 | **10,32** | **29,08** | **31,53** | 2,07 | 100,00 |

Zroj: štatistiky ÚPSVR a vlastné výpočty

Z uvedenej analýzy vyplýva, že na Slovensku sa aj vďaka opatreniam a štátnej podpore zameranej na zamestnávanie cudzincov z tretích krajín zvyšuje ich podiel. Zamestnaní cudzinci boli v roku 2019 vo veľkej miere na pozícii operátorov a montérov strojov a zariadení. Dôvodom je aj relatívne veľký počet strojárskych výrobných podnikov v automobilovom priemysle. Najmenej cudzincov v SR pracuje na pozícii kvalifikovaných pracovníkov v poľnohospodárstve, lesníctve a rybárstve.

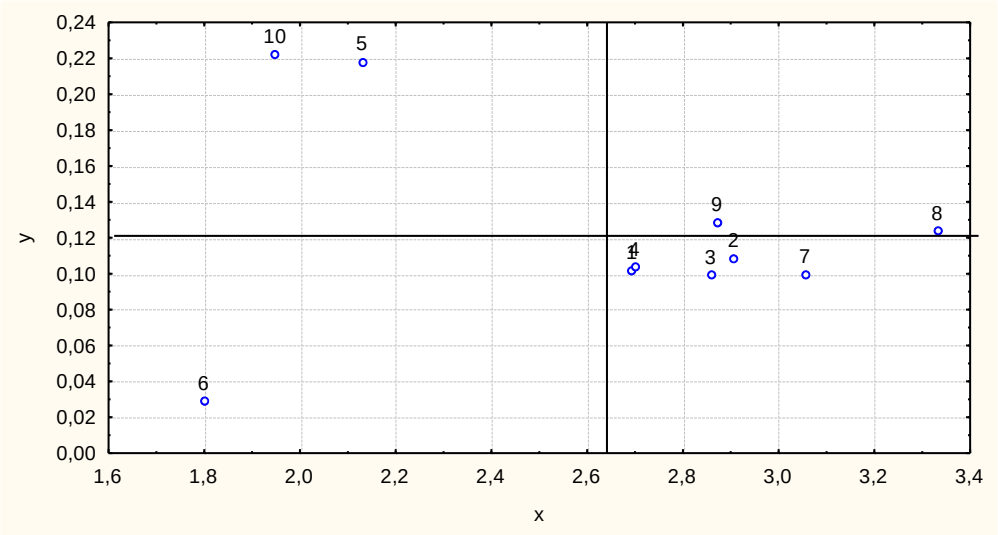
### *3.2 Analýza zmien v počte zamestnaných cudzincov podľa profesií pomocou korelačného diagramu*

### Zamestnanie občanov krajín EÚ/EHP s informačnou kartou

Z korelačného diagramu (obrázok 1) a z priemerného koeficienta rastu počtu zamestnaných občanov krajín EÚ/EHP s informačnou kartou podľa profesií vyplýva, že najväčší priemerný koeficient rastu mal po počte neurčených profesií počet zamestnaných cudzincov v službách a v obchode. Tento trend možno považovať za priaznivý. Najmenší priemerný koeficient rastu mal počet kvalifikovaných pracovníkov v poľnohospodárstve, lesníctve a rybárstve. Počet zamestnaných cudzincov v tejto profesii bol v roku 2013 veľmi nízky a zároveň mal do roku 2019 najmenší priemerný koeficient rastu. *Počet cudzincov - občanov krajín EÚ/EHP s informačnou kartou, ktorí sú kvalifikovaní pracovníci v poľnohospodárstve, lesníctve a rybárstve zaostáva za počtom cudzincov - občanov krajín EÚ/EHP s informačnou kartou vykonávajúcich ďalšie profesie.*

Počet operátorov a montérov strojov a zariadení ako aj počet pomocných a nekvalifikovaných pracovníkov z krajín EÚ/EHP s informačnou kartou mal nadpriemerné hodnoty v roku 2013 aj nadpriemerný koeficient rastu. *Počet operátorov a montérov strojov a zariadení ako aj počet pomocných a nekvalifikovaných pracovníkov z krajín EÚ/EHP s informačnou kartou sa vzďaľuje od počtu pracovníkov vykonávajúcich ďalšie profesie.* Rozdelenie profesií zamestnaných cudzincov z krajín EÚ/EHP s informačnou kartou do skupín na základe korelačného diagram je v tabuľke 7.

**Obrázok 1: Korelačný diagram počtu zamestnaných cudzincov podľa profesie u občanov EÚ/EHP s informačnou kartou**




Zdroj: vlastné spracovanie

**Tabuľka 7: Rozdelenie profesií zamestnaných cudzincov z krajín EÚ/EHP s informačnou kartou do skupín na základ korelačného diagramu**

| 1. | 2. | 3. | 4. |
|---|---|---|---|
| 8 | 5 | 6 | 1 |
| 9 | 10 | | 2 |
| | | | 3 |
| | | | 4 |
| | | | 7 |

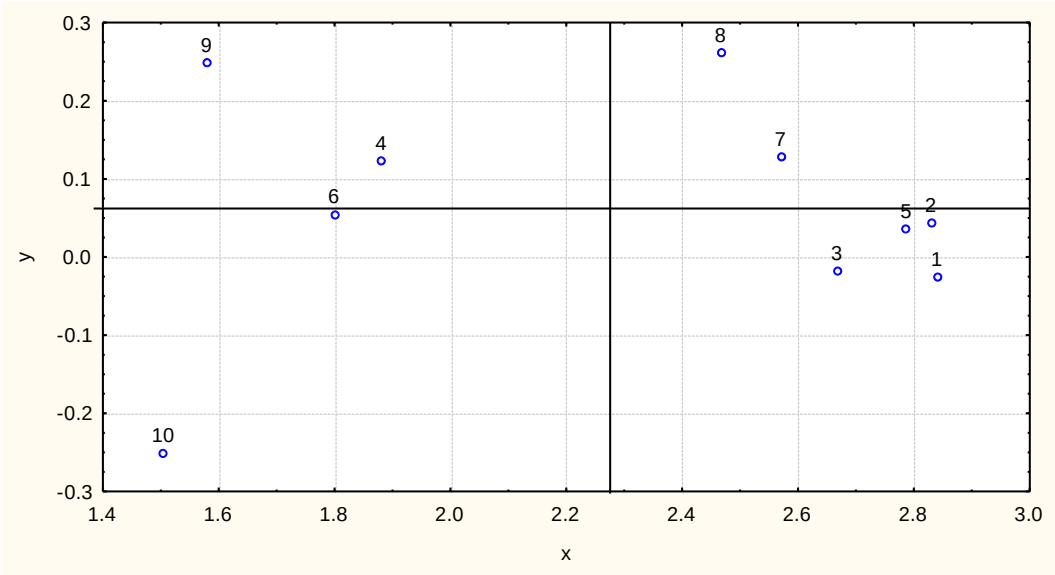
Zdroj: vlastné výpočty podľa štatistík ÚPSVR

**Zamestnanie štátnych príslušníkov tretích krajín s udeleným povolením**

Z korelačného diagramu (obrázok 2) a z priemerného koeficienta rastu počtu zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením podľa profesií vyplýva, že najväčší priemerný koeficient rastu mal počet operátorov a montérov strojov a zariadení. Keďže v roku 2013 bol ich počet nadpriemerný môžeme uzavrieť, že *počet zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením, ktorí pracujú ako operátori a montéri strojov a zariadení sa vzďaľuje od počtu ostatných profesií. Obdobný záver môžeme povedať aj o počte kvalifikovaných pracovníkov a remeselníkov. Počet pomocných a nekvalifikovaných pracovníkov mal druhý najrýchlejší rast.*

Podpriemerný koeficient rastu mal počet kvalifikovaných pracovníkov v poľnohospodárstve, lesníctve a rybárstve. Počet zamestnaných cudzincov v tejto profesii bol v roku 2013 podpriemerný a zároveň mal do roku 2019 podpriemerný priemerný koeficient rastu. Počet zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením, ktorí sú *kvalifikovaní pracovníci v poľnohospodárstve, lesníctve a rybárstve zaostáva za počtom zamestnaných štátnych príslušníkov tretích krajín s udeleným povolením, ktorí vykonávajú ďalšie profesie.* Rozdelenie profesií zamestnaných cudzincov z tretích krajín s udeleným povolením do skupín na základe koerelčného diagram je v tabuľke 8.

**Obrázok 2: Korelačný diagram počtu zamestnaných cudzincov podľa profesie u štátnych príslušníkov tretích krajín s udeleným povolením**




Zdroj: vlastné spracovanie

**Tabuľka 8: Rozdelenie profesií zamestnaných cudzincov z tretích krajín s udeleným povolením do skupín na základ korelačného diagramu**

| 1. | 2. | 3. | 4. |
|---|---|---|---|
| 7 | 4 | 6 | 1 |
| 8 | 9 | 10 | 2 |
| | | | 3 |
| | | | 5 |

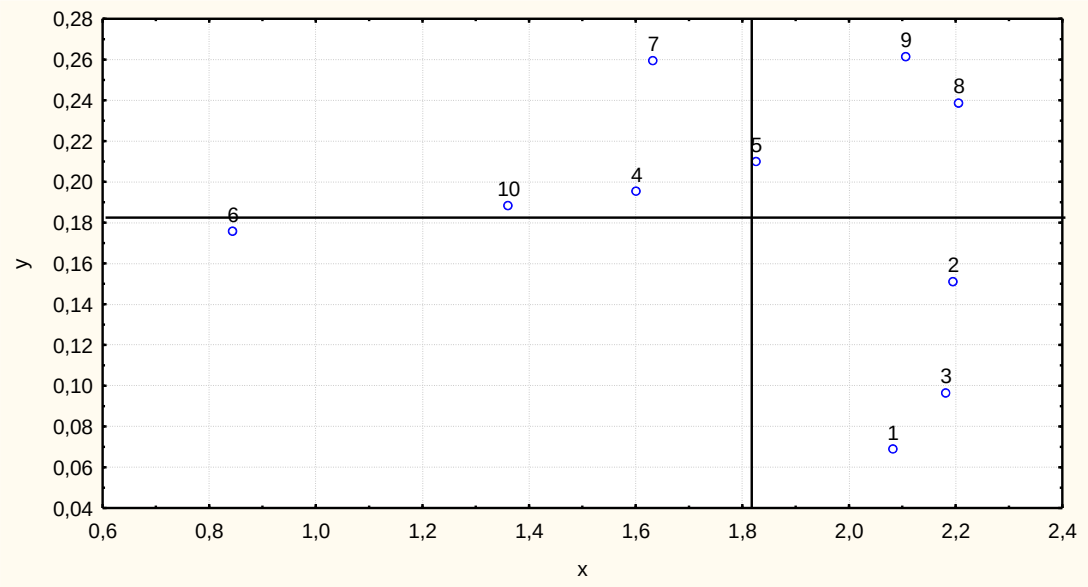
Zdroj: vlastné výpočty podľa štatistík ÚPSVR

## Zamestnanie občanov tretích krajín s informačnou kartou

Z korelačnému diagram (obrázok 3) a z priemerného koeficienta rastu počtu zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou podľa profesií vyplýva, že najväčší priemerný koeficient rastu mal počet *pomocných a nekvalifikovaných pracovníkov*. Keďže v roku 2013 bol ich počet nadpriemerný môžeme uzavrieť, že počet zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou zamestnaných ako pomocní a nekvalifikovaní pracovníci sa vzďaľuje od počtu ostatných profesií. Obdobný záver môžeme povedať aj **o** *počte operátorov a montérov strojov a zariadení ako aj o počte pracovníkov v službách a v obchode.*

*Podpriemerný koeficient rastu mal počet kvalifikovaných pracovníkov v poľnohospodárstve, lesníctve a rybárstve.* Počet zamestnaných cudzincov v tejto profesii bol v roku 2013 podpriemerný a zároveň mal do roku 2019 podpriemerný priemerný koeficient rastu. Počet zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou, ktorí sú kvalifikovaní pracovníci v poľnohospodárstve, lesníctve a rybárstve zaostáva za počtom zamestnaných štátnych príslušníkov tretích krajín s informačnou kartou, ktorí vykonávajú ďalšie profesie. Rozdelenie profesií zamestnaných cudzincov z tretích krajín s informačnou kartou do skupín na základe koerelčného diagram je v tabuľke 9.

**Obrázok 3: Korelačný diagram počtu zamestnaných cudzincov podľa profesie u štátnych príslušníkov tretích krajín s informačnou kartou**




Zdroj: vlastné spracovanie

**Tabuľka 9: Rozdelenie profesií zamestnaných cudzincov z tretích krajín s informačnou kartou do skupín na základ korelačného diagram**

| 1. | 2. | 3. | 4. |
|---|---|---|---|
| 5 | 4 | 6 | 1 |
| 8 | 7 | | 2 |
| 9 | 10 | | 3 |

Zdroj: vlastné výpočty podľa štatistík ÚPSVR

Môžeme zhrnúť, že vo všetkých skupinách počet zamestnaných cudzincov, ktorí pracujú ako kvalifikovaní pracovníci v poľnohospodárstve, lesníctve a rybárstve zaostáva za počtom cudzincov, ktorí vykonávajú ďalšie profesie. Počet cudzincov, ktorí pracujú ako operátori a montéri strojov a zariadení sa vzďaľuje od počtu ostatných profesií.

Tri analyzované skupiny sa líšia v profesiách, ktoré mali najväčší priemerný koeficient rastu. Zo zamestnaných občanov krajín EÚ/EHP s informačnou kartou mali najväčší priemerný rast, po neurčených profesiách, pracovníci v službách a v obchode. Zo zamestnaných občanov tretích krajín s udeleným povolením mali najväčší priemerný koeficient rastu operátori a montéri strojov a zariadení a pomocníci a nekvalifikovaní pracovníci. Zo zamestnaných občanov tretích krajín s informačnou kartou mali najväčší priemerný koeficient rastu pomocníci a nekvalifikovaní pracovníci a kvalifikovaní pracovníci a remeselníci.

Podľa samotný rozvoj technológií 4.0 je v zárodku. V budúcnosti je možné očakávať zmeny v štruktúre na trhu práce podľa profesií. Predpokladá sa, že v oblasti priemyslenej výroby dôjde k stratám pracovných pozícií v oblasti priemyselnej výroby. Keďže priemysel v SR má najväčšie zastúpenie v oblasti zamestnanosti, je možné očakávať výrazný dopad aj na trh práce v SR. Z toho dôvodu je možné očakávať v SR aj potrebu zmeny v štruktúre zamestnaných pcudzincov podľa profesií. SR reguluje prísun pracovnej sily z tretích krajín. Počet a štruktúra je vo veľkej miere ovplyvnená aj opatreniami vlády na podporu pracovnej mobility cudzincov. Skracujú sa lehoty pre rozhodovanie o udelení prechodného pobytu v

prípade nedostatkových zamestnaní a periodicita aktualizácie nedostatkových zamestnaní. Nakoľko však mzdová úroveň v SR je oveľa nižšia ako v najvyspelejších krajinách EÚ, tak záujem cudzincov o profesie súvisiace s najnovšími technológiami a digitalizáciou nie je výrazný. Dá sa predpokladať, že záujem cudzincov sa zamestnať v takýchto profesiách v SR bude oveľa menší ako v najvyspelejších štátoch EÚ.

## 4. ZÁVER

Hlavným cieľom príspevku bolo špecifikovať stav a vývoj počtu zamestnaných cudzincov podľa vykonávanej profesie na trhu práce v SR, následne určiť a porovnať zmeny v skupinách profesií.

V analyzovanom období došlo k rastúcemu trendu počtu pracujúcich cudzincov. Nezmenil sa len počet cudzincov ale došlo aj k zmene v štruktúre zamestnaných cudzincov podľa ich povolenia na prácu a podľa toho, či sú občanmi krajín EÚ/EHP. Poklesol podiel zamestnaných občanov EÚ/EHP s informačnou kartou štátnych príslušníkov tretích krajín s udeleným povolením. Naopak vzrástol podiel zamestnaných štátnych príslušníkov tretích krajín s informačnou koartou.

Vo všetkých troch skupinách sa počet zamestnaných cudzincov, ktorí sú kvalifikovaní pracovníci v poľnohospodárstve, lesníctve a rybárstve zaostáva za počtom cudzincov, ktorí vykonávajú ďalšie profesie. To znamená, že ich počet na začiatku analyzovaného obdobia aj priemerný koeficient rastu boli podpriemerné. Počet cudzincov zamestnaných ako operátorov a montérov strojov a zariadení sa vzďaľuje od počtu ostatných profesií. To znamená, že ich počet na začiatku analyzovaného obdobia aj priemerný koeficient rastu boli nadpriemerné.

Skupiny sa líšia v profesiách, ktoré mali najväčší priemerný koeficient rastu. Zo zamestnaných občanov krajín EÚ/EHP s informačnou kartou mali najväčší priemerný koeficient rastu, po neurčených profesiách, pracovníci v službách a v obchode. Zo zamestnaných občanov tretích krajín s udeleným povolením mali najväčší priemerný koeficient rastu operátori a montéri strojov a zariadení a pomocníci a nekvalifikovaní pracovníci. Zo zamestnaných občanov tretích krajín s informačnou kartou mali najväčší priemerný koeficient rastu pomocníci a nekvalifikovaní pracovníci a kvalifikovaní pracovníci a remeselníci.

### *Dodatok*

Tento príspevok bol vytvorený v rámci projektu VEGA reg. č. 1/0679/17 Bilancia ekonomických strát a prínosov z migrácie pracovnej sily.

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# VPLYV INDUSTRY 4.0 NA SEKTOR DOPRAVY A SÚVISIACICH SLUŽIEB V KONTEXTE ROZVOJA ĽUDSKÝCH ZDROJOV V PODMIENKACH SLOVENSKEJ REPUBLIKY

# IMPACT OF INDUSTRY 4.0 ON THE TRANSPORT SECTOR AND RELATED SERVICES IN THE CONTEXT OF HUMAN RESOURCES DEVELOPMENT IN THE SLOVAK REPUBLIC

***Michal HRNČIAR*[36]**
***Eva RIEVAJOVÁ.*[37]**

**Abstrakt:** *Predkladaná štúdia analyzuje kľúčové inovačné a technologické zmeny v sektore dopravy, logistiky a poštových služieb, ktoré budú ovplyvňovať sektor v horizonte do roku 2030 (s výhľadom do roku 2050) v Slovenskej republike. Dôležitou súčasťou analýzy je návrh vybraných dopadov na ľudské zdroje v zmysle zanikania, prípadne vytvárania nových zamestnaní. Hlavné technologické zlomy súvisia s novými technológiami, automatizáciou, robotizáciou, ale aj zmenami v logistike. Autonómne vozidlá už nie sú takou ďalekou budúcnosťou, aj keď v našich podmienkach bude potrebné sa na tento trend najskôr pripraviť. Samotná príprava ale bude vyžadovať zmenu kvalifikácií.*

**Kľúčové slová:** *Industry 4.0; doprava, logistika, poštové služby; automatizácia; robotizácia*

**Abstract:** *The present study analyzes key innovative and technological changes in the transport, logistics and postal services sector, which will affect the sector by 2030 (with a 2050 perspective) in the Slovak Republic. An important part of the analysis is the proposal of selected impacts on human resources in terms of extinction or creation of new jobs. The main technological changes are related to new technologies, automation, robotics, but also changes in logistics. Autonomous vehicles are no longer such a far future, although in our conditions it will be necessary to prepare for this trend first. But the preparation itself will require a change of qualifications.*

**Key words:** *Industry 4.0; transport, logistics, postal services; automation; robotics*

## 1. ÚVOD

Doprava patrí medzi kľúčové nevyhnutnosti sociálno-ekonomického rozvoja spoločnosti, umožňujúce nielen presuny ľudí a tovarov, ale aj špecializáciu produkcie a rast obchodu. Zároveň je však jedným z najväčších spotrebiteľov energií so značným vplyvom na životné prostredie. Zmeny a ich vplyv v zavádzaní nových technológií súvisiacich s prevádzkou dopravných prostriedkov (inovácia, elektronizácia, zavádzanie výpočtovej techniky, hybridné vozidlá, autonómne vozidlá a podobne) budú smerovať k identifikácii nových pracovných pozícií, zmien pracovných postupov napríklad v oblasti údržby a v konečnom dôsledku k zmenám obsahu vo vzdelávaní.

Vízia Logistiky 4.0 definuje procesy s cieľom v čo najväčšej miere automatizovať, čiže eliminovať, ľudský faktor. Táto vízia je založená na komplexnom prepojení nákladných vozidiel, vlakov, plánovacích výrobných a skladovacích softvérov spolu napr. s online dátami o dopravnej situácii vrátane počasia a jeho vývoja, čo by umožnilo plánovať daný proces plne automaticky.

[36] Ing., Ekonomická univerzita v Bratislave, Národohospodárska fakulta, Katedra sociálneho rozvoja a práce, Dolnozemská cesta 1, Bratislava, 852 35, Slovensko, e-mail: michal.hrnciar@euba.sk
[37] Prof., Ing., PhD., Ekonomická univerzita v Bratislave, Národohospodárska fakulta, Katedra sociálneho rozvoja a práce,Dolnozemská cesta 1, Bratislava, 852 35, Slovensko, e-mail: eva.rievajova@euba.sk

Poštové služby predstavujú hlavný nástroj komunikácie a výmeny informácií, plnia dôležitú úlohu, ktorá prispieva k cieľom sociálnej, hospodárskej a územnej súdržnosti v Európskej únii. Poštové siete sa vyznačujú významným územným a sociálnym rozmerom, keďže umožňujú univerzálny prístup k základným miestnym službám. Prostredie, v ktorom sú poskytované poštové služby sa dynamicky mení a klasické poštové služby sa musia v záujme udržania ich trvalého rozvoja, prispôsobovať novému trendu vývoja. Zásadný význam má v tejto súvislosti prudký rozvoj informačno-komunikačných technológií.

## 2. CIEĽ A METODOLÓGIA

Cieľom predkladanej štúdie je poukázanie na vplyv technologických a inovačných zmien súvisiacich so 4. priemyselnou revolúciou v oblasti dopravy a ďalších súvisiacich službách. Na základe zadefinovaných zmien je v štúdii načrtnutý dopad na ľudské zdroje, ktoré so sebou zmeny budú prinášať.

Východiskom pri tvorbe predkladanej štúdie je Národný projekt Sektorovo riadenými inováciami k efektívnemu trhu práce, realizovaného pod gesciou Ministerstva práce, sociálnych vecí a rodiny Slovenskej republiky. Naliehavosť riešenia problému nízkej flexibility vzdelávacieho systému, absencie objektívneho a komplexného opisu požiadaviek trhu práce využiteľného na formovanie skladby vhodných vzdelávacích programov vyústilo do realizácie Národného projektu Národná sústava povolaní (ďalej len „NSP“). V zákone č. 5/2004 Z. z. o službách zamestnanosti a o zmene a doplnení niektorých zákonov v znení neskorších predpisov sa NSP definuje ako základný systémový rámec pre tvorbu systémového riešenia prenosu potrieb trhu práce do systému celoživotného vzdelávania.

Vláda SR svojím uznesením č. 665/2014 zo dňa 17. decembra 2014 schválila Národnú stratégiu zamestnanosti do roku 2020. V citovanom uznesení stanovila, aby sa aktualizovala a doplnila NSP v súlade s vývojom na trhu práce a so zákonom o službách zamestnanosti, čím sa vytvorilo ideové východisko pre Národný projekt Sektorovo riadenými inováciami k efektívnemu trhu práce v Slovenskej republike (ďalej len „SRI“).

Medzi najvýznamnejšie aktivity Národného projektu Sektorovo riadenými inováciami k efektívnemu trhu práce v SR patrí vypracúvanie sektorových stratégií rozvoja ľudských zdrojov a definovanie sektorových odporúčaní na zabezpečenie kvalifikovanej pracovnej sily pre ekonomické subjekty. Úloha priamo súvisí s celospoločenským úsilím o konkurencieschopný ekonomický rast krajiny. Základom na jeho zabezpečenie sú ľudia. Je prvoradé mať dostatok kvalifikovaných pracovných síl, ktoré sú schopné flexibilne reagovať na inovačné prvky a procesy, strategické riešenia v hospodárstve SR, ale aj v európskom, či celosvetovom priestore. Z hľadiska formy sú sektorové stratégie rozvoja ľudských zdrojov dlhodobého charakteru – horizont roku 2030, prípadne aj dlhšie obdobie.[38]

Nevyhnutným predpokladom udržateľnosti konkurencieschopného ekonomického rastu krajiny sú také ľudské zdroje, ktoré sú schopné flexibilne reagovať na konkurenčné prostredie trhu, ktorý je čoraz viac globálnejší. Nestačí, aby len disponovali vedomosťami, ale vedeli ich efektívne využívať s motiváciou celoživotného rastu vedomostí a zručností. Cieľom je konkurencieschopnosť v spojení so strategickým myslením a strategickým plánovaním. Dosiahnutie takéhoto stavu vyžaduje vypracovanie komplexného dokumentu, ktorý strategicky v horizonte do roku 2030 predstaví formulácie v záujme vytvorenia podmienok trvalého rastu konkurenčného prostredia na meniacich sa globálnych trhoch a vnútornom trhu Slovenska. K tomu majú prispieť koncepty sektorových stratégií rozvoja ľudských zdrojov v

[38] Realizačný tím SRI. 2019. Metodický manuál na vypracovanie sektorových stratégií rozvoja ľudských zdrojov.

nadväznosti na inovačné procesy v hospodárstve SR, ktorých autorstvo spadá do pôsobnosti sektorových rád.

Stratégia ako dokument v písomnej forme je založená na uplatnení zásad strategického cyklu ako procesu kvalifikovaných postupov vychádzajúcich z analytických a syntetických činností, ktorými je možné vytvoriť návrh postupu, ako objekt predmetu stratégie naplnil v dlhšom časovom horizonte svoje ciele. Vychádza sa z toho, že spracovanie stratégie je interaktívny proces, ktorý sa skladá z piatich cyklov:

I. CYKLUS – Určenie základných premís,
II. CYKLUS – Spracovanie situačnej analýzy,
III. CYKLUS – Určenie stratégie,
IV. CYKLUS – Určenie postupov, akcií na realizáciu cieľov stratégie,
V. CYKLUS – Určenie techniky monitorovania strategických akcií a čiastkových cieľov a odporúčania prípadnej korekcie stratégie, prípadne tvorby kĺzavej stratégie.

## 3. RIEŠENIE PROBLÉMU A DISKUSIA

Pre zadefinovanie smerovania sektora vychádzajúceho z technologických a inovačných zmien, sa v rámci štúdie vychádza z tzv. základných premís, ktoré sú v procese tvorby stratégie vysvetlené ako "*všeobecná predstava o tom, kam sektor smeruje a čo chce dosiahnuť v určenom strategickom horizonte – rok 2030*." Ide o návrh takých zmien, ktoré budú mať podľa expertov zapojených do tvorby stratégie výrazný dopad na charakter ľudskej práce. Aby sme mohli jednotlivé názory expertov zovšeobecniť na celý sektor, zahrňujúci všetky tri vyššie spomenuté časti sektora – doprava, logistika, poštové služby, je potrebné zadefinovať všeobecné znenie premís, ktoré vyjadrí rovnaký ideový základ technologicko-inovačnej zmeny, ale priestor pre jeho aplikáciu v samotnom odvetví ostane otvorený.

Medzi trendy, ktoré budú kľúčové pre budúcnosť sektora patria nasledujúce premisy:

1. Postupná automatizácia, robotizácia, elektronizácia a modernizácia s výhľadom do roku 2050 s dopadom na štruktúru ľudských zdrojov do roku 2030
2. Dopravný, logistický systém a poštové služby, rešpektujúce environmentálny vývoj a výzvy budúcnosti

Tieto dve základné myšlienky vplyvu INDUSTRY 4.0 na celý sektor sú pre účely predkladanej štúdie rozpracované po jednotlivých častiach sektora.

Prepravné služby v doprave budú vo všeobecnosti pokračovať v nastolenom trende dosahovania vyššej účinnosti nákladov, znižovaním spotreby paliva, zvyšovaním prepravnej kapacity a zavádzaním nových technológií. Informačné a komunikačné technológie otvárajú nové možnosti predovšetkým v oblasti poznania skutočného technického stavu komponentov a ich okamžitého vyhodnocovania. Jeden zo základných vstupných faktorov je prudký rozvoj metód získavania, spracovania a poskytovania informácií získaných z rôznych zdrojov, súhrnne označovaná ako Internet-of-Things. Výzvou dnešnej doby je správne nastavenie pravidiel údržby technickej infraštruktúry s využitím BIG DATA. Cieľom je minimalizácia zásahov v údržbe, ktorá sa docieli preventívnou identifikáciou hrozieb. Pokroky vo vývoji senzorovej technológie spolu s rýchlymi a spoľahlivými sieťami, umožňujú cez interent dôkladné monitorovanie stavu prevádzky vozidiel (napr. v železničnej doprave). Uvedené umožní prechod od preventívnej údržby (kde je plán údržby zvyčajne určený priemerom alebo očakávanou štatistikou životnosti), na flexibilnejší prediktívny spôsob údržby, založený

na aktuálnych online dátach a meraniach skutočného stavu. Budúce systémy prediktívnej údržby budú čoraz viac využívať širšiu škálu údajov (big data). Digitálne dvojčatá následne umožnia skúmať aspekty a vykonávať rôzne typy simulácií, ktoré pomôžu predpovedať, kedy sa môže vyskytnúť kritické zlyhanie. Zaujímavým je nastupujúci trend 3D tlače, ktorého využitie v budúcnosti môže napomôcť pri údržbe a opravách napr. v železničnej doprave. Tlač vybraných náhradných dielov priamo na mieste potreby napomôže k odstráneniu dlhej obstarávacej doby u výrobcov a vysokých nákladov na prepravu.

S nástupom uvedených trendov v doprave vznikne dopyt aj po nových typoch úloh, v oblastiach ako je riadenie prevádzky, údržby a mobility. Výsledkom bude, že dopyt po pracovnej sile úplne nezmizne, ale budú sa meniť potrebné požiadavky a zručnosti pre jednotlivé pracovné miesta. Sústredenie zamestnancov sa presunie do špecializovaných centier. Medzi oblasti s možným znížením pracovných miest môžeme zaradiť napr. *Prevádzkovo-údržbárske profesie*. Naopak, medzi oblasti s potenciálom zvýšenia zamestnanosti môžeme zaradiť:

- *riadenie a koordinácia informačných systémov,*
- *analýza dát,*
- *diagnostika a vyhodnocovanie,*
- *virtuálna/rozšírená realita,*
- *umelá inteligencia,*
- *ovládanie robotov a dronov*.

Ďalšou významnou oblasťou dopadu nových technológií v doprave, ako časti sektora doprava, logistika, poštové služby, je digitalizácia a využívanie nových zariadení v procese komunikácie so zákazníkmi. Verejná doprava tvorí silný pilier v preprave cestujúcich v podmienkach Slovenskej republiky. Dopad digitalizácie v najbližších rokoch povedie k zvýšeniu potreby, aby pracovníci v doprave ako aj ich zákazníci komunikovali s novými typmi zariadení a strojov. Poskytovanie poradenských služieb v oblasti cestovania, prepravných poriadkov, resp. rezervovania lístkov prostredníctvom online chatu alebo telefónu sú len malou ukážkou vplyvu digitalizácie už v súčasných podmienkach. Očakávaný je potenciál využitia robotov v oblasti zákazníckeho servisu, ktoré budú schopné poskytovať služby ako sú lístky, občerstvenie alebo stravovanie. Kontextové aplikácie v spojení s informačnými sieťami a rozšírenou realitou môžu poskytnúť informácie na požiadanie pre podporu konkrétnych úloh.

Najväčší potenciál ohrozenia pracovných miest nástupom uvedeného trendu sa týka pracovných miest s nízkou kvalifikáciou, kde sa opakuje predvídateľná fyzická činnosť. Medzi oblasti s možným znížením pracovných miest sú napr.:

- *činnosti pomocnej prevádzky,*
- *pokladničné činnosti*.

Aby sme demonštrovali vplyv zavádzania nových technológií a inovácií priamo v doprave, v nižšie uvedenej ukážke si vyhodnotíme potenciálne ohrozenie vybranej pracovnej pozície. Pre účely tohto vyhodnotenia sme si zvolili zamestnanie Pokladník a predavač lístkov vo verejnej osobnej doprave, ktorý má v rámci národnej klasifikácie zamestnaní SK ISCO-08 číselné označenie 5230004. Vyššie uvádzané technologické zmeny v oblasti digitalizácie budú mať s najvyššou pravdepodobnosťou silný vplyv na ohrozenie nízko kvalifikovaných pozícií, akými je aj pozícia pokladníka a predavača lístkov vo verejnej osobnej doprave. Jedným z najvyšších vplyvov digitalizácie a automatizácie pri tejto pracovnej pozícii môže byť náhrada ľudskej pracovnej sily robotmi a automatmi, ktoré budú môcť poskytnúť plný servis zákazníkom.

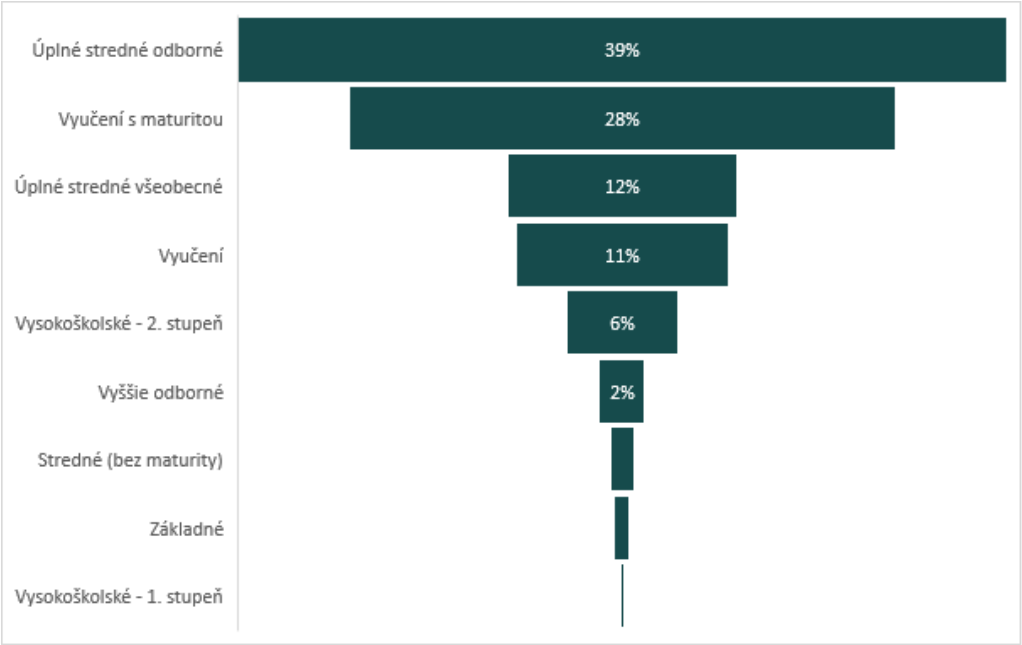
Pre účely vyhodnotenia vybraného zamestnania sme si zvolili 3 hlavné prvky štruktúry:

- *vzdelanostná úroveň zamestnancov pracujúcich na predmetnej pozícii*
- *veková štruktúra osôb pracujúcich na predmetnej pozícii*
- *miesto vykonávania pracovnej pozície v členení podľa krajov.*

Celkový počet aktuálne pracujúcich zamestnancov na pozícii Pokladník a predavač lístkov vo verejnej osobnej doprave je 910. Priemerná mesačná hrubá mzda je u týchto zamestnancov na úrovni 949 EUR. Priemerný vek zamestnancov na tejto pozícii je 49 rokov.

Vzdelanostná úroveň pracovníkov na tejto pozícií má nasledovnú štruktúru a zastúpenie:

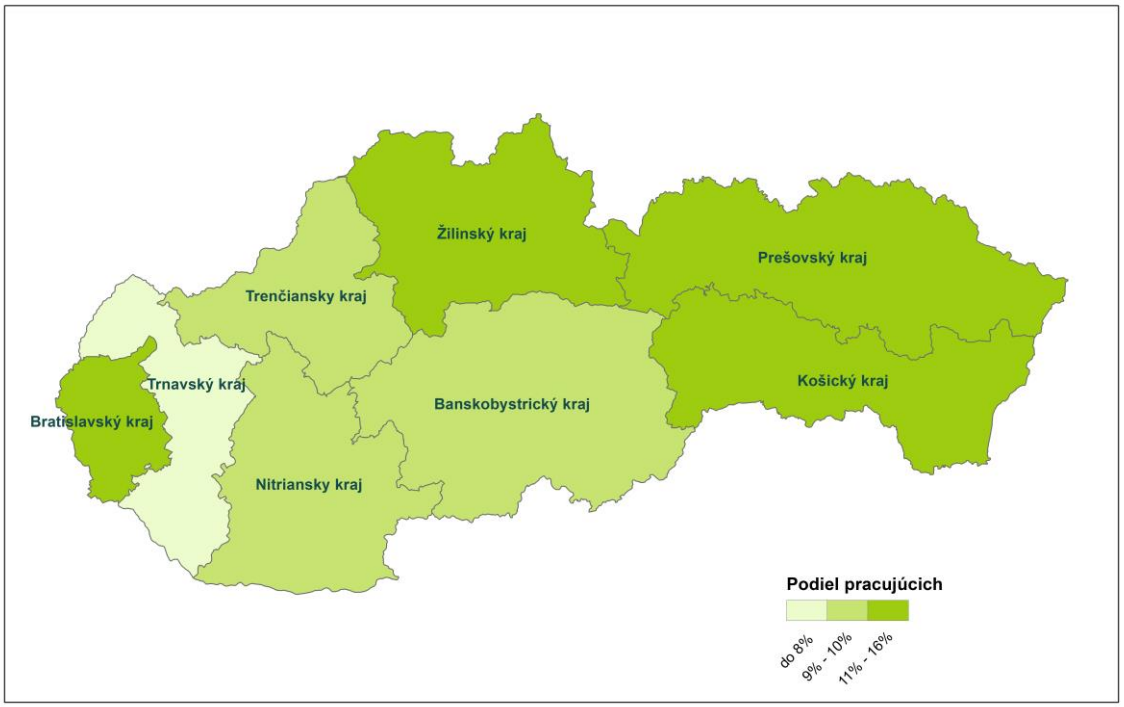
**Graf 1: Štruktúra vzdelanostnej úrovne pracovníkov na pozícii Pokladník a predavač lístkov vo verejnej osobnej doprave**




Zdroj: výpočty TREXIMA Bratislava, ISCP (MPSVR SR) 1-04
Obdobie: rok 2019

Najvyšší počet pracovníkov v zamestnaní Pokladník a predavač lístkov vo verejnej osobnej doprave je v Žilinskom a Bratislavskom kraji. Spolu tvoria podiel približne 32 %. Naopak, najnižší počet osôb zamestnaných na tejto pozícii je v Trnavskom kraji.

**Obrázok 1: Štruktúra pracovníkov na pozícii Pokladník a predavač lístkov vo verejnej osobnej doprave**

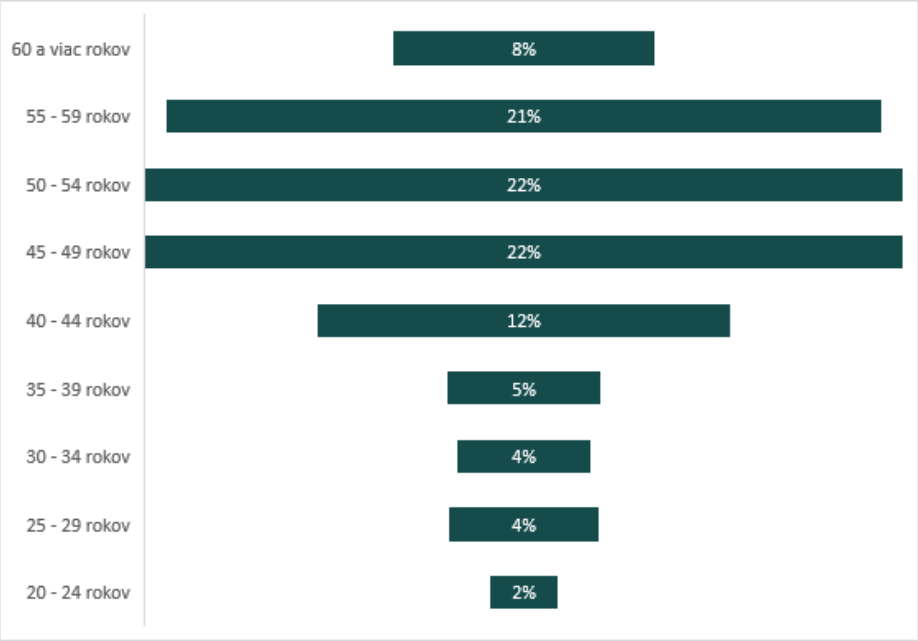



Zdroj: výpočty TREXIMA Bratislava, ISCP (MPSVR SR) 1-04
Obdobie: rok 2019

Vplyv nových technológií bude mať výrazný dopad na ľudskú prácu. Obavy o zánik niekoľko miliónov pracovných miest celosvetovo sa môžu naplniť počas najbližších rokov. Najviac budú týmito zmenami postihnutí tí zamestnanci, ktorí sa nedokážu včas prispôsobiť zmenám. Vek zohráva v tejto oblasti dôležitú úlohu.

Viac ako 60 % všetkých zamestnaných osôb na pozícií Pokladník a predavač lístkov vo verejnej osobnej doprave má vek vyšší ako 45 rokov. V prípade vplyvu automatizácie na znižovanie počtu pracovných miest v tomto zamestnaní je potrebné počítať aj s veľkou skupinou pracovníkov, ktorí do niekoľkých rokov odídu do dôchodku. Ostáva ale vyriešiť využitie mladšej pracovnej sily, ktorá bude musieť nájsť nové uplatnenie, prípadne sa dodatočne vzdelávať, aby splnila nové požiadavky.

**Graf 2: Veková štruktúra zamestnancov na pozícii Pokladník a predavač lístkov vo verejnej osobnej doprave**




Zdroj: výpočty TREXIMA Bratislava, ISCP (MPSVR SR) 1-04
Obdobie: rok 2019

Podobné dopady automatizácie sú očakávané aj v logistike, kde je predpokladané zvýšenie najmä cestnej dopravy prostredníctvom bezpečnostných systémov do nových dopravných prostriedkov. Nasadenie inteligentných dopravných systémov, dopravná výchova a vzdelávanie budú rozhodujúce k dosiahnutiu vízie „dopravné nehody bez smrteľných následkov“. V tejto oblasti najmä v mestách môže výrazne pomôcť aplikácia Smart City riešení. Do budúcnosti je potrebné počítať aj s autonómnymi nákladnými vozidlami. Logistika 4.0 výrazne ovplyvní aj technológiu cestnej nákladnej dopravy. Predpokladaný vplyv na ľudské zdroje bude zachytený najmä v oblasti vytvárania pracovných miest pre inžinierov zameraných na inteligentné dopravné systémy a Smart City.

V oblasti poštových služieb je v podmienkach Slovenskej republiky predpokladané smerovanie sektoru v nasledujúcich oblastiach:

- rozvoj elektronického obchodu generujúci narastajúci objem zásielok s obsahom tovaru s požiadavkou kvalitného zabezpečenia ich fyzického dodávania a atraktívnymi pridanými hodnotami,
- elektronizácia poštových služieb využitím mobilnej platformy,
- automatizácia a robotizácia v poštových službách s cieľom zavedenia automatizovaných poštových terminálov na podanie alebo vyzdvihnutie zásielok, využívanie bezobslužných zariadení, autonómnych vozidiel, dronov a kuriérskych robotov pre doručovanie zásielok. Automatizácia a robotizácia si bude vyžadovať vznik nových typov odborných profesií s potrebou digitálnych zručností. V modernej ekonomike a v podmienkach digitálnej transformácie bude kľúčovým aj dostatok digitálne zručných pracovníkov a IT špecialistov, zamestnancov pre zabezpečenie údržby a funkčnosti zariadení.

## 4. ZÁVER

Prostredie, v ktorom sú poskytované dopravné služby sa dynamicky mení a klasické služby a výkony sa musia, v záujme udržania ich trvalého rozvoja, prispôsobovať novému trendu vývoja. Zásadný význam má v tejto súvislosti prudký rozvoj informačno-komunikačných technológií, a osobitne rozvoj elektronizácie, automatizácie a robotizácie. Na druhej strane však tieto technológie pozitívne podporujú zavádzanie nových služieb, zefektívňujú procesy a prinášajú nové inovačné smery, ktoré lepšie zodpovedajú meniacim sa potrebám zákazníkov.

Vznik nových vyspelých technológií, ako je robotika, umelá inteligencia, výrazne mení charakter pracovných miest. Podľa OECD až 46 % pracovných miest čelí vysokému riziku automatizácie alebo podstatných zmien. Rutinné úlohy sa čoraz viac stávajú automatizovanými, zatiaľ čo novovytvorené pracovné miesta si vyžadujú rôzne kompetencie. Chýbajú high-tech zručnosti.

Dopad na ľudské zdroje bude vplyvom novej priemyselnej revolúcie výrazný. Práca, ako ju poznáme dnes, už nemusí byť rovnaká v budúcnosti. Hrozby o zrušení niekoľko miliónov pracovných pozícií vplyvom novej priemyselnej revolúcie sa striedajú s očakávaniami z minulosti, kedy každá priemyselná revolúcia priniesla zánik vybraných pracovných pozícií, ale na druhej strane vznik nových pozícií s požiadavkou na vyššiu kvalifikáciu. Zásadné vplyvy novej revolúcie môžeme sledovať v oblastiach automatizácie, robotizácie, elektronizácie, ktorá sa dotkne všetkých sektorov. Jednotlivé odvetvia v národnom hospodárstve budú musieť medzi sebou spolupracovať viac ako kedykoľvek predtým. Ich prepojiteľnosť napr. z dôvodu zvyšujúcej sa využiteľnosti informačných technológií bude silnejšia.

Do súčasnosti bol zaužívaný pracovný systém zložený z týchto krokov:

- rozvíjanie zručností v primárnom, sekundárnom a terciárnom vzdelávaní
- využitie týchto zručností len v jednom sektore
- dôchodok

Vplyvom technologických zmien a zmien v spoločnosti sa táto štruktúra mení nasledovne:

- rozvíjanie zručností prebieha nie len počas prvej časti života (v škole), ale prebieha počas celého života
- vzdelanie je doplnené o „vzdelávanie v rannom detstve“ – „Early Chidlhood education and care)
- efektívne využívanie zručností – nie len v jednom sektore v jednom zamestnaní, ale počas pracovného života využiť svoje zručnosti vo viacerých zamestnaniach a sektoroch – „Multiple jobs, multiple sectors“.

Najväčší potenciál ohrozenia pracovných miest nástupom uvedených trendov v doprave a súvisiacich službách sa bude týkať pracovných miest s nízkou kvalifikáciou, kde sa opakuje predvídateľná fyzická činnosť, resp. oblasť poskytovania služieb zákazníkom a spracovanie údajov. Bude potrebné rekvalifikovať zamestnancov, najmä prevádzkových zamestnancov na nové modely koordinácie a riadenia prepravy, rozširovať im IT gramotnosť na nevyhnutnú úroveň, aby mohli zvládať nové požiadavky.

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# VNÍMANIE PERSONÁLNYCH A BEZPEČNOSTNÝCH RIZÍK MALÝMI A STREDNÝMI PODNIKMY NA SLOVENSKU V ČASE PRIEMYSELNEJ REVOLÚCIE INDUSTRY 4.0

# PERCEPTION OF PERSONNEL AND SAFETY RISKS BY SMES IN SLOVAKIA AT THE TIME OF THE INDUSTRIAL REVOLUTION INDUSTRY 4.0

***Mária HUDÁKOVÁ***[39]
***Matej MASÁR***[40]
***Daniel BREZINA***[41]

**Abstrakt:** *V súčasnosti sú častou hrozbou kybernetické útoky, ktoré ohrozujú informačné systémy v podniku. To má vplyv na implementáciu prvkov koncepcie Industry 4.0, ktorá je v mnohých prípadoch riadená umelou inteligenciou, využívaním IT technológií a čoraz väčším objemom dát. V mnohých prípadoch už ani samotné antivírusové programy nie sú schopné zachytiť všetky hrozby. Ďalšou možnou hrozbou pri implementácií koncepcie Industry 4.0 je nedostatočná kvalifikačná úroveň zamestnancov. Súčasné podmienky pracovného trhu poukazujú aj na nedostatočné vedomosti a znalosti z oblasti bezpečnosti a právnych predpisov jednotlivých majiteľov a manažérov MSP. Autormi príspevku bol v rokoch 2017-2018 realizovaný empirický výskum orientovaný na posúdenie aktuálnej situácie MSP vo vzťahu k možným rizikám a hrozbám podnikateľského prostredia na Slovensku. Súčasťou výskumu bolo aj zhodnotiť personálne a bezpečnostné prostredie ovplyvňujúce efektívne riadenie MSP na Slovensku.* ***Hlavným cieľom článku*** *je na základe vybraných matematických a štatistických metód posúdiť závislosť vnímaných personálnych a bezpečnostných rizík majiteľmi malých a stredných podnikov od veľkosti ich podniku. Na základe spracovaných výsledkov z empirického výskumu je možné navrhnúť koncepciu kľúčových predmetov obsahu vzdelávania v novom študijnom programe Manažment rizík (Prevencia podnikových kríz) pre bakalárske štúdium na Fakulte bezpečnostného inžinierstva Žilinskej univerzity (FBI UNIZA) na Slovensku. Z výsledkov výskumu vyplýva, že majitelia a manažéri podnikov neposkytujú dostatočné vzdelanie v oblasti manažmentu rizík a neprejavujú veľký záujem o tento typ školenia v oblasti personálnych a bezpečnostných rizík. Je potrebné presvedčiť majiteľov a manažérov, aby venovali zvýšenú pozornosť aplikácii manažmentu rizík. Včasným rozpoznaným hrozieb a z nich vyplývajúcich rizík podniky dokážu efektívnejšie zvládať implementáciu koncepcie prvkov Industry 4.0 a zároveň posilniť konkurencieschopnosť či zvýšiť výkonnosť podniku.*

**Kľúčové slová:** *riziká, manažment rizík, MSP, prostredie, vzdelávanie, Industry 4.0*

**Abstract:** *Actually are cyber-attacks the most frequent threat, which attacks information systems in enterprises. Cyber-attacks have an impact on the implementation of the Industry 4.0 concept, which is driven in many cases by artificial intelligence, the use of IT technology and increasingly large amounts of data. In many cases, antivirus programmes are not able to detect all threats. Another possible threat in the implementation of the Industry 4.0 concept is the lack of qualifications employees. The current labor market situation point to a lack of knowledge SMEs owners and managers gathered from the safety and legislation area. In the years 2017-2018, the authors of the paper realized empirical research aimed at assessing the current situation of SMEs in business environment, which was focused on enterprise risk management. The research also assesses the influence of personnel and security risk to enterprises in Slovakia.* ***The main aim of the article*** *is to assess the dependence of perceived personnel and security risks by the owners of small and medium-*

[39] Doc. Ing. PhD., Katedra krízového manažmentu Fakulty bezpečnostného inžinierstva na Žilinskej univerzite v Žiline, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: maria.hudakova@fbi.uniza.sk
[40] Ing., Katedra krízového manažmentu Fakulty bezpečnostného inžinierstva na Žilinskej univerzite v Žiline, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: matej.masar@fbi.uniza.sk
[41] Ing., Katedra krízového manažmentu Fakulty bezpečnostného inžinierstva na Žilinskej univerzite v Žiline, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: daniel.brezina@fbi.uniza.sk

*sized enterprises on the size of their business on the basis of selected mathematical and statistical methods. Based on the processed results from empirical research, propose a concept of key subjects of educational content in the new study program Risk Management (Prevention of Enterprise Crises) for bachelor studies at the Faculty of Security Engineering of the University of Žilina (FBI UNIZA) in Slovakia. Research shows that business owners and managers do not provide sufficient education in risk management and show little interest in this type of personnel and security risk training. Owners and managers need to be persuaded to pay increased attention to risk management applications. By identifying early threats and the resulting risks, businesses can more effectively manage the implementation of the Industry 4.0 concept while enhancing competitiveness and improving business performance.*

**Key words:** *risk, risk management, SME, environment, education, Industry 4.0*

**JEL Classification:** *L64, M11, J50, M54*

## 1. ÚVOD

Súčasné podnikateľské prostredie je charakteristické turbulentnými a dynamickými zmenami regionálneho i globálneho charakteru. Sprievodným javom týchto zmien je nárast zdrojov možných kríz, ktoré ovplyvňujú podnikové procesy vrátane obsahu a spôsobov ich riadenia (Nedeliakova a kol., 2018; Kordoš, Habánik, 2018). Vedľa tradičných podnikateľských rizík sa objavujú nové hrozby, viac či menej predvídateľné, súvisiace s prírodnými katastrofami, klimatickými zmenami, ako aj politickými a sociálnymi rizikami (Turekova a kol., 2016). Mení sa aj vnímanie rastu úrovne rizík. Okrem vplyvu zmien na rastúci počet zdrojov ohrození, na rastúci počet neistých predpovedí a na prejavy tzv. nežiaducich prekvapení je to i rastúce uvedomovanie si nebezpečnosti podceňovania rizík majiteľmi a manažérmi (Holla a kol., 2017). Tieto skutočnosti v poslednom desaťročí významne determinujú správanie manažérov, ktorí sú nútení viac sa zaoberať otázkami manažmentu rizika (Luskova, Buganova, 2011). Zvyšujú sa požiadavky na ich pripravenosť identifikovať, analyzovať riziká a na ich schopnosť zvyšovať odolnosť podniku v podmienkach neočakávaných zmien (Fraser, Simkins, 2016).

V roku 2017 spracovala spoločnosť Allianz Global Corporate & Speciality (AGCS) v poradí šiesty prieskum zameraný na **identifikáciu podnikateľských rizík vo svete**, ktorého sa zúčastnilo viac ako 1200 odborníkov z oblasti manažmentu rizika z viac ako 50 krajín sveta. Medzi **10 najzávažnejších rizík** malých a stredných podnikoch patrili (Allianz Risk Barometer, 2017): prerušenie prevádzky, negatívny vývoj na trhu, kybernetické hrozby, prírodné katastrofy, zmeny právnych predpisov, makroekonomické vplyvy, požiare, politické riziká, poškodenie dobrého mena, rýchla morálna amortizácia zariadení v dôsledku vývoja nových technológií.

S čoraz širším rozsahom zavádzania koncepcie Industry 4.0 do jednotlivých podnikových procesov sa v podnikateľskom prostredí začína častejšie vyskytovať aj **riziko nevhodnej interpretácie údajov**. Podniky pracujú v súčasnom prostredí s mnohými údajmi, ktoré však nevedia efektívne vyhodnotiť, posúdiť ich relevantnosť a vhodným spôsobom spracovať tak, aby ich dokázali využiť vo svoj prospech (Kampova a kol., 2018).

Aj v roku 2018 spoločnosť Allianz Global Corporate & Speciality (AGCS) spracovala podobne ako v predošlých rokoch, prieskum zameraný na **identifikáciu najzávažnejších rizík**, ich zdrojov, ktoré majú najväčší vplyv na podnikanie. Prieskumu sa zúčastnilo viac než 1911 podnikov z viac než 80 krajín z celého sveta, z 22 podnikateľských sektorov. Medzi 10 najzávažnejších rizík, ktoré pociťujú majitelia a manažéri podnikov, patria (Allianz Risk Barometer, 2018): prerušenia prevádzky (podnikania), kybernetické hrozby (útoky), prírodné

katastrofy, negatívny vývoj na trhu (výkyvy, silná konkurencia, stagnácia na trhu), zmeny právnych predpisov, požiare, rýchly výskum a vývoj nových technológií, strata dobrého mena, politická nestabilita a neistota, klimatické zmeny.

Podľa prieskumu Allianz Risk Barometer (2018) majitelia a manažéri podnikov očakávajú v budúcnosti nasledujúce riziká:

- **Nedostatok kvalifikovanej pracovnej sily** – koncepcia Industry 4.0 vytvára nové možnosti práce s technológiami, ktoré v súčasnosti mnoho zamestnancov neovláda. Práve preto ich použitie v podniku, hlavne vo výrobnom procese, môže predstavovať riziko v podobe nedostatku skúseností a znalostí zamestnancov s potrebnými technológiami.
- **Neschopnosť interpretovať údaje** – v súčasnosti je v podnikateľskom prostredí trend digitalizácie, s ktorým nevyhnutne súvisí aj vysoký objem dát, ktorým treba prispôsobiť jednotlivé informačné systémy a vhodne ich nastaviť na čo najlepšiu interpretáciu, selekciu a vyhodnotenie jednotlivých údajov.
- **Vysoká fluktuácia zamestnancov** – predpokladá sa boj o kvalifikovanú pracovnú silu. Kvalifikovaní zamestnanci budú meniť prácu v dôsledku sociálnych výhod, ktoré im podnik, resp. konkurent ponúkne.
- **Chyby umelej inteligencie** – v súčasnosti sa umelá inteligencia dostáva do popredia, využíva sa hlavne vo výrobných procesoch, ale predstavuje rôzne riziká v podobe mnohých zlyhaní.
- **Zaostalosť v tzv. „smart výrobách“** – v súčasnosti úspešné podniky zavadzajú nový trend „smart výroby“, kedy výroba prebieha kompletne na tzv. smart zariadeniach, ktoré sú zároveň aj samoučiace. Riziko spočíva v ich možnom prestavení v dôsledku nekalého konkurenčného boja.
- **Rýchla amortizácia zariadení spôsobená nástupom autonómnych strojov a zariadení** – zariadenia strácajú na hodnote v dôsledku rýchleho výskumu a vývoja nových technológií, pričom ich finančná náročnosť pri obstarávaní nedovoľuje dosahovať návratnosť investície.

## 2. CIEĽ A METODOLÓGIA

**Hlavným cieľom článku** je na základe vybraných matematických a štatistických metód posúdiť závislosť vnímaných personálnych a bezpečnostných rizík majiteľmi malých a stredných podnikov od veľkosti ich podniku. Na základe spracovaných výsledkov z empirického výskumu je možné navrhnúť koncepciu kľúčových predmetov obsahu vzdelávania v novom študijnom programe Manažment rizík (Prevencia podnikových kríz) pre bakalárske štúdium na Fakulte bezpečnostného inžinierstva Žilinskej univerzity (FBI UNIZA) na Slovensku.

V roku 2017 - 2018 bol riešiteľmi projektu VEGA No. 1/0560/16 Manažment rizík malých a stredných podnikov na Slovensku ako prevencia podnikových kríz v rámci podpory Vedeckej grantovej agentúry Ministerstva školstva, vedy, výskumu a športu Slovenskej republiky, zrealizovaný empirický výskum zameraný na identifikáciu podnikateľských rizík malých a stredných podnikov na Slovensku a zistenie súčasného stavu aplikácie manažmentu rizík v podnikoch. Celkovo sa výskumu zúčastnilo 487 malých a stredných podnikov na Slovensku. Z pohľadu odvetvia, v ktorom malé a stredné podniky pôsobili tvorilo: priemysel 16 %, obchod 24 %, pôdohospodárstvo 1 %, stavebníctvo, 12 %, doprava, informácie 6 %, ubytovanie, stravovanie 9 %, obchodné služby 7 %, ostatné služby 22 %, iné služby 3 %.

Z celkového počtu MSP tvorilo: 64 % mikropodnikov, 24 % malých podnikov, 12 % stredných podnikov (Hudakova, Masar, 2018).

Zo spracovaných výsledkov prieskumu bola **posúdená závislosť medzi identifikovanými rizikami a veľkosťou podniku**, tzn. do akej miery závisí, resp. nezávisí druh vnímaného rizika od veľkosti podniku na Slovensku. Podniky boli rozdelené do troch skupín podľa veľkosti podniku: mikropodnik do 10 zamestnancov, malý podnik do 50 zamestnancov, stredný podnik do 250 zamestnancov. Potrebné údaje na výpočet analýzy rozptylu sú uvedené v tab. 1 (Hudakova a kol. 2018).

Základné štatistické charakteristiky na výpočet analýzy rozptylu (ZŠCH) boli stanovené:

$\mu$ – priemerná intenzita rizika,
$\sigma$ – štandardná odchýlka intenzity rizika,
$\kappa$ – špicatosť intenzity rizika,
$\sigma\chi$ – intenzita rozptylu rizika.

**Tab. 1: Základné štatistické charakteristiky jednotlivých rizík v stanovených troch skupinách MSP podľa veľkosti podniku**

| Riziká | BSCs | Mikropodnik | Malý | Stredný |
|---|---|---|---|---|
| **Bezpečnostné riziká** | M | 30,640 | 25,650 | 28,462 |
| | Σ | 0,166 | 0,134 | 0,121 |
| | K | 2,110 | 0,965 | 3,001 |
| | Σχ | 0,024 | 0,028 | 0,034 |
| **Personálne riziká** | M | 32,950 | 32,220 | 30,741 |
| | Σ | 0,169 | 0,027 | 0,182 |
| | K | 3,771 | -0,397 | 3,001 |
| | Σχ | 0,018 | 0,027 | 0,035 |

Zdroj: vlastné spracovanie

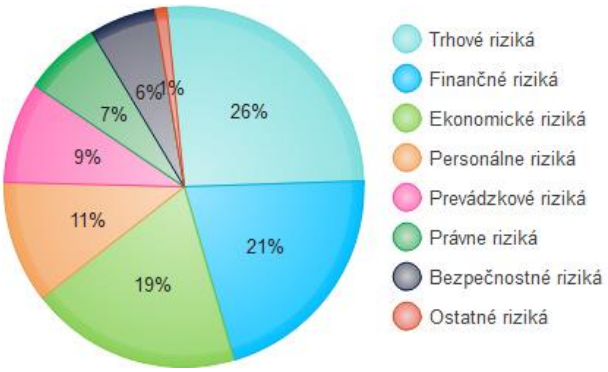
Jednotlivé závislosti boli posúdené využitím štatistických metód, t. j. analýzou rozptylu pomocou kvantitatívnych nástrojov štatistiky: Barletovho testu (test homoskedasticity), Kolmogorov-Smirnovho testu (test normality), F-testu (test p-value). **Analýza rozptylu** bola stanovená buď parametrickým alebo neparametrickým testom. Pre výpočet parametrickým testom museli byť splnené dve základné podmienky a to, že výsledná p – hodnota intenzity rizika z testu homoskedasticity (teda identickosť rozptylov) a z testu na overenie normality intenzít rizík, musí byť vyššia ako zvolená hladina významnosti 0,05.

## 3. VÝSLEDKY

Oslovení majitelia a manažéri MSP na Slovensku mali určiť z výberu siedmych podnikateľských rizík maximálne tri riziká, ktoré považujú za najzávažnejšie vo svojom podnikaní. Z celkového počtu 487 oslovených MSP bola stanovená absolútna početnosť identifikovaných kľúčových rizík MSP na Slovensku a **identifikované boli tieto najzávažnejšie riziká** (obr.1), (Hudakova, Masar, 2018):

1. trhové riziká 26 %,
2. finančné riziká 21 %,
3. ekonomické riziká 19 %,
4. personálne riziká 11 %,
5. prevádzkové riziká 9 %,
6. právne riziká 7 %,
7. bezpečnostné riziká 6 % a 1 % tvorili ostatné riziká.

**Obr. 1: Percentuálny podiel identifikovaných podnikateľských rizík MSP na Slovensku**




Zdroj: vlastné spracovanie

V rámci tohto príspevku sme poroznosť zamerali na posúdenie personálnych a bezpečnostných rizík MSP na Sovensku.

**Personálne riziká** sú v súčasnom podnikateľskom prostredí mnohokrát podceňované, potvrdzujú to aj výsledky autorov Urbancová a Hudáková (2015). Potvrdzujú to aj výsledky výskumu, v ktorom boli personálne riziká identifikované ako štvrté najzávažnejšie riziká MSP. Manažéri a majitelia MSP najčastejšie vnímajú ako zdroje personálnych rizík:

- nedostatočnú kvalifikáciu zamestnancov,
- vysokú fluktuáciu zamestnancov,
- pokles pracovnej morálky,
- nedostatočnú disciplínu a chyby zamestnancov, atď.

Ako posledné boli vyhodnotené **bezpečnostné riziká**. Aj keď sú v prieskume na poslednom mieste, podľa Veľasa (2017) stále pretrváva rastúci trend zvyšovania bezpečnosti v celom podniku, či už z pohľadu prostredia, procesov alebo informácií. Manažéri a majitelia MSP najčastejšie vnímajú ako zdroje bezpečnostných rizík:

- havárie,
- vonkajšie hrozby,
- majetkovú trestnú činnosť,
- zneužitie informácií, atď.

### *3.1 Posúdenie závislosti vnímaných rizík malých a stredných podnikov na Slovensku od veľkosti podniku*

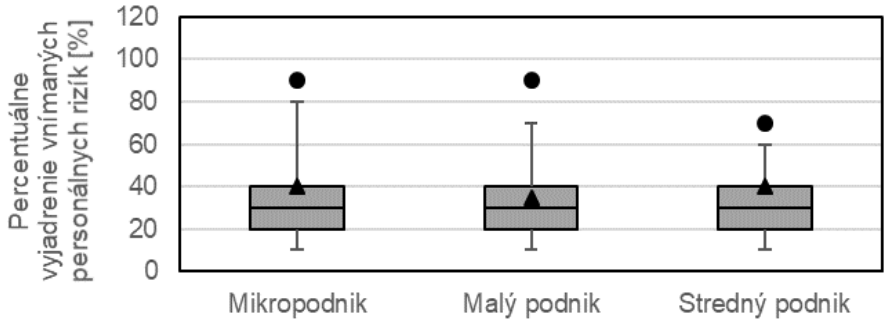
Súčasťou výskumu bolo aj zhodnotiť **personálne prostredie** ovplyvňujúce efektívne riadenie MSP na Slovensku. Na základe Barletovho testu homoskedasticity (p-value = 0,392) možno považovať hlavný predpoklad naplnenie homoskedasticity za splnený. Taktiež bola na základe vykonania Kolmogorovho-Smirnovho testu splnená i normalita skúmaného súboru. Hodnoty testu boli: pre mikropodniky - 0,112; malé podniky - 0,209 a stredné podniky - 0,225.

**Tab. 2: Analýza rozptylu intenzity personálnych rizík MSP použitím F-testu**

| Zdroj variability | Suma štvorcov | df | MS | F-ratio | p-value |
|---|---|---|---|---|---|
| Medzi skupinami | 1,024963 | 2 | 0,0051 | 1,1035 | 0,0435 |
| Vo vnútri skupín | 424,3923 | 148 | 0,0287 | | |
| Spolu | 425,4172 | 150 | | | |

Zdroj: vlastné spracovanie

**Obr. 2 Výsledky grafického znázornenia závislosti vnímaných personálnych rizík od veľkosti podniku použitím Box and Whisker**




Zdroj: vlastné spracovanie

Po vykonaní analýzy rozptylu intenzity personálnych rizík MSP v podmienkach Slovenskej republiky použitím parametrického F-testu, ktorý je 0,0435 (tab. 2), je možné považovať údaje za štatisticky významné, nakoľko je hodnota nižšia ako zvolená hladina významnosti (0,05). Na základe uvedeného je možné zhodnotiť, že exituje závislosť medzi intenzitou personálnych rizík, ktoré MSP vnímajú, a veľkosťou podniku na hranici spoľahlivosti 95 % (obr. 2). Počet zamestnancov má vplyv na veľkosť personálnych rizík. S uvedenými závermi sa stotožňujú aj autori Haviernikova, Kordos (2019) a Kormancova (2014).

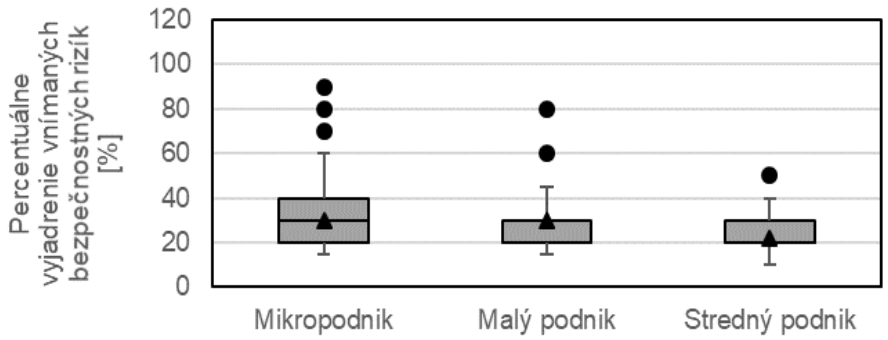
Súčasťou výskumu bolo zhodnotiť aj **bezpečnostné prostredie** ovplyvňujúce efektívne riadenie MSP na Slovensku. Na základe Barletovho testu homoskedasticity (p-value = 0,427) možno považovať hlavný predpoklad naplnenie homoskedasticity za splnený. Taktiež bola na základe vykonania Kolmogorovho-Smirnovho testu splnená i normalita skúmaného súboru. Hodnoty testu boli: pre mikropodniky - 0,173; malé podniky - 0,163 a stredné podniky - 0,097.

**Tab. 3 Analýza rozptylu intenzity bezpečnostných rizík MSP použitím F-testu**

| Zdroj variability | Suma štvorcov | df | MS | F-ratio | p-value |
|---|---|---|---|---|---|
| Medzi skupinami | 3,8711 | 2 | 0,0194 | 65,3715 | 0,0708 |
| Vo vnútri skupín | 184,1530 | 80 | 0,0230 | | |
| Spolu | 188,0241 | 82 | | | |

Zdroj: vlastné spracovanie

**Obr. 3 Výsledky grafického znázornenia závislosti vnímaných bezpečnostných rizík od veľkosti podniku použitím Box and Whisker**




Zdroj: vlastné spracovanie

Po vykonaní analýzy rozptylu intenzity bezpečnostných rizík MSP v podmienkach Slovenskej republiky použitím parametrického F-testu, ktorý je 0,071 (tab. 3), je možné považovať údaje

za štatisticky nevýznamné, nakoľko je hodnota vyššia ako zvolená hladina významnosti (0,05). Na základe uvedeného je možné skonštatovať, že nie je závislosť medzi intenzitou bezpečnostných rizík, ktoré MSP vnímajú a veľkosťou podniku na hranici spoľahlivosti 95 % (obr. 3). Výsledok testu možno považovať za správny, nakoľko bezpečnostné prostredie malých a stredných podnikov na Slovensku je tvorené viacerými rovnakým faktormi, ktoré nemajú vplyv na veľkosť podniku. S uvedenými závermi sa stotožňujú aj autori Haviernikova, Kordos (2019) a Kormancova (2014).

Z uvedeného prieskumu vyplývajú ďalšie zistenia z pohľadu manažmentu rizík v malých a stredných podnikoch na Slovensku:

- v 61% MSP, ktoré sa na prieskume zúčastnilo, je zodpovedný za riadenie rizík práve majiteľ podniku,
- 44% MSP nevytvára priestor na diskusiu ohľadom kľúčových rizík v podniku, iba 20% MSP diskutuje ohľadom kľúčových rizík na mesačnej báze,
- až 89% MSP nemajú vytvorený v podniku katalóg rizík, najviac podnikov, ktoré vytvára katalóg rizík sú práve stredné podniky 37%, v malých podnikoch len 12% a v mikropodnikoch len 5%.
- iba 42% stredných podnikov sa zaoberajú hľadaním príčin vzniku rizík, malé podniky hľadajú príčinu rizík len pri najzávažnejších rizikách, podobne ako i mikropodniky,
- iba 54% stredných podnikov zohľadňuje pri stanovení hodnoty rizika možné následky rizika a pravdepodobnosť ich vzniku.
- viac ako 66 % majiteľov a manažérov MSP nevzdeláva zamestnancov v oblasti manažmentu rizík. Viac než 24 % nemá časový priestor na školenie v oblasti manažmentu rizík, súčasne rovnaký počet majiteľov a manažérov MSP považuje tieto školenia za zbytočné. Pravidelne školí svojich zamestnancov len 16 % MSP na Slovensku.
- 49 % majiteľov a manažérov MSP by uvítalo školenie v oblasti manažmentu rizík. Najväčší záujem prejavili MSP o komplexné školenie v oblasti manažmentu rizík, t. j. 24 % a naopak najmenší záujem prejavili o aplikáciu metód, techník a nástrojov riadenia rizík. Školenie zahrnujúce riadenie špecifických rizík (projektových, finančných, bezpečnostných atď.) by uvítalo len 19 % majiteľov a manažérov MSP na Slovensku.

### *3.2 Návrh koncepcie štuijných predmetov nového študijného programu Manažment rizík (Prevencia podnikových kríz)*

Na Fakulte bezpečnostného inžinierstva Žilinskej univerzity v Žiline (FBI UNIZA) na Slovensku a podobne ako aj na iných fakultách ekonomického alebo manažérsko-technologického zamerania sa problematika manažmentu rizika objavuje vo vybraných predmetoch študijného programu krízový manažment (Buganova, Luskova, 2015). Najmä po poslednej akreditácii na FBI UNIZA sa dôraznejšie začali podporovať predmety zamerané na teóriu a prax manažmentu rizík v podniku (FBI, 2019).

Z toho vznikla potreba vytvoriť nový študijný program Manažment rizík (Prevencia podnikových kríz), ktorý rešpektuje súčasné celosvetové trendy z podnikového riadenia, vysokoškolského vzdelávania, ale aj požiadaviek z praxe. V tabuľke 1 je uvedený návrh koncepcie predmetov obsahu vzdelávania nového študijného programu Manažment rizík (Prevencia podnikových kríz) na FBI UNIZAna Slovensku určeného pre bakalárske štúdium.

**Tabuľka 4: Návrh koncepcie predmetov študijného programu Manažment rizík**

| Predmety | | |
|---|---|---|
| **1. rok** | **Zimný semester** | **Letný semester** |
| **Povinné predmety** | Ekonomika<br>Matematika<br>Inžinierska geometria<br>Základy technických vied | Podniková ekonomika<br>Manažment<br>Manažérska štatistika<br>Aplikovaná informatika |
| **Povinne voliteľné predmety** | Úvod do štúdia<br>Právo<br>Bezpečnosť a ochrana zdravia pri práci | Marketing<br>Strategický manažment<br>Reputačný manažment |
| **2.rok** | | |
| **Povinné predmety** | Manažment rizík<br>Finančný manažment (finančné riziká, systémy včasného varovania)<br>Ekonomické analýzy (ekonomické riziká)<br>Softvérová podpora v manažmente rizík 1 | Metódy a techniky manažmentu rizík<br>Manažment kvality (riziká ovplyvňujúce kvalitu)<br>Výrobný manažment (riziká vyplývajúce z výroby, BOZP, logistiky)<br>Bezpečnosť prevádzky (havárie, environmentálne riziká, riziká požiaru) |
| **Povinne voliteľné predmety** | Manažment zmeny<br>Kontroling<br>Svetová ekonomika<br>Cudzí jazyk 1 | Inžinierstvo spoľahlivosti<br>Manažment zmeny<br>Spoľahlivosť ľudského faktora<br>Cudzí jazyk 2 |
| **3. rok** | | |
| **Povinné predmety** | Manažment kontinuity činností<br>Operačná analýza (riziká pri rozhodovaní manažérov)<br>Projektové riadenie (projektové riziká)<br>Personálny manažment (personálne riziká) | Krízový manažment v podniku<br>Stratégie riadenia podnikových kríz<br>Manažérske informačné systémy (informačné riziká)<br>Seminár k bakalárskej práci<br>Obhajoba bakalárskej práce |
| **Povinne voliteľné predmety** | Poisťovníctvo<br>Osobnosť krízového manažéra (krízová komunikácia)<br>Podniková kultúra a organizačné správanie<br>Cudzí jazyk 3 | Geopolitika (riziká z politického prostredia)<br>Právne prostredie na úseku manažmentu rizík (riziká z právneho prostredia)<br>Odborná prax |

Zdroj: vlastné spracovanie

Súčasná prax dospela k potrebe hlbšieho teoretického zvládnutia problematiky manažmentu rizík (Dvorsky a kol., 2019; Hrehová, 2011). Navrhovaná koncepcia predmetov študijného programu Manažment rizík je zameraná na získanie potrebných vedomostí, znalostí a schopností absolventov efektívne aplikovať proces manažmentu rizík v akomkoľvek prostredí podniku. Rešpektuje potrebu prípravy Risk manažérov začlenených na rôzne úrovne riadenia a reaguje na súčasné zmeny v prostredí na Slovensku ale aj vo svete.

## 4. ZÁVER

V dôsledku uvedomenia si stavu manažérskej praxe a potreby reagovať na zmeny podnikateľského prostredia sa postupne vytvoril systém manažmentu rizika v podniku. Vnímanie rizika v malých a stredných podnikoch je ovplyvnené doterajšími skúsenosťami majiteľov a manažérov podnikov, pretrvávajúcim pocitom znalosti prostredia, nedocenením vplyvu zmien v prostredí. Z výsledkov výskumu vyplýva, že k vonkajším rizikám a hrozbám sa pridávajú aj chyby manažérov v ich odhaľovaní, a najmä nesprávne a neefektívne spôsoby reakcie na ne.

V podmienkach MSP je zameranie pozornosti na včasnú identifikáciu možných rizík a na včasnú reakciu na možné ohrozenia životne dôležité. MSP sú citlivejšie na zmeny vo vonkajších podmienkach, ako aj na problémy vnútorného prostredia. Vo všeobecnosti aj pre MSP platí, že najväčšie riziká vyplývajú z charakteru trhového prostredia, podnikateľského

prostredia v odvetví a z ekonomických a právnych podmienok v krajine. V MSP však môžu mať horšie následky aj riziká personálne, riziká vyplývajúce z nedostatočnej kvalifikácie zamestnancov, z nízkej motivácie a z porušovania disciplíny, z porušovania bezpečnostných opatrení a ďalších pravidiel a noriem. Osobitú úlohu tu zohráva pripravenosť manažmentu, jeho manažérske znalosti a skúsenosti, ktoré v mnohých prípadoch chýbajú a sú nahradzované odbornými znalosťami a rutinou.

Prínosom príspevku je aj navrhnutá koncepcia predmetov študijného programu, ktorá reflektuje požiadavky praxe a rešpektuje celosvetové trendy vzdelávania. Jej aplikácia zvýši kvalitu vzdelávacieho procesu na KKM FBI UNIZA, ale aj uplatniteľnosť absolventov v praxi na Slovensku. Navrhované riešenia sú prínosom pre vedenie FBI UNIZA, aby sa svojou kvalitou vzdelávacieho procesu zaradilo medzi vyspelé európske vzdelávacie inštitúcie a zároveň viac oslovilo potenciálnych študentov. Výsledky príspevku sú využiteľné aj na ostatných univerzitách podobného zamerania a taktiež aj pre ďalšie študijné programy, v ktorých sa prejavuje interdisciplinarita danej problematiky nielen na Slovensku ale aj v zahraničných krajinách.

### *Dodatok*

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# POŽIADAVKY NA VZDELANIE A KVALIFIKÁCIU ĽUDÍ V PRIEMYSLE 4.0

## REQUIREMENTS FOR EDUCATION AND QUALIFICATION OF PEOPLE IN INDUSTRY 4.0

***Simona HYŽOVÁ***[42]
***Kamila MAYEROVÁ*** [43]
***Jaroslav VYHNIČKA*** [44]

**Abstrakt:** *Stojíme na prahu technologickej revolúcie, ktorá zásadným spôsobom mení požiadavky na vzdelanie a kvalifikáciu ľudí. Hlavným cieľom príspevku je zistiť, aké sú požiadavky na vzdelanie a kvalifikáciu ľudí v priemysle 4.0. Príspevok sa zameriava na teoretické koncepcie nárokov na kvalifikáciu v rámci priemyslu 4.0 a podmienky, ktoré budú občania Slovenskej republiky spĺňať. Prostredníctvom analýze učebných plánov na základných, stredných, ale aj vysokých školách a následným porovnaním s požiadavkami, ktoré kladie tento priemysel bude možné poukázať do akej miery je predpoklad pre rozvoj a rast priemyslu 4.0 v podmienkach Slovenskej republiky.*

**Kľúčové slová:** *priemysel 4.0, trh práce, Slovenská republika*

**Abstract:** *We are on the threshold of a technological revolution that fundamentally changes the requirements for people´s education and qualifications. The main aim of this contribution is to find out what are the requirements for education and qualification of people in industry 4.0. The contribution focuses on theoretical concepts of qualification requirements within the industry 4.0 and conditions that citizens of the Slovak Republic will meet. Through the analysis of curricula at primary, secondary and also higher education institutions and subsequent comparison with the requirements of this industry it will be possible to show to what extent the development and growth of industry 4.0 in the conditions of the Slovak Republic is a prerequisite.*

**Key words:** *industry 4.0, education, qualification, Slovak republic*

**JEL Classification:** *M 21, F 12, O 21*

## 1. ÚVOD

Prebiehajúca štvrtá vlna, priemyselná revolúcia, mení pracovné pozície, podporné systémy a aj využívanie dát. Technológie súvisiace s priemyslom 4.0 ovplyvňujú nielen priemyselné organizácie, ale aj pracovné pozície. Zmeny sa dotýkajú využívania zariadení potrebných na inštaláciu nových technológii a budovania platformy pre riadenie a využívanie zdrojov v organizácii. Organizácie potrebujú vzdelávať svojich zamestnancov, čo v prebiehajúcej revolúcii mení aj systém vzdelávania, ktoré je označované ako Education 4.0 (Vzdelávanie 4.0).

Priemysel 4.0 ovplyvnil slovenskú ekonomiku, vedu, výskum, avšak školstva sa spomínaná revolúcia nedotýka. Aj napriek tomu, že priemysel 4.0 mení štruktúru zamestnanosti, na trhu práce je nedostatok kvalifikovaných pracovníkov. Veľkým problémom je nezáujem študentov

[42] Ing., doktorand, Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Adresa Študentská 3, Trenčín 91150,Slovensko, e-mail: simona.hyzova@tnuni.sk
[43] Ing., doktorand, Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Adresa Študentská 3, Trenčín 91150,Slovensko, e-mail: kamila.mayerova@tnuni.sk
[44] Ing., doktorand, Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Adresa Študentská 3, Trenčín 91150,Slovensko, e-mail:jaro.vyhnicka@gmail.com

o technické odbory a taktiež chýba prax a vzdelávanie v danej oblasti. Nedostatočný počet kvalifikovaných absolventov stredných a vysokých škôl je pre slovenský priemysel veľkým problémom. Firmy si uvedomujú daný problém a vo svojich podnikoch sa snažia vzdelávať a zvyšovať odbornosť svojich zamestnancov.

### *1.1 Industry 4.0*

Rastúca globalizácia na trhu, rastúca konkurencia a zložitejšie produkty majú za následok zavádzanie nových technológií, metód a obchodných procesov. Rýchlo sa meniace trhové prostredie a kolísanie požiadaviek zákazníkov vyžadujú efektívne fungovanie logistických procesov. *„Priemysel 4.0 transformuje výrobu zo samostatných automatizovaných jednotiek na plno integrované, automatizované a priebežne optimalizované výrobné prostredie“* (Mařík, 2016). Priemysel 4.0 spája produkciu vstavaného systému inteligentných výrobných procesov a technológií, aby vstúpili do nového technologického sveta. Pojem Industry 4.0 reprezentuje štvrtú priemyselnú revolúciu, novú úroveň organizácie a riadenie celého hodnototvorného reťazca naprieč životným cyklom produktu. Tento cyklus sa orientuje na pribúdajúce individualizované želania zákazníkov a zahŕňa všetko od prvotného nápadu, prijatí objednávky cez vývoj a výrobu, dodanie produktu koncovému zákazníkovi, až po recykláciu produktu a s tým všetkým spojené služby. Základom je dostupnosť všetkých relevantných informácií v reálnom čase, vďaka vzájomnému prepojeniu všetkých inštancií podieľajúcich sa na tvorbe hodnoty a rovnako tak je nevyhnutná schopnosť odvodiť na základe týchto dát optimálny tok tvorby pridanej hodnoty. Na základe prepojenia ľudí, objektov a systémov vznikajú dynamické, v reálnom čase optimalizovatelné a samoorganizujúce sa medzipodnikové siete, v ktorých dochádza k tvorbe hodnoty a ktoré je možné optimalizovať podľa rôzne zvolených kritérií ako napríklad podľa nákladov, dostupnosti či spotreby zdrojov (Kagermann, Anderl, Gausemeier, & Schuh, 2016).

### *1.2 Industry 4.0 a jeho vplyv na ľudské zdroje*

Vplyvom priemyslu 4.0 sa na trhu práce menia nielen typy povolaní, ale aj ich celková štruktúra. Taktiež dochádza aj k zániku niektorých povolaní a vznikajú nové pozície, ktoré sú potrebné pre spomínanú revolúciu.

Nové pracovné pozície si vyžadujú kreatívne a odborné zručnosti, e-vedenie, inovatívne inžinierstvo a taktiež sa mení kvalita a hodnota zručností ľudí. Medzi ohrozené pracovné pozície patrí menej kvalifikovaná pracovná sila, pracovná sila s nízkymi digitálnymi zručnosťami, ale aj pracovníci nad 50 rokov. Podľa prognóz komputerizácia ohrozuje predovšetkým povolania, na ktoré dnes stačí vzdelanie bez maturity.

Najmenej ohrozené sú profesie, ktoré vďaka svojim sociálnym, organizačným, fyzickým, kreatívnym, či intelektuálnom požiadavkám nebude v dohľadnej dobe možné nahradiť automatizáciou ani digitalizáciou. Hovoríme o riadiacich pozíciách a to v obvode, vzdelávaní, zdravotníctve, v sociálnych a ďalších oblastiach. Priemysel 4.0 neovplyvní pozície ako všeobecné sestry, pôrodné asistentky, veterináři a učitelia. Najviac žiadaní sú špecialisti na databázy a siete, riadiaci pracovníci v informačných a komunikačných technológiách, analytici a vývojári softvéru či počítačových aplikácií. Dané pozície majú vo svete digitalizácie a automatizácie najväčší pozitívny potenciál. Neustále pribúda pracovná sila s vyšším vzdelaním. Pre zamestnávateľov sú kľúčovými zamestnancami, tí ktorí majú dostatočné vzdelanie v danej oblasti.

### *1.3 Asociácia Duálneho Vzdelávania v kontexte industry 4.0*

Asociácia Duálneho Vzdelávania sa zameriava na realizáciu, podporu a rozvoj duálneho vzdelávania v Slovenskej republike. S cieľom podporiť a vytvoriť fungujúci systém duálneho vzdelávania na úrovni štátneho, samosprávneho a súkromného školstva.

Cieľom Asociácie Duálneho Vzdelávania je podpora individuálnych projektov, duálne vzdelávania a cezhraničná spolupráca, vytvorenie a udržiavanie dialógu za účelom výmeny informácií, komunikácie, podpory a realizovania záujmov členov združenia voči štátnym orgánom a organizáciám, nositeľom vzdelávania, zamestnávateľom, profesijným zväzom, záujmovým združeniam, neziskovým organizáciám a iným tretím osobám (ADV, 2017).

Projekt Priemysel 4.0 na Slovensku je realizovaný pod záštitou Asociácie Duálneho Vzdelávania (ADV) a vznikol s myšlienkou vytvoriť modelové centrum slúžiace na vzdelávanie širokej verejnosti a žiakov stredoškolského štúdia. Jedným z cieľov projektu je vyzbierať dostatočné množstvo financií na technologické študijné pomôcky, ktoré žiakom ukážu ako sa zmení práca vo výrobe a čo nám umožnia technológie budúcnosti vo výrobnej praxi.

## 2. CIEĽ A METODOLÓGIA

Cieľom príspevku je zistiť, aké sú požiadavky na vzdelanie a kvalifikáciu ľudí v priemysle 4.0. Pre účely nášho príspevku sme si vybrali odbory na stredných odborných a priemyselných školách v Trenčianskom kraji. Príspevok bol spracovaný pomocou metód analýzy sekundárnych a primárnych zdrojov, syntézy poznatkov, indukcie, dedukcie a komparácie. Zo sekundárnych zdrojov boli analyzované vedecké články z jednotlivých databáz. Primárne dáta boli získané z vedeckého článku Benešová – Tupá (2017), ktorých profily pracovných pozícii boli východiskové pre účely daného príspevku.

## 3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

Štvrtá priemyselná revolúcia zásadne mení vznik a vývoj pracovných pozícií, v tomto kontexte nastáva otázka a problém, aké budú kladené požiadavky na novo vzniknúte pracovné pozície. Hovoríme prevažne o potrebách vzdelania a kvalifikácie pre obsadenie danej pracovnej pozície dostatočne kvalifikovaným pracovníkom. Nasledujúcim problémom sa zaoberali aj Benešová s Tupou (2017), na základe čoho sformulovali profily pracovných pozíci v oblasti výroby a informačných technológií. Tieto profily budú východiskové pre následné porovnávanie a analýzy odborov, ktoré sú dostupné na stredných odborných a priemyselných školách v Trenčianskom kraji s možným potenciálom pre uplatnenie sa v budúcich profesiách, ktoré prináša priemysel 4.0.

**Tabuľka 1: Profily pracovných miest v kontexte priemyslu 4.0 vo výrobe**

| | Kvalifikácia | Zručnosti |
|---|---|---|
| **Technik elektroniky** | stredoškolské vzdelanie zamerané na mechaniku, prax v oblasti manipulačnej techniky a priemyselného vybavenia, vykonávanie servisných prehliadok, základné znalosti práce s databázami, virtualizáciou a externými úložiskami | manuálne zručnosti, samostatnosť, zodpovednosť, flexibilita, základné znalosti elektroniky a hydrauliky, servis tlakových valcov, schopnosť učiť sa ako spravovať a opravovať nové stroje |

| | | |
|---|---|---|
| **Technik automatizácie** | stredoškolské vzdelanie zamerané na elektrotechniku, strojárstvo a automatizáciu, prax a skúsenosti s údržbou strojov a strojových zariadení automatizovanej linky | znalosť bezpečnostných noriem, jazykové zručnosti - Anglický alebo Nemecký, flexibilita, samostatnosť a zodpovednosť |
| **Výrobný technik** | vysokoškolské vzdelanie v elektrotechnike | jazykové zručnosti - Anglický alebo Nemecký, logické myslenie, flexibilita, samostatnosť, zodpovednosť, schopnosť a ochota učiť sa nové veci, spoľahlivosť, znalosť simulovaného procesu |
| **Výrobný inžinier** | stredoškolské / postgraduálne vzdelanie v elektrotechnike a strojárstve | jazykové zručnosti - Anglický alebo Nemecký, technické zručnosti, samostatnosť, zodpovednosť, flexibilita a kreativita, schopnosť a ochota učiť sa nové veci, organizačné a komunikačné schopnosti, znalosť technickej dokumentácie |

Zdroj: Benešová, Tupa (2017) - vlastný preklad

**Tabuľka 2: Profily pracovných miest v kontexte priemyslu 4.0 v informačných technológiach**

| | Kvalifikácia | Zručnosti |
|---|---|---|
| **Špecialista informatiky** | stredoškolské / postgraduálne vzdelanie v oblasti IT, prax na podobnej pozícií, pokročilá znalosť sieťového manažmentu, základné znalosti práce s databázami, virtualizáciou a externými úložiskami | jazykové zručnosti - Anglický alebo Nemecký, samostatnosť, zodpovednosť, flexibilita, komunikatívnosť, spoľahlivosť, schopnosť plánovať, riešiť problém a viesť tím |
| **PLC programátor** | stredoškolské vzdelanie zamerané na elektrotechnické strojárstvo, prax na podobnej pozícií, skúsenosti s programovaním strojov, programovanie a znalosť PLC | jazykové zručnosti - Anglický alebo Nemecký,samostatnosť, zodpovednosť, flexibilita, komunikatívnosť, spoľahlivosť, schopnosť a ochota učiť sa nové veci |
| **Programátor robotov** | znalosť off-line a online programovania robotov, skúsenosti so základnou parametrizáciou robotou a ich kalibrácia, projektové riadenie, koordináci programového tímu robota a PLC programátormi, stredoškolské / postgraduálne vzdelanie zamerané na automatizačné technológie | jazykové zručnosti - Anglický alebo Nemecký, analytické a logické myslenie, zodpovednosť, flexibilita a komunikatívnosť, spoľahlivosť, znalosť simulovaného procesu |
| **Softvérový inžinier** | inštalácia zariadenia do prevádzky, stredoškolské / postgraduálne vzdelanie v oblasti IT, znalosti v C / C++ programovaní, znalosti v C # /. NET , základné znalosti práce s databázami (SQL) | schopnosť riešiť problémy, jazykové zručnosti - Anglický alebo Nemecký,analytické a logické myslenie, samostatnosť, zodpovednosť, flexibilita a komunikatívnosť, schopnosť riešiť problémy |

| | | |
|---|---|---|
| **Dátový analitik** | stredoškolské / postgraduálne vzdelanie v odobore technickom matematickom alebo štatistickom, PL / SQL - pokročilé skúsenosti , UML - pokročilé skúsenosti | jazykové zručnosti - Anglický alebo Nemecký, samostatnosť, zodpovednosť, flexibilita a komunikatívnosť, znalosť práce s tabuľkami (Excel), základné vedomosti zo šťatistiky |
| **Kyberbezpečnosť** | stredoškolské / postgraduálne vzdelanie v oblasti informačných technológií | jazykové zručnosti - Anglický alebo Nemecký, samostatnosť, zodpovednosť, flexibilita a komunikatívnosť, schopnosť a ochota učiť sa nové veci, analytické a logické myslenie, znalosť bezpečnostných a komunikačných štandardov, znalosť serverov (úroveň - administrátor) |

Zdroj: Benešová, Tupa (2017) - vlastný preklad

Ako je možné sledovať v predchádzajúcich tabuľkách 1 a 2, väčšina vybraných profesií je úzkošpecializovaná a vyžaduje si odborné vzdelanie. Kvalifikáciu a odbornú prax je možné dosiahnúť predovšetkým vzdelaním a následnou prácou v odbore. Naproti tomu, pri zručnostiach si môžeme všimnúť, že sa jedná prevažne o určitý talent, nadanie a sebazdokonaľovanie. Ku príkladu jazykové zručnosti sú základom, bez ktorého sa v dnešnej dobe len veľmi ťažko zaobídeme, pretože tieto základy sa vyžadujú vo väčšine zamestnaní. Vo výskume sme sa zamerali na stredné odborné a priemyselné školy Trenčinaskom kraji, ktorých odbory majú najväčší kvalifikačný potenciál pre rast a prosperitu priemyslu 4.0 v našich podmienkach.

**Tabuľka 3: Stredné odborné a priemyselné školy v Trenčianskom kraji s predpokladom pre pre premysel 4.0**

| Názov strednej školy | Mesto | Odbory s možným kvalifikačným predpokladom pre priemysel 4.0 |
|---|---|---|
| Stredná odborná škola strojnícka | Bánovce nad Bebravou | elektrotechnika, technické lýceum so zameraním na informatiku, strojárstvo, programátor obrábacích a zváracích strojov a zariadení, mechanik počítačových sietí, elektrotechnika, strojárstvo - výroba, montáž a oprava prístrojov |
| Stredná odborná škola | Dubnica nad Váhom | mechanik mechatronik, mechanik nastavovač, strojný mechanik, elektrotmechanik - silnoúrodová technika / úžitková technika |
| Stredná priemyselná škola | Dubnica nad Váhom | elektrotechnika, mechatronika, strojárstvo, technické a informačné služby |
| Stredná odborná škola | Handlová | mechanik opravár - stroje a zariadenia, technicko - administratívny pracovník, elektromechanik - silnoprúdová technika |

| | | |
|---|---|---|
| Stredná odborná škola | Nové Mesto nad Váhom | mechanik nastavovač, mechanik elektrotechnik, mechanik strojov a zariadení, strojárstvo (programovanie NC strojov a grafické systémy), elektrotechnika, informačné a sieťové technológie, mechani mechatronik |
| Stredná odborná škola | Považská Bystrica | operátor stavebnej výroby, mechanik stavebnoinštalačných zariadení |
| Stredná odborná škola strojnícka | Považská Bystrica | mechanik storjov a zariadení, programátor CNC, mechanik elektrotechnik, mechanik počítačových sietí |
| Stredná priemyselná škola | Považská Bystrica | informačné a sieťové technológie, technické a informatické služby v strojárstve, strojárstvo |
| Stredná odborná škola | Prievidza | mechanik strojov a zariadení, programátor obrábacích a zváracích strojov a zariadení, mechanik elektrotechnik, elektromechanik - silnoprúdovaá technika, mechanik oprávar - stroje a zariadenia |
| Spojená škola I. Krasku | Púchov | mechanik počítačových sietí, mechanik mechatronik |
| Stredná odborná škola | Stará Túra | mechanik nastavovač, mechanik počítačových sietí, mechanik elektrotechnik, informačné a sieťové technológie, elektrotechnika, elektormechanik |
| Stredná odborná škola | Trenčín | mechanik číslisocov riadeých strojov, mechanik elektrotechnik |
| Stredná odborná škola letecko-technická | Trenčín | mechanik lietadiel (mechanika), mechanik lietadiel (avionika), mechanik elektrotechnik, strojárstvo |

Zdroj: vlastné spracovanie

Z následujúcej tabuľky 3, vyplýva že v Trenčianskom kraji sa nachádza 13 stredných škôl, ktorých odbory spĺňajú možné kvalifikačné predpoklady pre priemysel 4.0. Jedná sa predovšetkým o technické lýceá so zameraním na informatiku, programátorstvo, informačné a sieťové technológie, strojárstvo a mechaniku. Ak si nasledujúce odbory porovnáme s kvalifikačnými predpokladmi profilov pracovných miest vo výrobe a informačných technológiach, môžeme sledovať kvalifikačné zhody. Naproti tomu, je otázne do akej miery budú jednotliví uchádzači z týchto stredných škôl aplikovať vedomosti v praxi a aké budú ich zručnosti. Ako možný a čoraz viac vyskutujúci sa problém označujeme modernú dobu, ktorá prináša okrem množstva pozitívnych javov, aj negatívne predovšetkým s príchodom moderných technológií. Tie vo veľkej miere vplývajú na všetky vekové kategórie, čo môže mať za následok nesústredenosť, zlé komunikačné schopnosti, nesamostatnosť, nespoľahlivosť a iné zásadné problémy, ktoré následne vplývajú na uplatnenie jednotlivých uchádzačov, ale aj rast priemyslu 4.0 v našich podmienkach. Druhým vyskytujúcim problémom je možnosť získať potrebné skúsenosti a prax, ktoré sú častokrát rozhodujúce pri príjmaní uchádzača do zamestnania, ale aj v budúcom napredovaní a smerovní v kariére. Asociácia Duálneho Vzdelávania podporila rozvoj priemyslu 4.0 s cieľom vytvoriť modelové centrum slúžiace na vzdelávanie širokej verejnosti a žiakov stredoškolského štúdia. Vzdelávanie je tu určené pre štyri cieľové skupiny:

- **Žiaci základných škôl**: Pomocou ukážok a simulačnej platformy, chce asociácia ukazať žiakom svet zajtrajška vo výrobe. Je určená pre cieľové skupiny žiakov ZŠ v 7., 8. a 9.

ročníku. Žiaci sa dozvedia informácie o pracovnom prostredí a taktiež obsah ich ďalšej výučby, ktoré si môžu vizualizovať, pomocou ich praktickej skúsenosti a fyzickému kontaktu s prostredím, ktoré nadobudnú v modelovom centre. V budúcnosti, vďaka daným praktickým skúsenostiam môže napomôcť žiakom k ľahšiemu výberu ich ďalšieho vzdelávania a následne aj s výberom ich budúceho povolania.

- **Žiaci stredných škôl**: Pomocou simulovanej platformy je cieľom ukázať žiakom na modelových hodinách ako sa zmení práca vo výrobe a čo nám umožnia technológie vo výrobnej praxi. Žiaci si osvoja praktické skúsenosti pri simulovanej práci s modelovými strojmi , ale aj podnikovú kultúru, ktorá pozitívne vplýva k prijímaniu technologických zmien, podpore inovácií, vývoja a pozitívne ovplyvňuje a napomáha zrýchliť tempo procesu rozvoja Priemyslu 4.0 vo všeobecnosti, alebo v konkrétnom podniku. Začínajú vnímať a stávajú sa otvorenejší k zmenám prostredia, flexibilnejší a adaptívnejší vo vzťahu k technológiám.
- **Nezamestnaní**: Prostredníctvom ukážok a simulačnej platformy sa asociácia snaží poukázať uchádzačom o zamestnanie svet zajtrajška vo výrobe. Uchádzači majú možnosť nahliadnuť do prostredia podnikov a priblížiť im cieľ a smerovanie podnikov.
- **Široká verejnosť**: Modelové centrum slúži požiadavkám širokej verejnosti, ktorá sa rozhodne pre návštevu, z dôvodov záujmu o technologické trendy a budúcnosť výroby z pohľadu zamestnancov, ktorých sa platforma Priemysel 4.0. implementovaním technológií dotkne. Z pohľadu zamestnávateľa aplikujúceho technologické zmeny vo svojom podniku, alebo hľadať spôsoby a inšpiráciu. Modelové centrum slúži aj pre rodičov, ktorí sa rozhodujú o tom, aké bude ďalšie vzdelávanie ich detí, keď chcú aby sa

## 4. ZÁVER

Napriek vývoju a dlhodobým prognózam, že prechod na Industry 4.0 bude mať dramatický dopad na štruktúru zamestnanosti, ani rok 2019 nepriniesol v riešení tejto otázky významnejší posun. Nedostatok kvalifikovaných pracovníkov, nezáujem o štúdium technických predmetov, absentujúce systémy prípravy absolventov škôl pre potreby praxe, nastavenie rekvalifikačných procesov a programov celoživotného vzdelávania sú nielen najbolestivejšie problémy zamestnávateľov, ale dosiahli úroveň alarmujúceho ohrozenia konkurencieschopnosti slovenského priemyslu. Automatizácia a robotizácia prevádzok začína byť riešením na nedostatok zamestnancov. Firmy si začínajú uvedomovať, že ak chcú byť pri prechode na Industry 4.0 úspešné, musí sa stať vzdelávanie a zvyšovanie odbornosti zamestnancov jednou z ich kľúčových priorít. Vyvíjajú aktivity, ktoré aspoň z časti pomôžu nepriaznivému stavu, ale bez toho, aby sa mohli oprieť o fungujúci vzdelávací systém reflektujúci potreby praxe, to nepôjde. Bez dostatočne odborne vzdelaných ľudí nemôžeme hovoriť o inteligentnom priemysle. Nové pracovné miesta vyžadujú nové znalosti a na to treba pripraviť študentov. Očakáva sa, že s Industry 4.0 zanikne asi 40% popisov pracovných miest a 30% vznikne nových, čo vytvára priestor pre prípravu študentov, aby bola koncepcia úspešne naplnená. Problém, a nielen v Slovenskej republike, je predovšetkým v komunikácii medzi akademickou obcou a podnikovou sférou. Zamestnávatelia sú nespokojní, že musia suplovať stredné alebo vysoké školy. Treba pripravovať študentov viac prakticky, čo bolo v bývalej československej federácii bežné, rovnako ako spolupráca s podnikmi. Kvalita prichádza často s aktualizáciou štandardov, ktoré je treba preniesť do štátnych noriem.

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# DIGITAL MARKETING FOR GREEN GOODS PROMOTION: MODERN TRENDS IN ENTREPRENEURSHIP

***Olena CHYGRYN*[45]**
***Tetyana PIMONENKO*[46]**
***Svitlana BILAN*[47]**
***Lyudmila STARCHENKO*[48]**

**Abstract:** *In the article mainstreamed the necessity of implementation the digital marketing technologies for green product and services promotion. The main purpose is to analyze the modern tendencies in the entrepreneurship with the connection of the green consumerism and systemize the approaches to spreading digital technologies in the marketing strategies. The authors emphasize the existence of appropriate benefits for green entrepreneurship development with the connection of global tendencies of consumer's preferences in the wishing to buy green products and goods. At the same time the widening spheres of sustainable entrepreneurship establish opportunities for creation and implementation modern marketing strategies. The assessment of implementation the digital marketing technologies for green product and services promotion have to hold to main aspects which give the opportunity to estimate the general digital and social media usage behavioral models by green consumers. The authors proposed the procedure of the investigation green marketing digitalization with the systematizing types of digital media. In the paper defined the future areas for research linking between educational level of the green consumers and Internet using. For investigation the social media usage behavior pattern of green consumers the authors proved that it is appropriate to analyze such social media outlets - Facebook, Twitter, YouTube, Google+, Pinterest, Flickr, and Instagram. Also, the article proposes managerial decision and digital marketing strategies involvement green consumers on Internet.*

**Key words**: *entrepreneurship, green goods, green consumers, digital marketing.*

**JEL Classification:** *M31, D12, E20, E21*

## 1. INTRODUCTION

The traditional academic research investigating usage of legacy media (TV, newspapers, magazines, etc.) among green consumers. The investigation of the digital media was not targeted on the green consumption study.

*The aim of the article* is to analyze the modern tendencies in the entrepreneurship with the connection of the green consumerism and systemized the approaches to spreading digital technologies in the marketing strategies.

An attractive business strategy today - going green in entrepreneurship. The modern trends in consumption, international policy, government strategies create a lot of opportunities for green industry business in the future (Razminiene, 2019; Mukhtarova et al., 2016).

The literature review (Wagner, 1997; Plachciak et al., 2015; Hens, 2019) has given the opportunity to generalize the main types of green products: energy efficient; water efficient; low emitting; safe or healthy products; recyclable; durable; biodegradable; renewable; reused;

[45] PhD, Department of Marketing, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, Echigrin0303@gmail.com
[46] PhD, Department of Marketing, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, tetyana.pimonenko@gmail.com
[47] PhD, Faculty of Management, Rzeszow University of Technology, Aleja Powstańców Warszawy 12, Rzeszów 35-959, Poland, s.bilan@prz.edu.pl
[48] PhD, Economics, Entrepreneurship and Business Administration Department, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, cpo@fpkpo.sumdu.edu.ua

locally produced. Antonio et al (2009) suggested that due to environmental awareness and a pattern of thought that have evolved over the time and researching in the field on green consumerism will be the main trend point in future. These processes will lead to necessity of identifying the consumer preferences, behaviors and intentions.

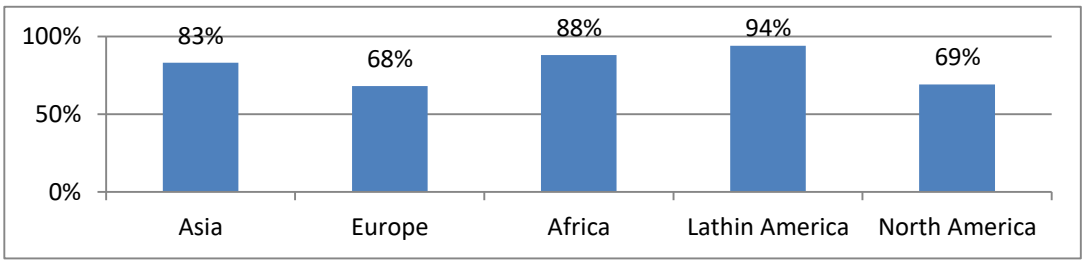
The scientists have noted (Mainieri, 1997; Nyilasy, 2016; Rogalska, 2018; Urbaniec, 2015; Bilan et al., 2018) that the sustainable entrepreneurship implies the expansion of the traditional economic center with the inclusion of environmental and social aspects in order to create a more sustainable environmentally-friendly business. Improving products over the lifecycle allows gaining economic benefits in the future, both in the product (recycling, replacement of hazardous materials) and in the market (improved performance, competitive advantage).

It is necessary to emphasize the existence of appropriate benefits for green entrepreneurship development: implementation of the green technologies, providing cleaner production, resource saving, reduction of environment pollution, environment management, improving of organization processes, public image perfection, production of green goods and services, competitiveness increasing (Diamantopoulos, 2003). Additionally, such processes create co-benefits for companies represented by increasing of worker productivity, improved employee morale, corporate reputation (Remeikiene & Gaspareniene, 2017; Gasparėnienė et al., 2017; Raišienė et al., 2018; Kordoš, Habánik, 2018).

## 2. PROBLEM SOLUTION / RESULTS / DISCUSSION

The world statistic shows the increasing of consumer's preferences in the wishing to buy green products and goods (Figure 1).

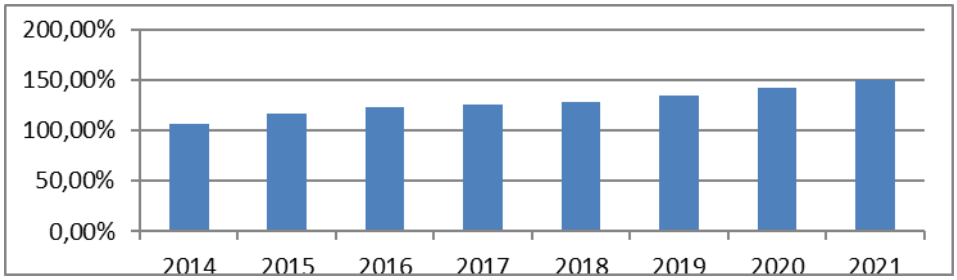
**Figure 1 – Consumers who care that companies implement programs to improve the environment**




Source: (Global, 2018)

As a figure 1 told sustainability processes have become a vital opportunity for companies to connect with consumers who are excited about change (see also: Ganushchak-Efimenko et al., 2018; Bilan, 2013). 48% of U.S. consumers told that they could change their consumption habits to reduce environment pollution. They spend in 2018 about $128.5 billion on sustainable fast-moving consumer goods. By 2021, experts expect these sustainably minded shoppers to spend up to $150 billion on green goods (Figure 2).

**Figure 2 Sustainable product sales in USA**




Source: (Sustainable, 2019)

The global tendencies show that consumers ready to change their shopping behavior and buying preferences, they are ready making adjustments in their shopping habits.

The assessment of the age and gender structure told about the consumers who are supporting the implementation of environmental programs on enterprises (Table 1).

**Table 1 – The consumer relation to implementation environmental programs on enterprises**

| Generation (% of global respondents) | | Gender (% of global respondents) | |
|---|---|---|---|
| Gen Z (Aged 15-20) | 80 | Men | Women |
| Millennials (21-34) | 85 | 80% | 81% |
| Gen X (35-49) | 79 | | |
| Baby Boomers (50-64) | 72 | | |
| Silent Generation (65+) | 65 | | |

Source: (Global, 2018)

It has to be noted that the regions with the high level of environmental pollution and hazards show the higher expectations from companies according implementation environmental policies, green technologies, green marketing etc. (Table 2).

**Table 2 – The level of expectations from companies' green policies**

| | Asia | Europe | Africa | Latin America | North America |
|---|---|---|---|---|---|
| Air pollution | 86 | 63 | 81 | 84 | 61 |
| Water Pollution | 85 | 67 | 85 | 90 | 68 |
| Waste | 73 | 63 | 73 | 81 | 60 |
| Water shortages | 75 | 54 | 78 | 87 | 57 |
| Using of pesticides | 75 | 50 | 65 | 74 | 63 |

Source: (Global, 2018)

The spheres of sustainable entrepreneurship are wide. They could include:

- landscaping, as activity which focuses on reducing pesticides and chemical fertilizer in agriculture business, composting and mulching;
- energy auditing which provide renewables in all spheres;
- cleaning services with eco-friendly products and green processes;
- organic food production;
- environment construction with using eco-friendly building materials;
- organic food production;
- recycling as a business activity.

It could be noted that the number of green consumers is increasing, they classify themselves as environment conscious. So, as the focus on the environment and sustainability increases, the modern marketing approaches and tools are forced to acknowledge these tendencies and incorporate them in their overall media strategies.

Providing the bait and switch marketing strategies in promotion green products and goods could run the risk of being labeled as greenwashing. At the same time if advertisement created right and receptive messages, it is difficult to reach green consumers because a little is known about the media consumption by environmentally-conscious consumers. That is why assessment of implementation the digital marketing technologies for green product and services promotion are significant.

The main approaches which have to be separated are:

- the general digital media usage behavioral models of green consumers;

- the social media usage behavior pattern of green consumers.

Determination of the digital marketing is complex. The online marketing, internet marketing or web marketing are the same related categories. After 2000 the term digital marketing has grown in popularity over time, particularly in certain countries. In the USA online marketing is still prevalent, in Italy is referred as web marketing but in the UK and worldwide, digital marketing has become the most common term, especially after the year 2013 (Kaur, 2017; Wątróbski et al., 2015).

Implementation of the digital marketing for green goods promotion has the potential to add up to more their sales. The advantages of digital marketing include such huge aspects: global scale, transparency, empowering effect, smaller investment, efficient target reach, opportunity to measure results of online marketing, wide audience, consumers' personalization.

So, the popularity of social media was indicated by the fact that in 2015, each month the Facebook app had more than 126 million average unique users and YouTube had over 97 million average unique users (Adhishek, 2018).

Investigation of the digitalization of the green marketing needs to define green consumer as a person who thinking about the green products in general and ready to buy them. It has to be noted that the green customer engagement is essential but also challenging task. Producers and retailers must shift to a nonlinear marketing approach which suggests using the value exchange model. Such green chain should have the mutual dialogue and benefit-sharing between provider and consumer. The communications in that case are more non-linear, free flowing and both one-to many or one-on-one.

Digital media vehicles have to be clustered. After that the respondents have to be tested how frequently they visited each media vehicle group. The digital media vehicle could include social networks, for example, such as Amazon, eBay and Zappos, online magazines, online supermarket sites, price comparison sites.

The types of digital media could include:
- social networks (Facebook, Twitter);
- shopping sites (Amazon, eBay, Zappos);
- video/photo sharing (YouTube, Flickr);
- online TV programs or radio;
- daily deal sites;
- brands' own sites (L'Oreal, Apple);
- blogs;
- online forums (Money Saving Expert, Answers Yahoo);
- Price comparison sites (Pricegrabber.com, Nextag.com);
- online supermarkets;
- online magazines;
- online banking, email.

As experts told, (Antonio, 2009) examination of the green consumption groups are significantly different from others. Have gotten results indicate a definite pattern in digital media usage depending on the level of green consumption. In general, the more individuals identified themselves as green consumers, the more frequent was their digital media consumption. For investigation the social media usage behavior pattern of green consumers it is appropriate to analyze such social media outlets - Facebook, Twitter, YouTube, Google+, Pinterest, Flickr, and Instagram.

According to (Diamantopoulos et al., 2003; Shaw et al., 2017) the general trend of getting results indicated that the higher level of green purchasing behavior, the more likely consumers would use Internet and social media. Explanation for such tendencies may be in the suggestion that green consumers are generally well educated. It could be the ground for future research linking between educational level of the green consumers and Internet using. Also, it is required to implement digital marketing technologies in the sphere of green business. The general conclusion for the future implementation managerial and marketing practice for reaching green consumers on the Internet could be the next.

1. It is economically reasonable to pay for Internet using in green marketing because green consumption was strongly correlated with Internet usage, across all types of digital media instruments.

This conclusion make sense because digital technologies is usually perceived as “green” compared to newspapers, magazines and other traditional media.

2. The advertising specialist has to use the heavy clustering of green consumers around informational media content (at the expense of entertainment content). Using Internet consumers move between news and advertising with greater frequency and ease. Such effect could be used successfully because it is characterizing by blurring of lines between entertainment and information on the Internet.

3. The buyer trends show that the green consumers are also heavy shoppers online. Despite on anti-consumption image of green users, the online sites are actively using by green consumers.

4. Social media turn out to be one of the most popular Internet networks among green consumers. It is necessary to emphasize that motivation of some purchasing in Internet could also be related to a higher level of need to belong to some networks, social groups.

The implementation of the new marketing strategy’s in digital sphere should continue to investigate and assess the level of consumer involvement in the processes of the economic and consumption greening.

The key points in the marketing strategies could be:

- using the psychological mechanisms underlying green consumers’ behavior. Consumers may have very different uses and gratifications of certain Internet media forms. For example, Griskevicius et al. (Griskevicius, 2010) show that in non-Internet contexts the green consumption has “badge value” for consumers;

- additional cross-cultural and multy-cultural studies can broaden different significant options to the investigated tendencies in the future studies. Because the green consumers in different continents, countries and different cultures use different types of digital technologies and tools;

- goods and services categories may also be an important moderator in green consumers’ media profiles. Certain green product categories (such as niche organic products or green energy) may be a natural fit for online promotion whereas others (such as recycling behavior) may be further removed from online channels and communication (Kasperowicz and

Štreimikienė, 2016). Future research could report on optimal media profiles for typical green product categories relevant for marketers;

- qualitative research can add more nuance to green consumer media use profiles.

## CONCLUSION

Evolution of the marketing Internet technologies continue to create the new ways and develop the relevant approaches for green products promotion. As opposed to traditional marketing the digital marketing leads to the creation of demand on green goods using the power of the Internet as an interactive environment that allows to get additional value in the form of time, attention and support from the green consumer.

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# HODNOTENIE ÚROVNE ROZVOJA DIGITÁLNEJ EKONOMIKY A DIGITÁLNYCH ZRUČNOSTÍ V SLOVENSKEJ A ČESKEJ REPUBLIKE

# EVALUATION OF THE LEVEL OF DEVELOPMENT OF DIGITAL ECONOMY AND DIGITAL SKILLS IN SLOVAK REPUBLIC AND CZECH REPUBLIC

***Eva IVANOVÁ***[49]
***Jana MASÁROVÁ***[50]
***Eva KOIŠOVÁ***[51]

**Abstrakt:** *Digitálna ekonomika, digitálna transformácia a digitálne zručnosti sú kategórie, ktoré rezonujú v súčasnej spoločnosti a súvisia s nástupom štvrtej priemyselnej revolúcie. V globálnom svete nastávajú revolučné zmeny v oblasti techniky a technológií založené na využívaní IKT. Kľúčovú úlohu vo všetkých týchto procesoch zohráva ľudský kapitál ako tvorca týchto zmien, ale aj ako aktér na strane ich využívania a zdokonaľovania. Cieľom článku je zistiť súčasný stav a vývoj digitálnych zručností v SR a ČR a urobiť ich komparáciu na základe ukazovateľov sledovaných v indexe DESI, ktorý od roku 2015 vykazuje Európska komisia. Zamerali sme sa na signifikantný ukazovateľ ľudský kapitál, ktorý ma pri hodnotení v tomto indexe najvyššiu váhu. Pri spracovaní problematiky sme použili analýzu časového radu rokov 2014-2019, ďalej metódu komparácie a syntézu na formuláciu záverov. Využili sme databázu údajov Eurostatu a Európskej komisie. Výsledky skúmania: SR a ČR vykazujú porovnateľnú úroveň digitálnych zručností a zároveň sa nachádzajú mierne pod priemerom európskej únie. Z hľadiska parciálnych ukazovateľov najlepšie hodnoty obidva štáty majú v ukazovateli pripojenie na internet a ľudský kapitál, naopak najhoršie vo využívaní internetových služieb. Celkové výsledky v dimenzii ľudský kapitál v indexe DESI majú obidva štáty pod priemerom EÚ (hodnota v indexe 48), pričom jeho hodnota v SR je 44,2 a v ČR 44,8. V ďalšom skúmaní sa zameriame na hodnotenie ukazovateľov úrovne digitálnej ekonomiky v širšom kontexte štátov EÚ.*

**Kľúčové slová:** *digitálna ekonomika, digitálne zručnosti, index DESI, ľudský kapitál, Slovenská republika, Česká republika*

**Abstract:** *Digital economy, digital transformation and digital skills, related to the Fourth Industrial Revolution, have been given special attention these days. In the global world, there have been revolutionary changes in technology and the use of ICT. The key to all these processes is human capital in terms of making, utilising and upgrading these changes. The purpose of the paper is to assess and compare the current state and evolution of digital skills in the Slovak and Czech Republics using the DESI dimensions which have been calculated by the European Commission since 2015. The authors have focused on the major dimension of human capital. The analysis of the time series of data from 2014 to 2019 and a comparison of synthesis methods were employed to draw conclusions. The data were extracted from the Eurostat and European Commission database. Research results: The Slovak Republic and the Czech Republic show a comparable level of digital skills being slightly below the European Union average. In terms of partial indicators, the highest scores were recorded in the connectivity and human capital dimensions in both the Slovak and Czech Republics and the lowest scores in the use of Internet services. Regarding the human capital, both countries have scores below the EU average (48) – Slovakia (44.2), the Czech Republic (44.8). In the the follow-up research, the digital economy performance indicators in the wider context of the EU countries will be assesed.*

**Key words:** *digital economy, digital skills, DESI, human capital, Slovak Republic, Czech Republic*

[49] Ing., CSc., Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, Trenčín, 911 50 Slovensko, e-mail: eva.ivanova@tnuni.sk
[50] Ing., PhD., Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, Trenčín, 911 50 Slovensko, e-mail: jana.masarova@tnuni.sk
[51] Ing., PhD., Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, Trenčín, 911 50 Slovensko, e-mail: eva.koisova@tnuni.sk

**JEL Classification:** *E60, E64,J20, J24,*

## 1. ÚVOD

Rýchly vývoj informačných a komunikačných technológií (IKT) v posledných desaťročiach spôsobil významné zmeny vo vývoji svetovej ekonomiky. Tieto nové technológie prenikajú do všetkých oblastí ľudského života, prinášajú nové možnosti a nový potenciál pre dosahovanie sociálno-ekonomického rozvoja. Dochádza k digitalizácii globálneho hospodárstva a informačné technológie sa stávajú základom všetkých činností a integrujú sa do všetkých sektorov a odvetví hospodárstva.

Rozvoj digitálnej ekonomiky prináša so sebou pozitívne zmeny, ktoré súvisia jednak so vznikom nových výrobkov a služieb, inováciami a z toho vyplývajúceho ekonomického rastu, jednak so zásadnými zmenami na thu práce. Digitalizácia ekonomiky vyžaduje od pracovnej sily primerané digitálne zručnosti, pričom dôraz sa kladie aj na flexibilitu pracovných síl. Ľudský kapitál sa stáva kľúčovým faktorom rozvoja a jeho úroveň závisí od kvality vzdelávania a od jeho digitálnych zručností.

Cieľom článku je identifikácia súčasnej úrovne a vývoja digitálnych zručností v Slovenskej republike a Českej republike a porovnanie s priemerom Európskej únie, s akcentom na ľudský kapitál.

Na dosiahnutie stanoveného cieľa sú v článku využité metódy: analýza časového radu (obdobie 2014-2019), komparácia a syntéza. Vychádzame z údajov Európskej komisie, ktorá na hodnotenie úrovne digitálnych zručností a digitálnej výkonnosti vykazuje Index digitálnej ekonomiky a spoločnosti.

## 2. DIGITÁLNA EKONOMIKA A ĽUDSKÉ ZDROJE

Zásadné zmeny vo fungovaní globálnych ekonomík, ktoré súvisia s rozvojom informačných a komunikačných technológií, sa označujú pojmom digitálna transformácia. Jej dôsledkom sú aj zmeny v správaní spotrebiteľov a firiem, ale tiež komunít a regiónov. Veľký význam majú inovácie, ktoré sa zhmotňujú v nových produktoch, službách, procesoch či technologických postupoch. Výsledkom týchto zmien je vznik digitálnej ekonomiky, ktorá sa podľa Klinca (2000) stáva motorom ekonomického rastu a rozvoja vyspelých krajín, dochádza k digitalizácii základných funkcií ekonomiky a prevedenie stále rastúceho počtu ekonomických činností do digitálnej podoby.

Podľa OECD (2012) digitálna ekonomika pozostáva z trhov založených na digitálnych technológiách, ktoré uľahčujú obchod s tovarom a službami prostredníctvom elektronického obchodu. Rozšírenie digitálneho sektora bolo v posledných rokoch kľúčovou hnacou silou hospodárskeho rastu a posun smerom k digitálnemu svetu mal účinky na spoločnosť, ktorej úspešnosť sa hodnotí mierou zavedenia digitálnych technológií.

Kombinácia digitalizácie a IKT prispela k tomu, že globálna ekonomika smeruje k novej - štvrtej etape priemyselnej revolúcie, ktorá sa označuje ako Priemysel 4.0 (Industry 4.0). Týmto pojmom sa označujú rozsiahle zmeny vstupujúce do súčasného priemyslu, ktorých nositeľom je digitalizácia. Keďže ide o digitalizáciu výrobkov, služieb a všetkých podnikových procesov, automatizáciu a robotizáciu, tradičný výrobný proces dostáva nový rozmer a moderné technológie umožňujú postupne čiastočne alebo úplne nahradiť ľudskú prácu. (SBA, 2019) Ako uvádza Červeňová (2019), štvrtá priemyselná revolúcia sa považuje za najvýznamnejšie vyústenie digitalizácie ekonomiky.

Rýchly vývoj digitálnej ekonomiky si uvedomuje aj Európska komisia, ktorá ako jednu z hlavných iniciatív Stratégie Európa 2020 spracovala dokument Digitálna agenda pre Európu. Cieľom je umožniť obyvateľom Európy a podnikom v plnej miere využívať prínosy digitálnych technológií, vyplývajúce z jednotného digitálneho trhu založené na rýchlom a ultrarýchlom internete a interoperabilných aplikáciách. (Ondrejková, 2016).

Digitálna ekonomika obsahuje ekonomické procesy, interakcie a aktivity, ktoré sú založené na digitálnych technológiách. Tieto progresívne technológie vznikli na báze inovácií a ich transformácie do praktického života. Ako uvádzajú Chaaben a Mansouri (2017), digitálne technológie pomáhajú zlepšovať hospodársky rozvoj, produktivitu podnikov vo všetkých odvetviach a zvyšovať kvalitu života ľudí.

Zmeny, ktoré tieto technológie priniesli, vyžadujú nové prístupy, organizáciu a „nových ľudí“, ktorí disponujú digitálnymi zručnosťami. Digitálna transformácia vytvára nielen obrovské možnosti, ale generuje nové požiadavky a nároky na zmeny vo vzdelávaní, v zamestnávaní, v motivovaní ľudí, v hodnotení a odmeňovaní za prácu. Ako konštatuje Porubčinová (2011), inovácie a nové informačné technológie zvyšujú požiadavky na obsah ľudského kapitálu, na neustále obnovovanie a rozvíjanie schopností, zručností a poznatkov na trhu práce, pričom premeny v obsahu ľudského kapitálu sa stávajú signifikantným znakom prechodu k novému spoločenskému typu. To potvrdzuje obojstranný vzťah medzi vývojom širšieho spoločenského prostredia a formovaním znalostí, schopností a zručností človeka na trhu práce.

Automatizácia a digitalizácia pravdepodobne ovplyvnia nielen kvalifikačné potreby, ale aj hodnotu samotnej práce. Ľudský kapitál spolu s kvalitatívnou zmenou zmení aj svoju trhovú hodnotu. Zvyšujúci sa tlak na nové pracovné schopnosti tiež zvýši ich hodnotu, a tým aj náklady na prácu. (Kořen, 2018)

Ako sme už vyššie uviedli, rozvoj digitálnej ekonomiky je podmienený digitálnymi zručnosťami pracovnej sily, preto je aj podľa Európskej komisie (2015) potrebné zvýšiť úroveň digitálnych zručností v radoch zamestnancov vo všetkých odvetviach hospodárstva a v radoch uchádzačov o zamestnanie s cieľom zlepšiť ich zamestnateľnosť. Potrebná je zmena v spôsobe, akým sa systémy vzdelávania a odbornej prípravy prispôsobujú digitálnej revolúcii. V súvislosti s týmto je potrebné si uvedomiť, že osobitné problémy na trhu práce budú mať ľudia s nízkym vzdelaním, ktorí neovládajú najnovšie technológie, nedokážu pracovať s internetom, t.j. digitálne negramotné osoby. Ako uvádza Velšic (2010), rozdielna úroveň prístupu k IKT, digitálna gramotnosť a iné parametre môžu v blízkej budúcnosti tvoriť významný faktor prehlbovania sociálnych rozdielov. Najmä digitálnu negramotnosť treba v tomto kontexte vnímať ako nový hnací motor chudoby, pretože znižuje šance na kvalitné vzdelanie, na dobre ohodnotené zamestnanie, na zvyšovanie kvalifikácie a špecializácie, na majetok či vyšší spoločenský status.

Problematika digitálnej ekonomiky a jej vývoja sa dostáva aj do okruhu záujmu odborníkov nielen z oblasti techniky a technológie, ale aj ekonómie a ľudských zdrojov. Takisto sa touto problematikou aj naďalej intenzívne zaoberá Európska komisia, ktorá v roku 2015 na hodnotenie úrovne pokroku v digitálnej spoločnosti vyvinula „Index digitálnej ekonomiky a spoločnosti“ (DESI), v ktorom hodnotí tieto oblasti (dimenzie):

- pripojenie na internet,
- ľudský kapitál,
- využívanie internetových služieb,
- integrácia digitálnych technológií,
- digitálne verejné služby.

Každá oblasť je rozdelená na subdimenzie, ktoré sú hodnotené na základe viacerých ukazovateľov. Keďže jednotlivé ukazovatele sú vyjadrené v rôznych merných jednotkách, uskutočňuje sa ich normalizácia pomocou metódy minima a maxima. Každá dimenzie, subdimenzia i jednotlivé čiastkové ukazovatele majú stanovenú váhu na základe ich dôležitosti. Výsledné skóre príslušného štátu sa vypočíta ako súčet vážených hodnôt jednotlivých dimenzií.

Keďže v našom príspevku sa osobitne zameriame na hodnotenie ľudského kapitálu, uvádzame v rámci DESI aj jednotlivé ukazovatele dimenzie 2 - ľudský kapitál, ktoré sa využívajú na hodnotenie digitálneho pokroku od roku 2019:

- subdimenzia 2a – zručnosti používateľov internetu:
    - 2a1 - aspoň základné digitálne zručnosti,
    - 2a2 - viac ako základné digitálne zručnosti
    - 2a3 - aspoň základné softvérové zručnosti
- subdimenzia 2b: pokročilé zručnosti a rozvoj:
    - 2b1 - odborníci na oblasť IKT,
    - 2b2 - odborníčky na oblasť IKT
    - 2b3 - absolventi odboru IKT.

Dimenzia ľudský kapitál spolu s dimenziou pripojenie na internet sú považované za najdôležitejšie, čo vyplýva zo skutočnosti, že týmto dimenziám sú pridelené váhy 25%.

V dimenzii ľudský kapitál sa zohľadňujú jednak zručností v oblasti základného využívania, ktoré jednotlivcom umožňujú zapojiť sa do digitálnej spoločnosti a spotrebúvať digitálne služby a tovar, jednak pokročilé zručnosti, ktoré umožňujú pracovníkom plne využívať moderné technológie, čím sa zvyšuje produktivita a hospodársky rast. (Stoica, Bogoslov, 2017)

Európska komisia pri vykazovaní dimenzie ľudský kapitál vychádza z údajov Eurostatu, ktorý uskutočňuje zisťovanie o využívaní IKT domácnosťami a jednotlivcami a tiež zisťovanie týkajúce sa pracovných síl (Labour force survey).

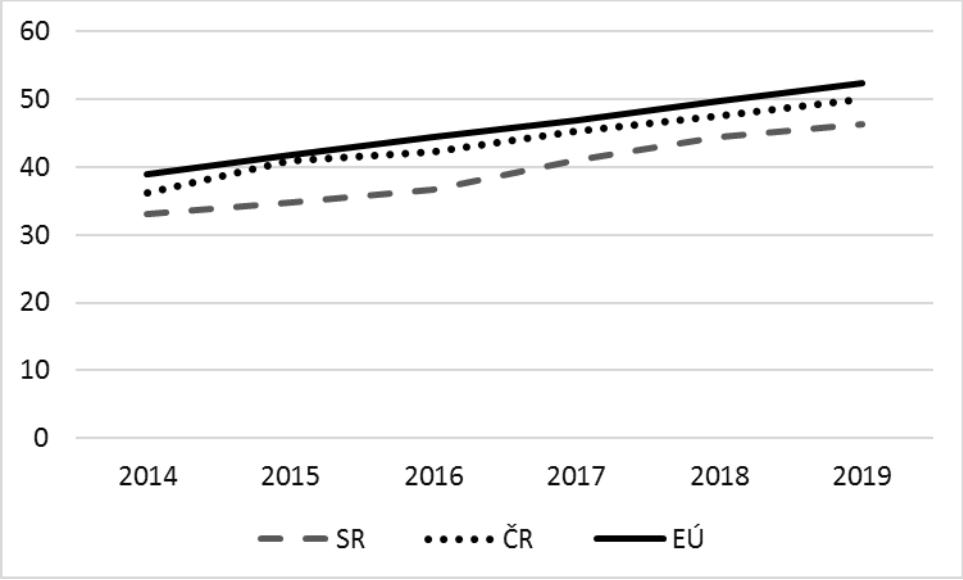
## 3. POROVNANIE DIGITÁLNEJ ÚROVNE V SLOVENSKEJ REPUBLIKE A ČESKEJ REPUBLIKE

Slovenská republika a Česká republika ako súčasť Európskej únie v súvislosti s rozvojom digitálnej ekonomiky uskutočňujú viaceré kroky na zvyšovanie digitálnej úrovne a rozvoj digitálneho trhu v rámci jednotného európskeho digitálneho trhu. V SR aj ČR boli schválené viaceré dokumenty zamerané na podporu rozvoja digitálneho trhu a digitálnych zručností obyvateľov (napr. Akčný plán Jednotný digitálny trh - príležitosť pre Slovensko, Akčný plán inteligentného priemyslu – v SR, Digitální Česko a iné). Zvyšovanie digitálnej úrovne je podmienkou pre ich ďalší ekonomický rozvoj.

### *3.1 Vývoj indexu DESI v SR, ČR a EÚ*

Index DESI je vykazovaný v rokoch 2014-2019. Po zmenách v metodike v roku 2019 boli údaje za minulé roky spätne prepočítané, aby bolo možné sledovať vývoj v dlhšom časovom období. Obrázok 1 zobrazuje porovnanie hodnôt indexu DESI v SR a ČR, pričom ho porovnávame aj s priemernou hodnotu Európskej únie.

**Obrázok 1: Porovnanie hodnôt indexu DESI v SR a ČR s priemerom EÚ**

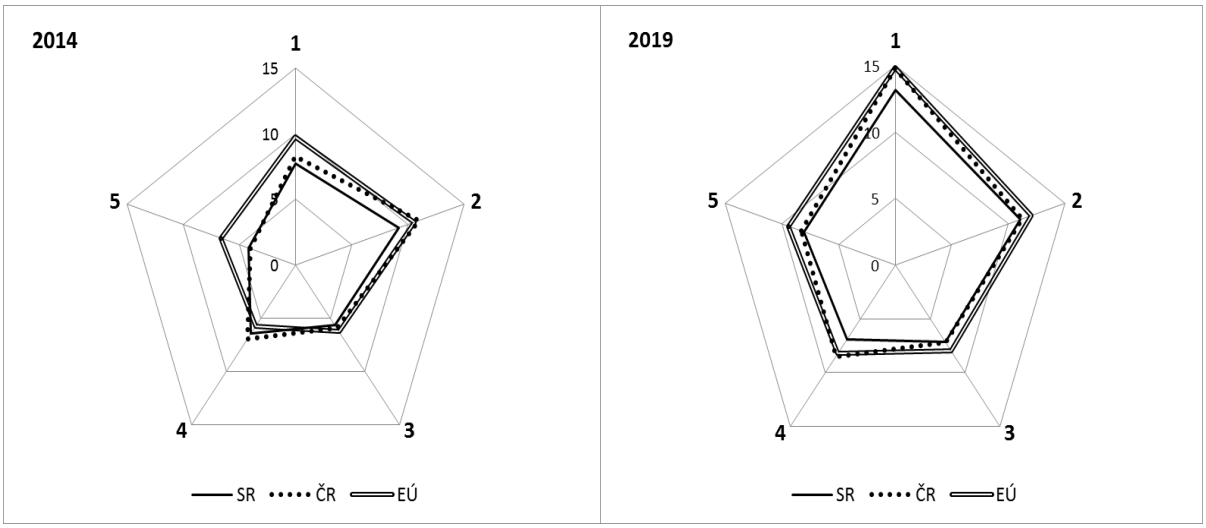



Zdroj: vlastné spracovanie podľa Európskej komisie (2019)

Z grafického znázornenia je zrejmé, že SR ani ČR nedosahujú v žiadnom sledovanom roku priemernú úroveň pokroku digitálnej spoločnosti v Európskej únii, hoci ČR sa k tejto úrovni veľmi približuje v roku 2015. Celkovo je trend vývoja indexu DESI pozitívny, rastúci v celom sledovanom období aj v SR aj v ČR.

V obrázku 2 je znázornené porovnanie hodnôt jednotlivých dimenzií indexu DESI v SR, ČR a EÚ v prvom a poslednom sledovanom roku.

**Obrázok 2: Porovnanie dimenzií indexu DESI v roku 2014 a 2019**




Zdroj: vlastné spracovanie podľa Európskej komisie (2019)
Vysvetlivky: 1 – pripojenie na internet, 2 - ľudský kapitál, 3 - využívanie internetových služieb, 4 - integrácia digitálnych technológií, 5 - digitálne verejné služby

Grafické zobrazenie ukazuje značné zlepšenie hodnôt jednotlivých dimenzií DESI v roku 2019 oproti roku 2014, najmä v dimenziách 1 – pripojenie na internet (o 6,51 v ČR a 5,45 v SR) a 5 – digitálne verejné služby (o 4,29 v ČR a 3,83 v SR). Iba nepatrný nárast nastal v hodnotení ľudského kapitálu v ČR (o 0,20) a v hodnotení integrácie digitálnych technológií

v SR (o 0,45). Celkovo možno konštatovať, že SR aj ČR dosahujú najlepšie hodnotenie v dimenziách 1 (pripojenie na internet) a 2 (ľudský kapitál), najhoršie hodnotenie v dimenzii 3 – využívanie internetových služieb.

Pri porovnaní úrovne jednotlivých dimenzií DESI v SR, ČR a priemere EÚ zisťujeme, že v roku 2014 SR aj ČR mali lepšie hodnotenie ako je priemer EÚ v dimenzii 4 (ČR aj v dimenzii 2), kým v roku 2019 už SR nedosahuje priemer EÚ v žiadnej dimenzii, ČR vykazuje stále hodnotenie lepšie ako priemer EÚ v dimenzii 4.

### *3.2 Dimenzia Ľudský kapitál v SR, ČR a EÚ*

Ako uvádza Európska komisia (2019), dimenzia Ľudský kapitál hodnotí zručnosti potrebné na využitie možností, ktoré ponúkajú digitálne technológie. V rámci tejto dimenzie sa posudzujú zručnosti používateľov internetu a tiež pokročilé zručnosti a rozvoj v oblasti IKT. V tabuľke 1 uvádzame hodnoty jednotlivých ukazovateľov v rámci dimenzie Ľudský kapitál v SR, ČR a EÚ.

**Tabuľka 1: Úroveň ľudského kapitálu v indexe DESI v SR a ČR v roku 2019**

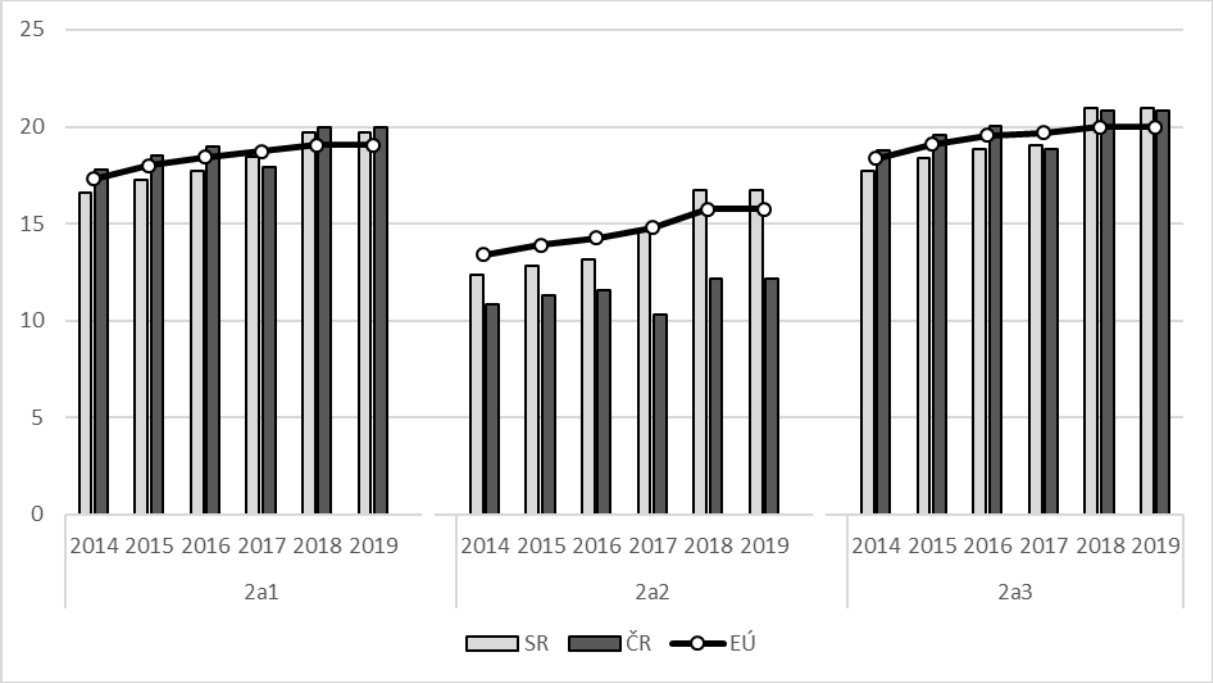
| | SR | ČR | EÚ |
|---|---|---|---|
| **2 – Ľudský kapitál - skóre** | 44,2 | 44,8 | 48,0 |
| **2a1 - aspoň základné digitálne zručnosti** (% obyvateľov) | 59% | 60% | 57% |
| **2a2 - viac ako základné digitálne zručnosti** (% obyvateľov) | 33% | 24% | 31% |
| **2a3 - aspoň základné softvérové zručnosti** (% obyvateľov) | 63% | 62% | 60% |
| **2b1 - odborníci na oblasť IKT** (% z celkového počtu zamestnancov) | 2,8% | 3,6% | 3,7% |
| **2b2 - odborníčky na oblasť IKT** (% zamestnaných žien) | 0,8% | 0,7% | 1,4% |
| **2b3 - absolventi odboru IKT** (% absolventov) | 3,2% | 4,0% | 3,5% |

Zdroj: vlastné spracovanie podľa Európskej komisie (2019)

Podľa údajov Europskej komisie má SR lepšie hodnotenie ako ČR aj EÚ v ukazovateli viac ako základné digitálne zručnosti. Mierne lepšie hodnotenie ako ČR dosiahlo Slovensko aj v ukazovateľoch 2a3 a 2b2. Slovensko prekračuje priemer EÚ vo všetkých ukazovateľoch subdimenzie 2a, na druhej strane ani v jednom ukazovateli subdimenzie 2b priemer EÚ nedosahuje. Zaujímavosťou je skutočnosť, že hoci ČR vykazuje väčšie percento absolventov odboru IKT ako je priemer EÚ, čo sa týka ukazovateľa viac ako základné digitálne zručnosti, je ČR značne pod úrovňou priemeru EÚ.

Porovnanie vývoja normovaných hodnôt jednotlivých ukazovateľov dimenzie 2a v SR, ČR a EÚ je zobrazené na obrázku 3, vývoj ukazovateľov dimenzie 2b na obrázku 4.

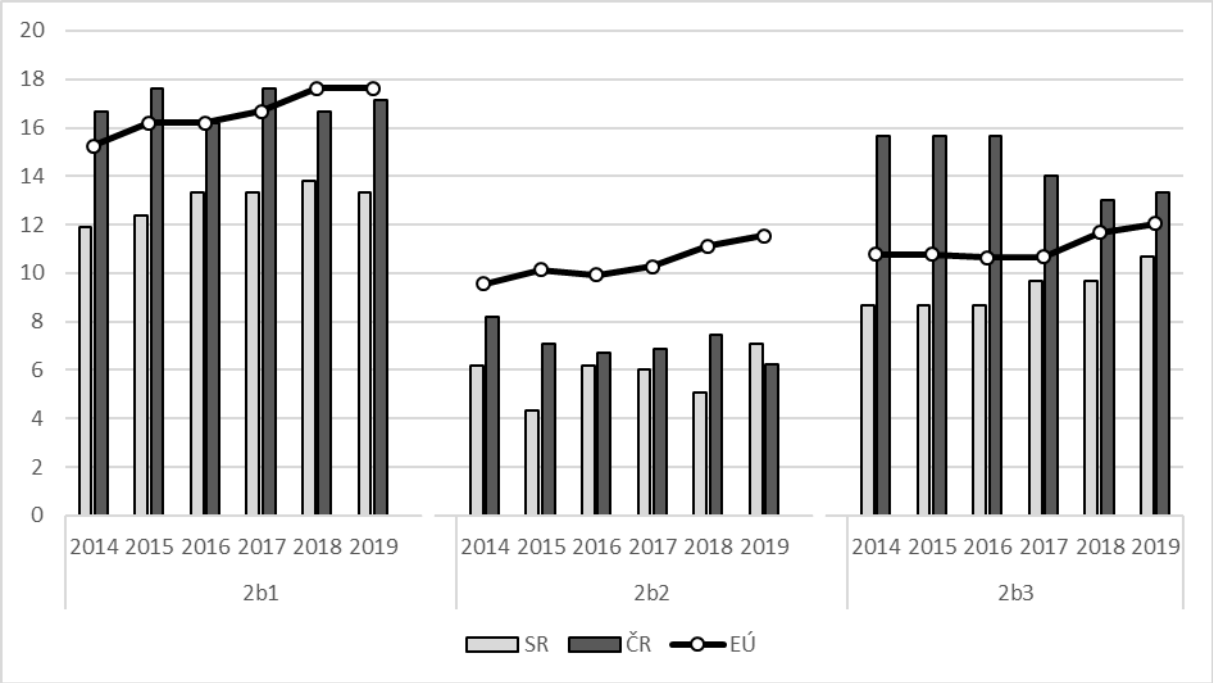
**Obrázok 3: Porovnanie hodnôt ukazovateľov subindexu 2a v SR a ČR s priemerom EÚ**




Zdroj: vlastné spracovanie podľa Európskej komisie (2019)

V subdimenzii 2a – zručnosti používateľov internetu sa hodnotenie SR postupne zlepšuje, a v posledných rokoch prekročilo aj úroveň priemeru EÚ. Z tejto subdimenzie najnižšie hodnotenie SR aj ČR dosahujú v ukazovateli viac ako základné digitálne zručnosti, avšak v tomto ukazovateli má SR výrazne lepšie hodnotenie ako ČR. Mierne lepšie hodnotenie SR oproti SR bolo zaznamenané aj v úrovni aspoň digitálnych softvérových zručností v rokoch 2017-2019.

**Obrázok 4: Porovnanie hodnôt ukazovateľov subindexu 2b v SR a ČR s priemerom EÚ**




Zdroj: vlastné spracovanie podľa Európskej komisie (2019)

V rámci subdimenzie 2b - pokročilé zručnosti a rozvoj SR aj ČR dosahujú najlepšie hodnotenie v podiele odborníkov na oblasť IKT z celkového počtu zamestnancov. V tomto ukazovateli i v podiele absolventov odboru IKT však dosahuje SR výrazne horšie hodnotenie ako ČR a ako priemer EÚ. V ukazovateli podiel odborníčok na oblasť IKT na počte zamestnaných žien sa hodnotenie SR aj ČR nachádza výrazne pod priemerom EÚ. V tomto ukazovateli SR dosiahla v poslednom roku lepšie hodnotenie ako ČR.

## 4. ZÁVER

Rýchly rozvoj vedy a techniky v 20. a 21. storočí spojený s rozvojom výrobných, dopravných, obchodných a ďalších systémov zapríčinil potrebu uchovávať, spracovávať a vyhodnocovať nesmierne množstvo informácií, čo je možné iba vďaka informačno-komunikačným technológiám. Ich dynamický vývoj pôsobí aj na potrebu zvyšovania kvalitu ľudských zdrojov, najmä v oblasti ich digitálnych zručností, a to vo všetkých odvetviach hospodárstva. V týchto súvislostiach vznikajú nároky na systém vzdelávania, ktorý má reflektovať požiadavky trhu práce a zároveň akcentuje úlohu celoživotného vzdelávania. Informácie a tomu zodpovedajúce technológie sa rozširujú expnenciálným tempom a tomuto trendu by mal zodpovedať aj systém vzdelávania. Priemysel indastry 4.0 potrebuje ľudí s technickým vzdelaním, analytickými schopnosťami, kreatívným myslením a rozvinutými digitálnymi zručnosťami, ktorí vedia flexibilne reagovať na nové požiadavky trhu práce.

Predmetom predloženého článku bolo zistiť úroveň rozvoja digitálnej ekonomiky a digitálnych zručnosti v Slovenskej a Českej republike v porovnaní s úrovňou rozvoja v EÚ. Pre hodnotenie sme použili index DESI zavedený Európskou komisiou. Z výsledkov vyplýva, že SR ani ČR nedosahujú v sledovanom období priemernú úroveň rozvoja digitálnej ekonomiky v Európskej únie, pričom celkový trend vývoja indexu DESI je pozitívny v celom sledovanom období rokov 2014- 2019 aj v SR aj v ČR. Pri porovnávaní jednotlivých dimenzií DESI na začiatku a na konci sledovaného obdobia najlepšie výsledky sú v dimenziách 1 – pripojenie na internet (o 6,51 v ČR a 5,45 v SR) a 5 – digitálne verejné služby (o 4,29 v ČR a 3,83 v SR). Najhoršie hodnoty majú obidve krajiny v dimenzii 3 – využívanie internetových služieb. Pri hodnotení parciálnych ukazovateľov v jednotlivých subindexoch tvoriacich index DESI v oblasti digitálnych zručností ľudí má SR lepšie hodnotenie ako ČR aj EÚ v ukazovateli viac ako základné digitálne zručnosti. Mierne lepšie hodnotenie ako ČR dosiahlo Slovensko aj v ukazovateľoch základné sofrwérové zručnosti a odborníčky na oblasť IKT. Slovensko prekračuje priemer EÚ vo všetkých ukazovateľoch subdimenzie 2a (zručnosti používateľov internetu) na druhej strane ani v jednom ukazovateli subdimenzie 2b (pokročilé zručnosti a rozvoj) priemer EÚ nedosahuje.Výrazne negatívne výsledky dosahuje SR v porovnaní s ČR, ale aj najmä s priemerom EÚ v podiele absolventov odboru IKT, čo indikuje potrebu zmien v systéme vzdelávania v SR.

Z predložených výsledkov vidíme, že obidva porovnávané štáty aj keď patria medzi relatívne rozvinutejšie štáty EÚ v oblasti rozvoja digitálnej ekonomiky ako aj v oblasti rozvoja digitálnych zručností vo všeobecnosti zaostávajú.

### *Dodatok*

Tento článok je súčasťou projektu VEGA č. 1/0689/20 Digitálna ekonomika a zmeny v systéme vzdelávania ako reflexia na požiadavky trhu práce.

This paper is the part of the project VEGA 1/0689/20 Digital economy and changes in the education system to reflect labour market demands.

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# THE STRATEGIC APPROACH TO THE INNOVATIVE DEVELOPMENT OF RUSSIAN ECONOMY

***Marina IZMAILOVA*** [52]
***Mikhail ABRASHKIN*** [53]
***Margarita SAVINA*** [54]
***Martin ŠIKÝŘ*** [55]

**Abstract:** *The goal of the paper is to present an authors' concept of the strategic approach to the innovative development of the Russian economy developed in order to make Russia one of the most technologically advanced countries in the world. Achieving the goal of the paper is based on the results of the authors' research focused on the critical analysis of the state participation in the innovative development of the Russian economy. Based on these results the paper discusses the role of the state in the strategic management of the innovative development of the Russian economy, summarizes proposals the state participation in the innovative development of the Russian economy, and presents scenario variants of the innovative development of the Russian economy. The results support research assumption that making Russia one of the most technologically advanced countries in the world require urgent and complex innovative technological renovation of all areas of the economy. Only this can bring a real innovative character to the Russian economy.*

**Key words:** *innovative development, economic growth, Russian economy*

**JEL Classification:** *R10, R58, O32*

## 1. INTRODUCTION

The paper actuality is determined by the necessity of seeking new tools for the modernization of the Russian economy based on the acceleration of the innovative development (Gorokhova, Šafránková, & Sekerin, 2015). The innovative breakthrough of Russia is becoming possible through providing formation of the new scientific and industrial policy (Spitsin, Mikhalchuk, Chistyakova, Spitsyna, & Pavlova, 2018) focused on technological upgrading of all economic landscape, attaching really innovative character to the economy (Sekerin & Gorokhova, 2016). The world-wide experience analysis of technological countries proves that in modern reality innovations are an effective tool of solving strategic tasks within the all national economy (Li, Hou, & Wu, 2017) and each particular company as they determine development acceleration rate, leadership strengthening and leaving behind competitors, creating timely protection from hurt for the branch in the case of radical innovation introduction, making economically unreasonable the whole business (Schuh, Potente, Wesch-Ponte, Weber, & Prote, 2014). These tasks should be solved in the shortest period in Russia, because developed countries have from 3 to 5 years to bring to an end structure rearrangement, after that period new leaders appear who will be able to capture a new long wave of economic growth (Glazyev, 2017). Russia should not omit the chance to become one of the leaders. That's why it's necessary to implement powerful initiative impulse in accelerating a new technological renovation.

[52] Prof. Financial University under the Government of the Russian Federation, , Leningradsky prospect 49, Moscow, 125993, Russian Federation, e-mail: m.a.izmailova@mail.ru
[53] Assoc. Prof. State Budgetary Higher Educational Institution Moscow Region University of Technology, ul. Gagarin, 42, Moscow region, Korolev, 141070, Russian Federation, e-mail: abrashkinms@mail.ru
[54] Prof. Russian State Social University, Vilgelm Pik str.,4, building 1, 129226, Moscow, Russian Federation, e-mail: marg.savina@yandex.ru
[55] Assist. Prof., PhD. Czech Technical University in Prague, Masaryk Institute of Advanced Studies, Kolejni 2637/2a, 160 00, Praha 6, Czech Republic e-mail: martin.sikyr@cvut.cz

## 2. PROBLEM FORMULATION AND METHODOLOGY

The goal of the paper is to present an authors' concept of the strategic approach to the innovative development of the Russian economy developed in order to make Russia one of the most technologically advanced countries in the world.

Achieving the goal of the paper is based on the critical analysis of the state participation in the innovative development of the Russian economy using empirical and statistical data on innovations and the development of Russian economy available in the scientific literature and provided by the Russian Federal State Statistics Service (Rosstat). To formalize and summarize the results of the analysis, comparative, abstract-logical, inductive-deductive and statistical methods were used. Based on the results of the analysis, it was possible to discuss the role of the state in the strategic management of the innovative development of the Russian economy, summarize proposals the state participation in the innovative development of the Russian economy, and present scenario variants of the innovative development of the Russian economy. Authors current results of the researches have been summarized in the study edited by Veselovsky (2018).

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

The authors' research results are presented in three aspects: 1) in revealing state role in strategic management of innovative development of the Russian industry; 2) in elaboration of suggestions on state policy perfection in the field of innovative development of the Russian industry; 3) in forecasting scenario variants of the industry in Russia.

### *3.1 The role of the state in strategic management of innovative development of the Russian industry*

In Russia the state makes considerable efforts to support demand on innovation both subsidizing innovative companies and distributing orders directly to the innovative products. Russia is the eighth in the world in spending on research a development (Rosstat, 2018). At the same time co-financing program introduction of scientific research and experimental constructive work and extending preferences and benefits for the companies implementing scientific-research and experimental constructive work on priority guidelines can become additional measures to increase demand for innovations (Veselovsky & Izmailova, 2019). Besides, the state can play a considerable role in creating demand of highly technological branches product from the big business. Having been a shareholder of the biggest companies, the state can stimulate its involvement in the system work on innovations by the set of tools of corporative management (Kordos, 2019; Kordos, 2018). In particular, the following innovation effectiveness estimation indices can be considered: share of innovative products in receipts, investment of innovations in the revenue's growth, size and structure of innovative projects portfolio, innovative strategy availability and its quality, roadmaps of partnership development for innovations (Sekerin & Gorokhova, 2016).

The state provides environment and terms for the development of innovations in the country (see The Strategy for Innovative Development of the Russian Federation until 2020) creating necessary infrastructure, which includes the educational system, innovative clusters and peculiar economic zones, agencies and innovation development institutions, intellectual property protection and law system, system of standards, certifications and accreditation, as well as institutional environment, including favourable conditions for running business and fiscal policy (Kurakova, Zinov, & Tsvetkova, 2014). But in spite of it, there hasn't been qualitative leap in innovation and entrepreneur activity in the country yet. That's why there is an improvement conditions potential as before.

Development of science and production cooperation, guidelines accuracy of specialized clusters development and agencies for innovation development as well as stimulation of appearing in the market and technological brokers and engineering centres formation are the key tasks of infrastructure perfection requiring purposeful attention (Westerman, Bonnet, & McAfee, 2014). There are five innovative agencies in the world four of which are functioning successfully in Russia (table 1), while activity of the agency which should stimulate science and production cooperation is developed least of all (Knyaginin, Kudrin, & Rozhkova, 2017).

This is the close interaction of science and business which makes possible scaling and introduction of innovative ideas, arising in the process of fundamental and applied researches. This guideline can be developed, for example, establishing consortiums and increasing effectiveness of the areas for communication on innovation problems between players from different branches, start-ups and research institutes and change of experience and technologies (Li et al., 2017).

**Table 1: Types of agencies and institutions for innovation development**

| Areas of activity of innovation agencies | Specialization | Examples in Russia |
|---|---|---|
| Cooperation of science and production | Comprehensive support of associations or joint projects with enterprises and research institutes or higher school participation | The function of this type of agencies is implemented by technological areas partially |
| Strategic programs of researches | Financing of fundamental or applied researches | Russian scientific fund, Russian fund of fundamental research |
| Services for innovative companies | Techno parks, incubators and centres of technology transition, rendering consultative services for innovative companies | Innovative centre “Skolkovo” Techno park “Mosgormash” |
| Financing of innovative companies | Direct financing by granting, credit arrangement, guarantees and financing by share issue | Fund of innovation assistance “Vebinnovation” |
| Financing of priority guidelines | Financing of guidelines and groups of companies | Fund of internet initiatives development |

Source: authors based on Veselovsky et al. (2018)

Although technological platforms have also been playing the role in them yet, company representatives – leaders of the branches often don’t participate in them, but it's necessary for the effective dialogue. It’s important to go on development of specialized clusters on priority guidelines, financing their activity and helping in determining priorities of the next development stage. A specialized agency on production and science cooperation could be a centre of competence for different clusters, consortiums and other interaction formats of scientific and business environment. It could determine a priority development guideline in this branch, coordinate actions of the agency and support measures of different clusters, technological platforms and other consolidating systems.

### *3.2 Proposals on state policy perfection in the field of Russian industry innovative development*

The systemic view supposes the complex of measures on the content of the economic development policy aimed at industry innovative development (Veselovsky & Izmailova, 2019):

- to reduce percentage rates and to create mechanisms of innovative and investment activity refinancing through target monetary issue under obligations of the government, state

development institutions, enterprises envisaged by federal and regional investment programs, projects of development institutions, special investment contracts within strategic and indicative planning systems;

- to exempt from taxation incomes of enterprises aimed at investment to implement scientific research and experimental constructive work, mastering new technologies, production development, accelerated amortization of main funds on the basis of depreciation deduction target use;
- double increase (as minimum) the budgetary means expenditures on financing scientific applied research, launching target scientific-technical-technological program complex on the basis of state support of innovative activity implementation on economic development perspective guidelines;
- to increase (repeatedly) refinancing and development institutions effectiveness raising by the Bank of Russia associated with planning arrangement of their investment activity in according to the accepted priority guidelines of modernizing and economic development;
- to establish the state off-budgetary investment credit fund (the analogue of German KFW) at the expense of the target credit emission;
- to establish modern information infrastructure of scientific research and entrepreneur activity;
- to provide effective protection of Russian intellectual ownership rights including abroad, to assist supporting new technological import.

To establish the management system of industry modernization and technological development it's necessary (Glazyev, 2015):

- to elaborate and introduce the target program implementation mechanism outpacing economic development provided the new technological structure establishment; the program should envisage measures of investment volume increase for development of components of a new technological setup of productive technological complexes, creation of favourable macroeconomic environment and formation of appropriate institutions and outlines of management;
- to create a strategic planning system in which it’s necessary to establish priorities of economic development and scientific technical activity, envisage elaboration of indicative plans and programs of their implementation;
- to implement as quick as possible the federal law "on strategic planning" requiring the additions by procedures formation choice of priority guidelines scientific technical progress and planning of measures for their implementation, by adopting target indices of developing institution activity;
- to submit activity of all bodies implementing macroeconomic regulation, including Bank of Russia and Department of Finance of the Russian Federation, as well as state corporations for achievement task goals and decision in the field of economy modernization, its technological development and scientific technical potential of full value. Implementation of this measure requires carrying out indicative planning of joint activity of the state and companies in concluding and realizing investment contracts in which the form of responsibility for observance of all adopted obligations should be provided.

### *3.3 Scenario variants of innovative development of Russia*

Implementation of abovementioned approaches to a new policy of innovative development – at the stage of digital economy establishing – is capable to take the country to the main stream

of civilization technological development (Glazyev, 2017). Nevertheless, in according to the strategic documents revealing conceptual approaches to innovative development of Russian possibility of innovative development three scenarios implementation in the country is envisaged (Morozyuk, Sharkova, Merkulina, & Vasilyeva, 2017):

- acceleration capability scenario orients economy to purchase import technologies and equipment, reduction of state expenditures on scientific-educational branch and innovative activity accompanying salary administration growth stagnation in the budgetary sphere;
- the scenario of running down development envisages modernization of economy on the basis of import technologies introduction, increasing competitiveness of labour and capital at the international market at the expense of the investments involvement, state finances are directed to the infrastructure projects and salary administration growth in the state sector;
- scenario of the leading development covering fundamental research and the main scientific-technical sectors will permit to modernize mentioned spheres, to start export of non-raw products, to achieve considerable rate of the economic growth. It will provide competitiveness of the domestic economy in the whole. Considerable growth of the state expenditures on the development of the human capital, scientific and innovative sphere, and scientific technical research results commercialization is provided.

Analysing each of the presented scenarios and taking into consideration the current situation in Russia and in the world characterized by geopolitical and economic instability the scenario of our country leading development involving a range of perspective guidelines is considered to be the most adequate (Veselovsky, 2018):

- increase of power of the industrial and technological potential, first of all at the expense of acting development and establishment of new technological productions;
- transition to the non-raw specialization of economy including through establishment of highly technological processing production for the competitive products issue;
- implementation of import replacement program with support of domestic commodities producers, increasing export effectiveness against the background of import curtailment, motivation of domestic consumer demand growth of population on the domestic product;
- increasing energy- and resources efficiency of ownership management, infrastructure development which can minimize sanction costs in all sectors of economy;
- establishment of the leading development zones within which it’s possible to implement mega- and infrastructure projects;
- attracting domestic and foreign investments on the basis of taking rational decisions for implementation of considerable investment projects, including ones on the principles of public-private partnership;
- creation of stimulus for the enterprise innovative activities, reduction of region polarization on the basis of region strategic management, increasing potential of subsidized regions;
- increasing steadiness of the financial system, ranging flexible tariff, customs and tax policy, budget financial support of the small and medium business;
- guarantee provision of population social protection, solving demographic problems, etc.

To achieve the specified results, it’s necessary to consider the following conditions (Glazyev, 2015):

- establishing favourable conditions in the country for entrepreneur development and innovation stimulation, attraction of professionals with creative thinking and aimed at the making innovative products in the science and highly technological sectors;
- increasing innovative investment attractiveness of the country and on its base strengthening its competitive positions;
- establishment and development of economic environment which forms demand on innovations;
- successful implementation of innovative policy in the regions and in the whole country.

In the terms of risk and turbulent environment implementation of the whole complex of measures capable to transit economy of Russia to the innovative development way should be based on the adoption of balanced management decisions.

## 4. CONCLUSION

Earlier the state role in the innovative process was to establish innovative environment in which all participants of the market could work out and introduce effectively innovations as well as to sponsor fundamental sciences and new elaborations. In the modern coming up with every day complicating world when there is a high degree of interpenetration of branches and growing speed of changing the role of the state is becoming more considerable (Hermann, Pentek, & Otto, 2016). Carrying out policy of country innovative development involving elaboration and implementation of the industry development strategy the state not only assists in financing strategic important perspective projects, but influences directly how branches are developed innovatively.

For large scale innovations it’s necessary principally a new level of big business, state, science and technological entrepreneur interaction (Schuh et al., 2014). Innovations are very often associated with start-ups, but at the same time big companies and fundamental researches are the sources of the biggest part of global innovations. Consequently, in the scale of the country involvement of the big business into innovative process will play the most important role. In view of the fact that innovations require a wide set of competences and serious resources which aren't often available in the separate company the decisive factor of introduction of innovative solutions and their successful commercialization is becoming partnership and effective interaction of a wide range of innovative activity participants.

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# LABOUR MARKET CHANGES IN THE REGIONS OF SLOVAKIA IN THE CONTEXT OF INDUSTRY 4.0

***Dana JAŠKOVÁ***[56]

**Abstract:** *The 4th Industrial Revolution is significantly different from the previous Industrial Revolutions. It will completely change everyone and every aspect of life. Industry 4.0 represents change of paradigm in industrial leading to higher productivity and performance. The impacts of implementation of Industry 4.0 can be expected at the microeconomic and macroeconomic level. The impacts of Industry 4.0 are not only in technological level but also in the field of human resources. The article aims to assess the impact of the implementation Industry 4.0 on labour market in industry in regions of Slovakia. Changes in important labour market indicators are assessed. An aggregate indicator, known as a Composite Indicator, is constructed for each region of interest. Complex multivariate statistical methods are used to construct the composite indicator.*

**Key words:** *Industry 4.0, Composite Indicator, multivariate statistical methods*

**JEL Classification:** *L63, J21, R11*

## 1. INTRODUCTION

Technological advances have brought several benefits to the industrial world. New concepts like digitization, Internet of Things (IoT) a Cyber Physical Systems (CPS), have gained prominence in different sectors. All these terms are found in the definition of Fourth Industrial Revolution (Industry 4.0), also known as the German high-tech strategy for future manufacturing industries. The Industry 4.0 concept was originally developed in Germany in 2011. It is closely related to the Internet of Things (IoT), the Computer Physical System (CPS), Information and Communication Technologies (ICT), Business Architecture (EA) and Business Integration (EI). Industry 4.0 plays an important role in the transformation of traditional companies into Smart Factories with the help of IoT and CSP. The main role of CPS is to respond effectively to production requirements and improve the efficiency and effectiveness of the industry as a whole. A decentralized approach is of great importance in the context of Industry 4.0, which emphasizes the independent management of processes and smart objects across the entire production network. In fact, it is a real and virtual collaboration on processes. Developing integrated processes and man-machine interaction stimulates complexity and mobility, as well as data transfer between value chains. With Industry 4.0, industries gain operational efficiency in time, cost and productivity. (Lu, 2017)

Mechanical production plants based on water and stream power represented the first industrial revolution. The second industrial revolution, which started at beginning of the 20$^{th}$ century, was symbolized with mass labor production based on electrical energy. The third industrial revolution, which begins began in the 1970s, was characterized by automatic production based on electronics and internet technologies. The fourth industrial revolution (Industry 4.0) is characterized by cyber physical systems production, based on heterogeneous data and knowledge integration. Industry 4.0 aims to achieve a higher level of operational efficiency than a higher degree of automation. There are five key themes for the future of Industry 4.0:

- digitization, optimization, and customization of production,
- automation and adaptation,

[56]RNDr. Dana Jašková, PhD., Department of Economy and Economics, Faculty of Social and Economic Relations, Alexander Dubček University of Trenčín, Študentská 1, 911 50 Trenčín, Slovakia, e-mail: dana.jaskova@tnuni.sk

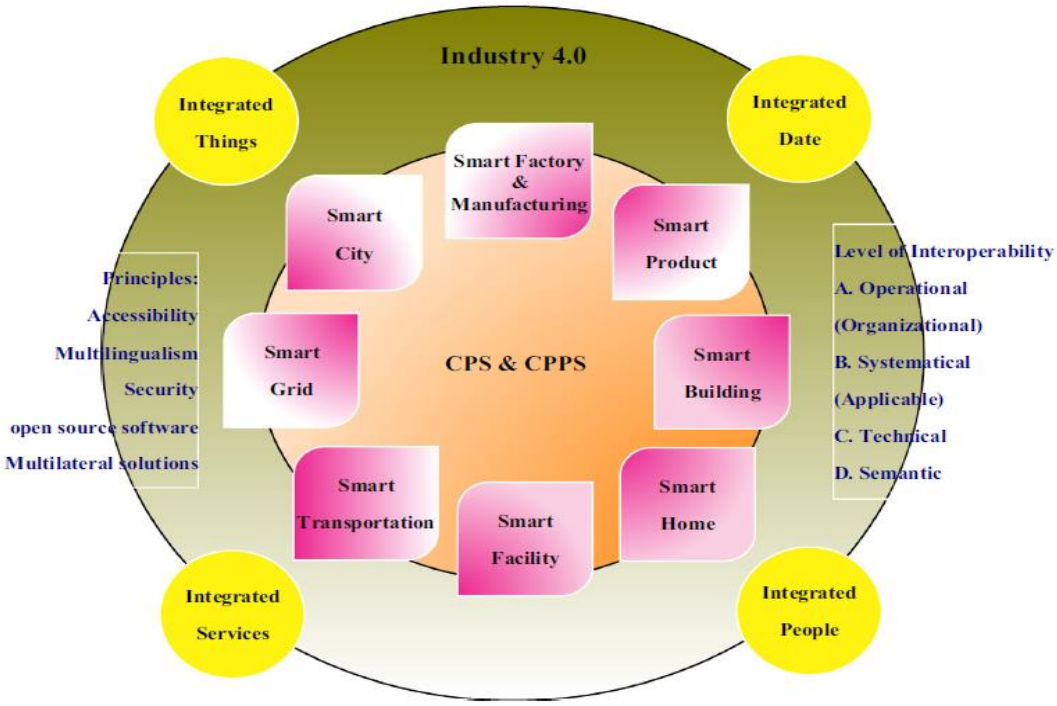
- human machine interaction (HMI),
- value added services and businesses,
- automatic data exchange and communication.

These areas of the future for Industry 4.0 are highly related to Internet technologies. (Lu, 2017)

Industry 4.0 is based on two key aspects: integration and interoperability. Thanks to the integration with suitable applications and software systems, the process management implemented by the network organization will not be limited by individual organizations. IEEE defines interoperability as the ability of two systems to understand and use each other's functionality. It represents the ability to exchange data and share information. Interoperability should not only be considered a property of ICT systems, but also concerns the business processes context of an enterprise. Interoperations are only meaningful, when all levels of an enterprise are addressed (Berre et al., 2007).

The interoperability feature synthesizes software solutions, applications, business processes into a single system. The Industry 4.0 interoperability system combines four levels: operational, systematical, technical and semantic interoperability. The framework of interoperability of Industry 4.0 is illustrated in the following figure.

**Figure 2: Interoperability of Industry 4.0**




Source: Lu (2017)

Operational interoperability represents general structures of concepts, standards and relationship between CPS and Industry 4.0. Systematic interoperability identifies guidelines, standards, methodologies and creates models. Technical interoperability includes tools and platforms for technological development, IT systems, the ICT environment and related software. Semantic interoperability ensures the exchange of information between different groups of people, applications and different levels by institutions.

## 2. WORKFORCE AND INDUSTRY 4.0

The Industry 4.0 concept has been gradually adopted by organizations in all countries of the world. This has brought new challenges. These challenges relate to the skill level of the workforce. Skills that are currently preferred in the labor market will lose their priority in the future. Skills that are currently preferred in the labor market will lose their priority in the future. A higher percentage of jobs will put emphasis on cognitive skills. The system of work-related skills required will outweigh physical capabilities. (Berger, 2017)

In most countries, there is a mismatch between the skill sets that jobseekers have and the skills sets expected to have them. This gap will widen further in the loss of demand if each country fails to take the necessary measures. The governments of these countries have taken independent initiatives to promote training and skills development in their countries. However, considerable efforts are still needed to develop skills for Industry 4.0. One of the issues discussed in the context of Industry 4.0 is its expected impact on employment. (Vuksannovič et al, 2016)

Many experts believe that the adoption of Industry 4.0 will lead to an increased use of automation and robots in manufacturing. These robots will be able to perform tasks multiple times with a high level of precision and in a shorter time period than humans. Robots will act as an effective replacement for work. Other experts believe that the use of Industry 4.0 technologies will not result in job loss. Conversely, Industry 4.0 will result in increased labor productivity and product quality. As a result, demand for manufactured quality products will increase. This will give companies a different option to increase their capacity to meet demand. There is no doubt that certain low-skilled jobs will disappear. Increasing capacity will have a positive impact on job creation, which requires a higher level of skills. The creation of new high-skilled jobs largely compensates for the removal of low-skilled jobs. (Berger, 2017)

### *2.1 Labour market in Slovakia*

EU economies have continued to grow since 2013, with an annual GDP improvement of around 2% on average. The positive trend is related to the improvement of social conditions. The Slovak labor market is improving in line with positive developments in the EU labor markets. The main indicators, the unemployment and employment rates, are improving in most EU member states. On average, the average unemployment rate in the EU was below 7% in mid-2018, with a lower rate for men. In most EU countries, the unemployment rate has fallen close to pre-2008 levels.

The Slovak labor market follows developments in the EU, but the risk areas continue to recover. This is reflected in the key indicators. The unemployment rate fell to a historically low level (6.6%) in 2018 and continued to decline further to 5.7% in the first half of 2019. The decreasing trend in the unemployment rate can also be observed in other countries of the V4, so the difference between the unemployment rate in Slovakia and the unemployment rate in the Visegrad countries decreased only slightly. The improvement is largely due to negative demographic changes and the continuing expansion of labor demand. Negative demographic trends in EU countries (including Slovakia) and positive economic growth are the main reasons for labor shortages and high job vacancies. Employers have started to use the long-term unemployed group, finding training solutions to support their inclusion in the workplace.

Structural imbalance has traditionally been a key problem in the Slovak labor market. The overall employment rate continues to increase slightly and the employment rate also increases in individual age categories. However, the gap between the age groups is still great and only a little more is employed than every third young man under the age of 25 and every fifth young woman. (Štefánik et al., 2018)

The gender structure of labor market participation is a problem with lower female participation rates, especially among young women. Their employment rate is slightly decreasing year-on-year. The gap between the participation rates of young and older women increased in 2018. The Slovak population is aging at a high rate and while the labor market may have benefited from older, highly qualified workers for several years, the situation is getting worse and younger, low-skilled cohorts will be even less able to match the demand for replacement. Long-term unemployment is systematically one of the most problematic areas of the Slovak labor market. Another problem of the labor market structure is the situation of the low-skilled unemployed. The unemployment rate is highest among the low skilled. The development of time for low-skilled people is either slightly positive compared to high-skilled women or recently even negative for low-skilled women. (Štefánik et al., 2018)

### *2.2. Labour market in regions of Slovakia*

Regional differences in the labor market in Slovakia stem from many factors, such as location, hard and soft infrastructure, availability of services, concentration of institutions. Labor market flexibility is considered to be key factor not only in the competitiveness of the country but also within its regions. One of the basic components of labor market flexibility is labor mobility (Eamets, Jaakson, 2014). In general, we distinguish between spatial and occupational mobility. While spatial mobility is related to the work of employees, structural mobility reflects the ability of the workforce to move jobs between departments or to adapt to new jobs and skills.

As reported by Niebuhr et al. (2009), labor mobility strengthens the disparities in regional employment, respectively unemployment and wages. In the relevant models, the impact of mobility is not limited to the supply of labor but is based on the impact on labor demand. According to some models of economic geography (Südekum, 2005; Epifani, Gancia 2005), due to external effects, migration may lead to widening disparities in regional labor markets. Regional disparities in Slovakia are perhaps most noticeable in the area of employment. Indicators of economic activity, unemployment, average wage and the like show a significantly different situation and a different situation on the labor market in individual Slovak regions.

In practice, unemployment rates, gross domestic product per capita or average wages are most often used to characterize the labor market. Each of these statistics has its shortcomings. Average wages do not include data on the income of sole traders, contract revenues and the employee's local affiliation is determined by the seat of the organization. Per capita GDP in regions is distorted by labor mobility, official statistics on people's permanent residence, or the attribution of the performance of some branches to headquarters in other regions. The above-mentioned indicators are also influenced to a different extent by the gray economy, which may be differently regionally present. Although strong economic growth has led to a significant improvement in the labor market situation, structural problems remain. There are significant differences between regions, between women and men, in terms of employment levels and job vacancies. (Štefánik et al., 2018)

Demographic trends and new production processes will have a significant impact on the labor market. Although the population is projected to decline in the long term (until 2035), it is projected to fall most in regions that are already struggling with labor shortages (with the exception of Bratislava). It is also estimated that 33% of all jobs in Slovakia are highly automated and another 31% are at risk of a substantial change in the way they are implemented (OECD, 2018a). These estimates suggest that nearly two-thirds of jobs are at risk, the highest rate among OECD countries. Automation can also contribute to creating new jobs. This requires considerable investment in adapting to new labor market demands, which require new and more advanced types of skills and qualifications. Only 33% of Slovaks

currently possess higher than basic digital skills. Employers report that they are increasingly having difficulty finding employees with the required skills. The vacancy rates vary considerably between regions, with a clear negative correlation with the unemployment rate. Long-term unemployment remains a serious problem. The long-term unemployment rate (as a share of the economically active population) declines year-on-year, but the average duration of unemployment is among the highest in the EU. Three quarters of the long-term unemployed are concentrated in three regions - Prešov, Košice and Banská Bystrica.

The gender gap in employment is narrowing, but the employment of women of reproductive age is not improving. For example, the gender gap in employment decreased by 1.4 percentage points to 12.8% in 2017, which is above the EU average. This improvement was mainly due to higher employment rates for women aged 45+. In contrast, the employment rate for women aged 25-34 decreased, contributing to widening the gap in this age category. The overall pay gap between women and men is 19%, which is above the EU average (16.2%). (Štefánik et al., 2018)

## 3. MATERIALS AND METHODS

To compare regions in terms of labour market, this phenomenon must be quantified. At present, the methodology of constructing a aggregated indicator, which is called a Composite Indicator (CI), is preferred. The OECD published a detailed methodology for its construction. The OECD's Handbook on Constructing Composite Indicators (Nardo et al., 2005) describes different methodologies that can be applied to combine varied information into this index and the difficulties associated with each part of the process. A composite indicator is an indicator that is constructed from several indicators and evaluates the region from different perspectives. The composite indicator should allow a more comprehensive, coherent and synthesizing view of the level of the region. (Minařík, 2013).

The evaluation of the labour market of the region is diverse, taking into account the purpose pursued, the choice of method and its correct application. The selection of indicators for their evaluation is also important. A key role is played by the way they are integrated into a single indicator and the subsequent correct interpretation of the results. The indicator must be significant, relevant, understandable, transparent, analytical, complete, internally comparable, and externally comparable. These requirements must be respected in their selection.

The construction of *CI* can be described by the following steps: creation of a theoretical framework, selection and combination of input indicators, assessment of their material significance, statistical characteristics, weighting, normalization, aggregation, relation to input indicators, visualization of results. Summary indicators have both advantages and disadvantages. They are discussed in detail by Saisana and Tarantola (2002).

### *3.1 Methods of construction of summary indicator*

Methods of construction of the aggregate indicator can be divided into statistical-analytical methods, which are focused on the selection of input indicators and statistical-descriptive methods, which allow calculation of the aggregate indicator.

One-dimensional statistical methods provide an overview of the analyzed indicators. Multidimensional methods are used in the construction of composite indicators to find the optimal number of input indicators, reduce them and reveal the similarity of the examined objects (cluster analysis, correlation analysis and analysis of main components). The statistical-descriptive methods allow the computation of the aggregate indicator using aggregation techniques and the analytical-hierarchical process, which is based on different ways of determining weights for individual indicators in their aggregation.

Throughout this section, we will use the following designation: $y_{i,t}^{r}$ - the original value of the indicator *i*, of the region *r* in year *t* (2010; 2017), where $i = 1, \dots, n; (n = 10)$, $I_i^t$- - normalized indicator value *i* in year *t*, $w_{i,\upsilon}$- weight associated with indicator *i*, $\upsilon$ =1,…,V means the method of determining the weight of the indicator, $CI_t$- value of composite indicator over time *t*. The following methods can be used to normalize input indicators: Normalization based on interval scales, Standardization z-scores, Min-Max, Distance to a reference, Methods for cyclical indicators and Percentage of annual differences over consecutive years.

The weight of the indicator can be determined by subjective methods, expert decision and Point method. Objective methods include methods ($\upsilon$=1,…,7): Equal weighting (EW), Principal component analysis (PCA), Benefit of the doubt (BOD), Unobserved components models (UCM), Budget allocation process (BAP), Analytic hierarchy process (AHP), Conjoint analysis (CA.)

## 4. THE RESEARCH RESULTS AND DISCUSSION

Selection of suitable indicators for further analysis is based on database from Berger (2017). For our purposes, the relevant indicators (Statistical Office of SR), which were officially published at the regional level of Slovakia, NUTS III, were selected. The comparison period was 2010 and 2017. Table 1 shows the input indicators:

**Tab. 1: Input indicators**

| sign | Indicator name | Type | Unit |
|---|---|---|---|
| $y_{1,r}$ | Economic activity rate - men | max | % |
| $y_{2,r}$ | Economic activity rate - women | max | % |
| $y_{3,r}$ | Unemployment rate - men | min | % |
| $y_{4,r}$ | Unemployment rate - women | min | % |
| $y_{5,r}$ | Employment rate 20 – 64 - men | max | % |
| $y_{6,r}$ | Employment rate 20 – 64 - women | max | % |
| $y_{7,r}$ | Average nominal monthly wage – industry - men | max | € |
| $y_{8,r}$ | Average nominal monthly wage – industry - women | max | € |
| $y_{9,r}$ | Regional gross domestic product per capita (at current prices) | max | € |
| $y_{10,r}$ | Average gross equivalent household income | max | €/month |

Source: own processing

The input data were initially subjected to statistical analysis. Data consistency and multicollinearity were excluded. Given the different unit of data examined, they were normalized by the Min-Max method according to the relation:

$$I_i^r = \frac{y_{i,r} - y_{i,min}}{y_{i,max} - y_{i,min}} \tag{1}$$

in case of positive scope and in case of negative scope of the indicator according to the relationship

$$I_i^r = \frac{y_{i,max} - y_{i,r}}{y_{i,max} - y_{i,min}} \tag{2}$$

where $x_{i,max}$ is a maximal value of $i$-th indicator and $x_{i,min}$ is a minimal value of $i$-th indicator over the reporting period *t=2010; 2017*. Weights of individual indicators $w_i$ were determined by expert judgment and were standardized. The values are in the following table:

**Tab. 2: Weights of indicators**

| indicators | $w_1$ | $w_2$ | $w_3$ | $w_4$ | $w_5$ | $w_6$ | $w_7$ | $w_8$ | $w_9$ | $w_{10}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| weight | 0,0802 | 0,0856 | 0,0936 | 0,0909 | 0,1150 | 0,1150 | 0,1070 | 0,1096 | 0,0936 | 0,1096 |

Source: own computation

Composite indicator was calculated for each region using a linear aggregation method based on the following formula:

$$CI_t = \frac{\sum_{i=1}^{n} I_i^r w_i}{\frac{\sum_{i=1}^{n}\sum_{r=1}^{R} I_i^r w_i}{R}} \tag{3}$$

The composite indicator takes values around an average of 1. The higher the value, the better is the assessment of human capital in the region. Resulting values $CI_r^t$ are in the following table:

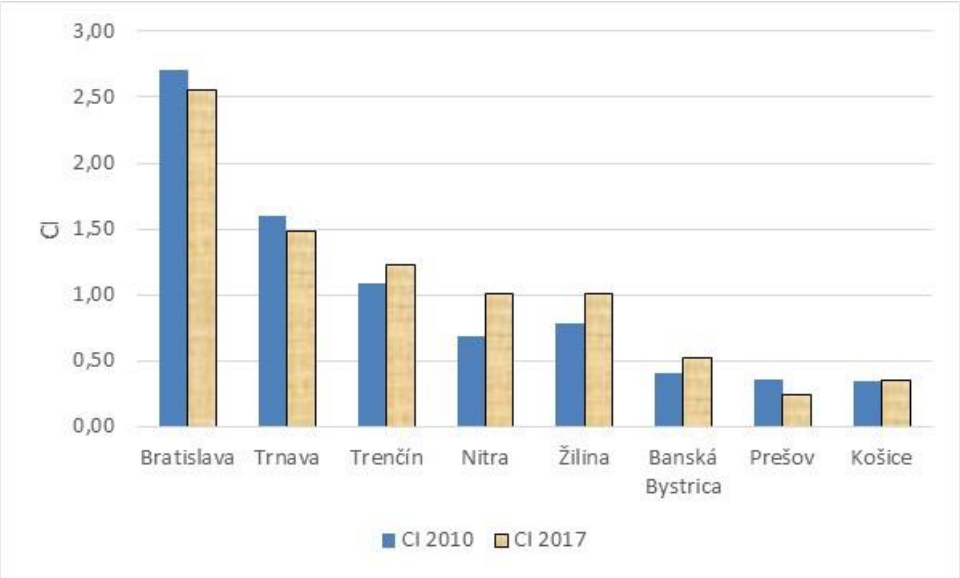
**Tab. 3: Composite indicator for individual regions**

| Region | *CI 2010* | Rank | *CI 2017* | Rank | difference |
|---|---|---|---|---|---|
| **Bratislava** | 2,71 | 1 | 2,55 | 1 | -0,16 |
| **Trnava** | 1,60 | 2 | 1,49 | 2 | -0,11 |
| **Trenčín** | 1,09 | 3 | 1,23 | 3 | **0,14** |
| **Nitra** | 0,69 | 5 | 1,01 | 4 | **0,32** |
| **Žilina** | 0,79 | 4 | 1,01 | 5 | **0,22** |
| **Banská Bystrica** | 0,41 | 6 | 0,52 | 6 | **0,11** |
| **Prešov** | 0,36 | 7 | 0,24 | 8 | -0,12 |
| **Košice** | 0,35 | 8 | 0,36 | 7 | **0,01** |

Source: own computation

The table shows composite indicator values in 2010 and 2017. In the years under review, the order of the region is also given. The difference is the increase or decrease in the value of the composite indicator. The data are shown in the following graph.

**Figure 3: Comparison of regions from the labor market point of view**




Source: own processing

The Bratislava labour market showed the best potential of the labour market in both years. As mentioned, value $CI_t > 1$ is characterized by regions as above average. There are values for

the Bratislava region $CI_{2010}$ and $CI_{2017}$ greater than 2,5, which is highly above average. Although a decrease of $0{,}16$. In 2010, the regions of Trnava and Trenčín also appeared above average. The biggest positive change in the labor market is recorded in the Nitra and Žilina regions in the period under review. From below-average regions, they reached the level of above-average regions. This is probably related to large investments in the automotive industry. The Banská Bystrica and Košice regions recorded a slight increase. From the perspective of the labor market, they continue to be assessed as below average. The Prešov region has the lowest labor market potential, and even recorded a decrease of 0,12 over the period under review.

## 4. CONCLUSION

The Fourth Industrial Revolution is fundamentally changing modern production through new technological achievements including digitization and robotization, artificial intelligence and IoT and new materials. Thanks to these changes, production in developed countries is once again becoming the main source of prosperity and job creation. In this paper, the author aimed at providing a better understanding for Industry 4.0 concept. The impact of this concept on the need for changes in the labor market is described. Changes of key labor market indicators in Slovakia in recent years are mapped. The aim of the paper is to comprehensively assess changes in the labor market in the regions of Slovakia. The analysis is performed using a constructed composite indicator. The composite indicator includes officially published key labor market indicators in the regions. The results of the analysis indicate changes in the labor market. A positive change was registered in the Nitra and Žilina regions, where the automotive industry is developing systematically. It is in the automotive sector that the most significant impact of Industry 4.0 in Slovakia can be observed. It is in the automotive sector that the most significant impact of Industry 4.0 in Slovakia can be observed.

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# PODNIKOVÉ VZDELÁVANIE V PODMIENKACH INTELIGENTNEJ VÝROBY

## ENTERPRISE TRAINING IN CONDITIONS OF SMART MANUFACTURING

***Rolf KARBACH*** [57]
***Emília KRAJŇÁKOVÁ***[58]
***Andrea HORVATHOVÁ***[59]

**Abstrakt***: Procesy zavedenia inteligentnej výroby vo výrobných podnikoch sú sprevádzané zmenami v štruktúre a obsahu pracovných miest. Roboty disponujúce umelou inteligenciou preberajú od výkonných a riadiacich pracovníkov určité úlohy vyžadujúce duševné činnosti – kontrolu výrobných procesov a s ňou súvisiace vyhľadávanie a získavanie informácií, ich spracovanie, analýzu, a dokonca v určitom rozsahu aj procesy rozhodovania. Za týchto podmienok sa menia požiadavky na vzdelanie, kvalifikáciu a zručnosti pracovníkov, ktorí pracujú v podnikoch s inteligentnou výrobou. Vychádzajúc z toho daná štúdia definuje špecifiká pracovných miest v podnikoch s inteligentnou výrobou – povahu a charakter jednotlivých činností, hodnotí rýchlosť uskutočnených zmien v nadväznosti na zmeny v „inteligentných" strojoch a zisťuje rozsah kompetencií pracovníkov. Na základe týchto analýz sa zisťujú požiadavky na rozsah, intenzitu a formy podnikového vzdelania tak výkonných, ako aj riadiacich pracovníkov v podnikoch s inteligentnou výrobou.*

**Kľúčové slova**: *podniky s inteligentnou výrobou, podnikové vzdelanie, pracovné miesta, požiadavky na vzdelanie.*

**Abstract:** *Implementation of smart manufacturing within manufacturing companies is accompanied by corresponding changes in the job structure and description. Robots equipped with artificial intelligence take over some mental tasks of executive officers and managers – such as production control and related information and data collection, its subsequent analysis and evaluation, and even to some extent decision making. These new conditions bring with them changes in the education, skills and qualification requirements placed on the employees working in smart factories. Based on that, this study defines the specifics of jobs in smart factories – specifically the nature of individual operations, it evaluates how fast the changes in jobs are implemented in relation to the changes in "smart" machinery, and it determines the extent of competences of workers. These analyses form a basis for determining the requirements for the extent, intensity and form of enterprise training of executive officers and managers in smart factories.*

**Keywords:** *enterprises with smart manufacturing (smart factories), enterprise training, jobs, education requirements.*

**JEL classification**: M29, M28

## ÚVOD

Využitie súčasného priemyslu ako príležitosti k pozitívnemu vývoju na trhu práce si vyžaduje prijímanie efektívnych a rýchlych opatrení a nástrojov zaisťujúcich flexibilitu na trhu práce, prípravu osôb uvoľňovaných zo zanikajúcich profesií na profesie nové, alebo profesie, ktorých výkon je spojený s novými vedomosťami a zručnosťami, rovnako ako opatrenia

[57] Prof. Dr., Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne. Adresa: Študentská 3, Trenčín 911 50, Slovensko, e-mail: rolf.karbach@fh-zwickau.de
[58] doc., Mgr., CSc., Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Adresa Študentská 3, Trenčín 91150, Slovensko, e-mail: emilia.krajnakova@tnuni.sk
[59] Ing., doktorand, Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Adresa Študentská 3, Trenčín 91150, Slovensko, e-mail: horvathova.ada@gmail.com

stimulujúce tvorbu nových pracovných príležitostí. Predpokladom je tvorba spoľahlivých a aktuálnych informácií, prostredníctvom systému monitoring a predvídania vývoja na trhu práce vrátane kvalifikovaných potrieb z hľadiska pravdepodobnosti a rýchlosti postupu automatizácie a kyberentizácie a ich dopadu na zamestnanosť v jednotlivých sektoroch, profesiách a regiónoch.

Z týchto informácií budú odvodené a prijaté nevyhnutné zmeny v štruktúre a spôsoboch výuky na začiatku i v ďalšom vzdelávaní, v službách zamestnanosti, v legislatívnom i daňovom systéme a v systéme sociálneho zabezpečenia. Predovšetkým sa má jednať o vytvorenie takých podmienok, aby sa všetky zmeny stali príležitosťou pre rast kvalifikácie, flexibility a inovatívnosti ľudí ako výrobcov i ako spotrebiteľov a aby sa posilnila konkurenčná výhoda SR v medzinárodnom prostredí a budúci rast životnej úrovne a kvality života. Hlavným cieľom je dosiahnuť konkurenčnú výhodu prostredníctvom strategického rozmiestňovania schopných a oddaných zamestnancov.

## 1 ÚLOHA PODNIKOVÉHO VZDELÁVANIA V PODMIENKACH PRIEMYSLU 4.0

Bez ohľadu na to, akou mierou či formou sa podnik rozhodol investovať do rozvoja svojich zamestnancov, odporúča sa, aby využil systematický prístup ku vzdelávaniu, ktorým zabezpečí podporu dosiahnutia strategického cieľa podniku prepojených s podnikovou kultúrou a s orientáciou na zamestnanca (Vodák & Kucharčíková, 2011). Je potrebné, aby školením prešli novoprijatí zamestnanci a taktiež zamestnanci, pre ktorých by bolo prínosom prejsť školením a vyskúšať si nové možnosti, prípadne precvičiť zaužívané znalosti a zručnosti. Školenie by malo pozostávať z teoretickej a potom praktickej časti. V priebehu školení sa očakáva, že nový zamestnanec nadobudne nové znalosti a rýchlejšie sa adaptuje v pracovnom procese. Čo sa týka preškolenia zamestnancov, tak by si mali upevniť, prípadne nadobudnúť nové znalosti a zručnosti, čo im môže pomôcť v ich kariérnom raste. Na konci školení by mala prebehnúť verifikácia získaných poznatkov, ktoré boli zamestnancom poskytnuté počas školení.

Aj keď nie je možné zmerať objem získaných informácií, je možné vyhodnotiť úspešnosť záverečnej verifikácie a tým vyhodnotiť, v akej miere má konkrétne tréningové centrum prínos nielen pre jednotlivých zamestnancov, ale pre celý výrobný segment. Prepojenie techniky a vzdelanostnej úrovne konkrétneho zamestnanca by malo smerovať k rýchlej adaptácii a použitiu poznatkov v praxi pre dané pracovisko. Zrýchlený vývoj technického pokroku, začatý už v 20. storočí, vedie človeka k tomu, aby sa stále učil novým vedomostiam a zručnostiam z hľadiska jeho budúcich potrieb. Vzdelanie sa tak stáva kapitálom ako pre každého jednotlivca, tak pre zamestnávateľa. Základným kameňom úspechu sa stáva flexibilita a pripravenosť na zmeny (Barták, 2015).

Kvalifikácia a vzdelanie sú ťažko kvantifikovateľné vlastnosti človeka a preto nie je ľahké identifikovať potreby podniku v oblasti vzdelávania. V tejto fáze ide o špecifikovanie potreby vedomostí, zručností, schopností a kompetencie pre cieľové skupiny pracovníkov. Potreby vzdelávania sa určia ako rozdiel medzi predpokladanými a skutočnými výsledkami podniku, alebo sa určia ako rozdiel medzi dosiahnutými výkonmi jednotlivých podnikových útvarov a medzi predpokladanými, alebo sa určujú úrovňou výkonnosti jednotlivých zamestnancov. Analýza potreby vzdelávania sa môže vykonať na úrovni organizácie, resp. pracovných miest a na úrovni jednotlivých zamestnancov. Komplexná analýza znamená jej súčasné vykonávanie na všetkých úrovniach a mala by predstavovať určitú postupnosť krokov, aby sa dospelo k správnej identifikácii a návrhu riešenia problému.

### *1.1 Pojmy „digitalizácia“, „Priemysel 4.0“, „inteligentná výroba“*

V ostatných rokoch sa hovorí o štvrtej priemyselnej revolúcii v kontexte inteligentného priemyslu a je označovaný ako Priemysel 4.0. Technologicky je systém postavený na aplikácii digitálnych technológií (ako IoT, manažment životného cyklu výrobku, analýza veľkých dát (Big Data), ukladanie informácií do cloudu, či vývoj a aplikácia umelej inteligencie (z angl. Artifical Inteligence – AI), a pod.) a exponenciálnych technológií (v podobe pokročilej robotiky, 3D tlač, umelá inteligencia, senzoring, biotechnológie, neurotechnológie, nanotechnológie, a pod.). Pojmom Priemysel 4.0 označujú (Pirvu, Zamfirescu, Gorecky, 2016) za súčasný trend automatizácie a výmeny dát výrobných technológií.

Priemysel 4.0 je označovaný za štvrtú fázu priemyselnej revolúcie, ktorá sa vyznačuje zavádzaním kyberneticko-fyzikálnych systémov snímajúcich a spracovávajúcich dáta z fyzických zariadení. Internetovým zosieťovaním viacerých KFS sa vytvárajú aplikácie, ktoré s vhodne kombinovanými informačno-komunikačnými technológiami vedú k inteligentnej továrni. Inteligentné riešenia založené na digitalizácii a kyberneticko-fyzikálnych systémoch ovplyvňujú aj fungovanie tradičných podnikov, ktoré ich zavádzaním získavajú výraznú konkurenčnú výhodu a prinášajú so sebou zmeny v predpokladanom vývoji hospodárstva, ktorá musí mať dopad aj na vzdelávací systém.

Inteligentný priemysel je charakterizovaný rozsiahlymi zmenami, nositeľom ktorých je digitalizácia zasahujúca takmer do všetkých oblasti ľudského života. Prostredníctvom digitálnych technológií fyzické systémy spoločne navzájom komunikujú a spolupracujú v reálnom čase. Okrem vzájomnej interakcie medzi systémami komunikujú aj s ľuďmi vo vnútri spoločnosti vo výrobe, so zamestnancami na ostatných pozíciách vrátane pozícií nevýrobného charakteru či účastníkmi hodnotového reťazca mimo firiem ako sú dodávatelia, odberatelia, a pod. Priemysel 4.0 je spájaný s výrazom „inteligentný priemysel“ a „inteligentná výroba“.

### *1.2 Inteligentná výroba dôsledok priemyslu 4.0.*

OECD konštatuje, že mnohé krajiny sveta čelia veľkým výzvam v súvislosti s nízkym nárastom produktivity práce, slabou úrovňou obchodu a investícií a rastúcou alebo pretrvávajúcou vysokou úrovňou príjmovej nerovnosti a bohatstva (OECD, 2017). Na základe údajov získaných zo Štatistického úradu Európskych spoločenstiev sa najväčšia časť peňažných prostriedkov domácností vynakladala na platby za nájom, energie, vodu a plyn. Najmenšia časť peňažných prostriedkov domácností predstavovala výdavky na vzdelávanie (Rievajová & Trebichalská, 2018).

V súčasných globálnych ekonomických turbulentných procesoch pri zabezpečovaní udržateľného hospodárskeho rastu vo svetovej ekonomike a zvyšovaní konkurencieschopnosti v prostredí svetovej ekonomiky dôležitú úlohu hrajú nadnárodné spoločnosti (Kordoš & Vojtovič, 2016).

Ďalším problémom, s ktorým sa vyrovnávajú vlády sveta je hľadanie inovatívnych riešení na využitie príležitostí a zmiernenie rizík, ktoré vznikajú pri veľkých zmenách v ekonomike a spoločnosti, ako je globalizácia, digitalizácia, 4.0 priemyselná revolúcia, meniaca sa povaha práce, demografické zmeny, cirkulárna ekonomika či prechod na nízko uhlíkové hospodárstvo. Technológie na báze umelej inteligencie majú obrovský potenciál posilniť ľudskú vynaliezavosť, aby pomohli zlepšovať naše životy. Aj preto bude v transformácii na nové zručnosti budúcnosti potrebná intenzívnejšia spolupráca vlády, vzdelávacieho systému, podnikateľskej komunity, ale aj záujem jednotlivcov v procese adaptácie na zmeny (Račková E., 2019).

V súčasnosti implementované technológie v rámci inteligentnej výroby sú stále relatívne drahé v porovnaní so mzdami pre zamestnancov. Avšak, ak v budúcnosti poklesnú náklady robotizácie pod úroveň mzdových nákladov určite bude nasledovať prepúšťanie časti tradičných zamestnancov nielen v krajinách tretieho sveta, ale predovšetkým vo vyspelých štátoch (Sommer, 2015) a (Muller, Buliga a Voigt, 2018).

Zároveň môže nastať situácia, kedy vznikne obrovské množstvo nezamestnaných, ktorí môžu a sú ochotní pracovať, ale nemajú vhodné pracovné príležitosti. Obrovským sociálnym a ekonomickým problémom a globálnym demografickým procesom v ostatných rokoch je starnutie populácie a jej zamestnávanie hlavne vo vyspelých krajinách sveta (Kate, 2013; Carbonaro et al., 2016; Hughes, et al., 2016; Krajňáková & Vojtovič, 2017).

Tieto veľmi rôznorodé demografické posuny v štruktúre a počte obyvateľstva vyvolávajú radu zložitých ekonomických, sociálnych a psychologických problémov, ktoré sú zároveň predmetom záujmu predstaviteľov odbornej a vedeckej komunity. Najdôležitejším teoretickým nástrojom chápania a nasledovných analýz a hodnotení procesov starnutia populácie je takzvaná koncepcia aktívneho starnutia obyvateľstva (Ilmarinen, 2008; Ilmarinen, 2012).

Vo väčšine prípadov je kľúčovým prvkom agendy aktívneho starnutia pre politických činiteľov čeliť výzvam predĺženia pracovného života predstaviteľov starších generácií. Zvládnutie tejto úlohy samo o sebe znamená dosiahnutie rovnováhy medzi záujmami starších pracovníkov, záujmami mladších generácií a prístupom k pracovným príležitostiam a záujmami zamestnávateľov v oblasti plánovania pracovných síl. Uprednostňovanie politiky podriadenia koncepcie pozitívneho starnutia potrebám hospodárskeho rozvoja a trhu práce je dominantným u absolútnej väčšiny predstaviteľov tak akademickej, ako aj praktickej sféry. Druhým dôležitým teoretickým a empirickým spôsobom skúmaní a hodnotenia problematiky starnutia populácie je prístup s dôrazom na potreby trhu práce a zamestnania starších pracovníkov.

Technologický a hospodársky pokrok a rast požiadaviek na vzdelanie, kvalifikáciu a skúseností zamestnancov a nedostatok mladých pracovníkov s potrebnými zručnosťami na trhoch práce vyspelých krajín vyžadujú hľadať mechanizmy udržania práceschopností starších pracovníkov a adekvátne formy ich zamestnávania. Okrem toho, pravidelné štruktúrne zmeny v priemyselnej výrobe a v profesionálnom profile pracovných pozícií, nedostatok pracovníkov s potrebnými kvalifikáciami a starnutie pracovnej sily dohromady predstavujú výzvu tak pre zamestnávateľov, ako aj pre politikov a vedcov.

Permanentné a výrazné zmeny v trendoch na trhu práce a rastúci význam počítačových, informačných, digitálnych a iných moderných technických zručností, skúseností s komunikáciou a jednaním s inými ľuďmi a tímovej práce predstavujú výzvu najmä pre starších pracovníkov, pokiaľ ide o rast a zdokonaľovanie ich vedomostí a zručností počas pracovného života. K podobným záverom prichádza štúdia nemeckých autorov, ktorá zisťovala súvislosť medzi inovačnou výrobou, oblasťami s vysokou koncentráciou zručnosti a nepriaznivou demografickou a najmä vekovou štruktúrou (Gregory & Patuelli, 2015).

## 2 VPLYV INTELIGENTNÝCH STROJOV NA ZMENY V POŽIADAVKÁCH NA SCHOPNOSTI A ZRUČNOSTI PRACOVNÍKOV

Umelá inteligencia je oblasťou štúdia v počítačovej vede, ktorá sa snaží jednotlivé duševné schopnosti človeka, ako napríklad veľmi rýchle vyhľadávanie potrebných informácií v rôznych databázach, ich porovnávanie, zovšeobecnenie, zadávanie úloh a kontrola činností robotov a pod. uskutočňovať pomocou software vytvoreným človekom a pridaným do

jednotlivých výrobných robotov. To znamená vnímať znakové, hlasové, svetelné podnety, rozumieť a reagovať na reč, plánovať a riešiť problémy. Paradigma umelej inteligencie pokrýva množstvo teórií, ktoré si kladú za cieľ viac či menej napodobňovať schémy ľudského (prípadne vo všeobecnosti biologického) správania sa, vyhodnocovania a analýzy podnetov prostredia, prípadne tvorivej činnosti. Teória umelej inteligencie si stanovuje ciele, ktoré by sme od inteligentného systému očakávali a hľadá v rôznych vedných disciplínach dostupné riešenia.

Príkladom umelej inteligencie je hranie vyrovnanej partie s človekom v strategických hrách, ako Go alebo šach. To znamená, že počítač, ktorý vyhral nad Kasparovom, je tiež príkladom umelej inteligencie. Roboty, algoritmy a umelá inteligencia k nám prichádzajú síce postupne, ale už dnes spôsobujú zmenu. Umelá inteligencia v súčasnosti významne ovplyvňuje naše životy, fungovanie spoločnosti a ekonomiku. Tento vplyv je revolučný a exponenciálny. Ako každá významná zmena prinesie úžitok pripraveným a stratu tým druhým. Do tejto oblasti sa musí investovať rozumne a inovatívne cez našu výskumnú a podnikateľskú elitu. Musia sa zároveň na túto zmenu pripraviť všetci občania prostredníctvom kvalitného a reformovaného vzdelávania, lebo táto revolučná zmena sa dotkne nás všetkých. Technológie na báze umelej inteligencie majú obrovský potenciál posilniť ľudskú vynaliezavosť, aby pomohli zlepšovať naše životy. Aj preto bude v transformácii na nové zručnosti budúcnosti potrebná intenzívnejšia spolupráca vlády, vzdelávacieho systému, podnikateľskej komunity, ale aj záujem jednotlivcov v procese adaptácie na zmeny (Račková E., 2019).

Výrobne stroje a zariadenia sa veľmi rýchlo a permanentne zdokonaľujú a tým ovplyvňujú štruktúru a počet pracovných miest vo výrobných podnikoch. Mnohé pracovné pozície, ktoré sú dnes aktuálne, už o päť rokov nemusia byť potrebné. Taxikárov nahradia autonómne autá, predavačky samoobslužné pokladne, avšak iné pracovné pozície môžu vzniknúť. Dopad automatizácie povedie podľa prognóz k zníženiu počtu zamestnancov pri vybraných pozíciách najmä v odvetví priemyslu. Na opačnej strane vzniknú iné profesie, kde bude potrebný hlavne ľudský kontakt. Podľa niektorých štúdií je v dôsledku automatizácie a robotizácie ohrozených až 50 % pracovných miest v tradičných odvetviach priemyselnej výroby (Frey & Osborne, 2013). Iné štúdie však oponujú, že technologické dopady na zamestnanosť sú preceňované a často poňaté príliš úzko a izolovane a zároveň neberú do úvahy zmeny vo flexibilite pracovných miest a multiplikačné efekty pre tvorbu pracovných miest, ktoré nové technológie prinesú.

V podmienkach priemyslu 4.0 sa očakáva zrýchlenie procesov zmien v ponuke pracovných príležitostí, štruktúre pracovných miest, rastúcej flexibility pracovného času, pracovných úväzkov a pod., zmení sa profesionálny profil zamestnancov a ich kompetenčné modely. Dôjde aj k zániku niektorých povolaní a vznikne potreba nových, aj takých o akých ešte nemáme ani predstavu. Jedno je však isté, že Industry 4.0 bude potrebovať ľudí s technickým vzdelaním a analytickými schopnosťami, nové pracovné pozície, si budú vyžadovať kreatívne a odborné zručnosti, e-vedenie a inovatívne inžinierstvo (Krajňáková & Vojtovič, 2011, 2014). Zároveň sa zmení kvalita zručností ľudí a taktiež sa zmení aj hodnota daných zručností ľudí. Najviac budú ohrození menej kvalifikovaní ľudia, s nízkymi digitálnymi zručnosťami, a naopak, v najmenšom ohrození sa ocitnú povolania, ktoré vďaka ich organizačným, sociálnym, kreatívnym aj intelektuálnym požiadavkám sa nedajú v krátkej dobe nahradiť automatizáciou ani digitalizáciou. Ide hlavne o riadiace pozície či už vo vzdelávaní, zdravotníctve, v sociálnych a mnohých ďalších oblastiach. Týka sa to aj všeobecných zdravotných sestier, pôrodných asistentiek, učiteľov a pod.

Napriek vyššie uvedenému netreba brať na ľahkú váhu slová Charlesa Elachi, riaditeľa vývojárskeho centra NASA v rokoch 2001–2016, ktorý hovorí, že „nasledujúcim generáciám, by sme mali dať poriadne základy v celej škále odborov ako matematika, ale aj hudba či

literatúra. Treba podporovať multidisciplinárne vzdelávanie a učiť mladých ľudí mať otvorenú myseľ a prijímať nové myšlienky. Aj keď momentálne je doba programátorov, strojárov, technikov, vyspelé krajiny a spoločnosti sa zameriavajú nielen na exaktné vedy a techniku, ale aj na humanitné vedy. Dokonca aj v NASA okrem inžinierov a vedcov mame tím umelcov, ktorí sú akýmsi prostredníkom medzi nami a laickým svetom".

Adekvátne opatrenia politiky zamestnanosti, ktoré môžu tieto procesy zjednodušiť, zdynamizovať a tým zamedziť tvorbe vysokej štrukturálnej nezamestnanosti. Na druhej strane však musia byť vytvorené primerané podmienky pre všetky kategórie pracujúcich, aby nedochádzalo k nevyváženej polarizácii trhu práce a štruktúry pracovných miest. Pre toto je potrebné rozpracovať adekvátne opatrenia, ktoré by mohli reagovať na nové trendy v technologickom pokroku. Vzhľadom k tomu, že sebazamestnanosť a podnikanie budú stále častejšou formou pracovného uplatnenia v stále širšej škále činností a povolaní, mala by byť okrem rozšírenia možností príslušného vzdelávania nastavená ich podpora formou daňových opatrení a poradenstva, ktoré by znížili podnikateľské riziko pri štarte podnikania a pod.

## 3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

Pre zistenie toho aké schopnosti a zručnosti pracovníkov sa vyžadujú v zamestnaniach s využitím strojov s umelou inteligenciou, sme uskutočnili empirický prieskum v modernom automobilovom podniku. Predmetom nášho prieskumu boli schopnosti a zručnosti pracovníkov, ktoré vyžadujú moderné výrobné stroje. Pre tieto účely sme oslovili dve skupiny pracovníkov - manažérov a výkonných pracovníkov, s otázkou aké schopnosti a zručnosti sú dôležité v ich práci s modernými inteligentnými strojmi. Pre odpovede na otázku sme použili päť stupňovú škálu – od najdôležitejších po najmenej dôležité. Výskumná vzorka sa skladala zo 70 respondentov v každej kategórii. Odpovede respondentov sme vypočítali ako vyvážené priemerné aritmetické hodnoty 1+; 0,5; 0; -0,5; -1, ktoré sa pridávali odpovediam respondentov o dôležitosti jednotlivých schopností a zručností v podmienkach inteligentnej výroby. Zároveň sme určili aj hierarchiu významnosti jednotlivých schopnosti a zručnosti na základe odpovedí respondentov (Tab. 1)

**Tabuľka 1: Význam schopností a zručností manažérov a výkonných pracovníkov v podmienkach inteligentnej výroby**

| Vlastnosti a zručností | Manažéri | | Výkonní pracovnici | |
|---|---|---|---|---|
| | Priemer | Rang | Priemer | Rang |
| Kritické myslenie | 4 | 1 | 1,8 | 1 |
| Vedieť komunikovať, presvedčovať | 3,2 | 2 | -3,5 | 10 |
| Hľadať alternatívy | 2,7 | 3 | -0,2 | 4 |
| Digitálne zručnosti | 2,6 | 4 | -2,1 | 8 |
| Tvorivosť | 2,5 | 5 | -0,6 | 5 |
| Vedieť spolupracovať | 2,5 | 6 | 0,3 | 2 |
| Skúšať a učiť sa | 2,2 | 7 | -1,6 | 6 |
| Vedieť prezentovať pred publikom | 1,9 | 8 | -2,8 | 9 |
| Sociálne a emocionálne zručnosti | 1,7 | 9 | -1,8 | 7 |
| Schopnosť riešiť problémy | 0,7 | 10 | 0 | 3 |

Zdroj: Autorský prieskum

Ako svedčia tieto údaje, hierarchie hodnotenia významnosti uvedených schopností a zručností manažérmi a výkonnými pracovníkmi sú veľmi odlišné, s výnimkou takej ľudskej vlastnosti ako kritické myslenie. Manažéri a výkonní pracovnici rovnako považujú, že kritické myslenie je v ich práci v podmienkach inteligentnej výroby najdôležitejšou potrebnou

vlastnosťou. Väčšina ostatných vlastnosti sa hodnotili manažérmi a výkonnými pracovníkmi takmer diametrálne odlišne. Napríklad, kým komunikačné schopnosti v hierarchii hodnotení manažérov sú na druhom mieste, tak u výkonných pracovníkov na desiatom. Celkove medzi hierarchiou hodnotenia týchto vlastnosti manažérmi a výkonnými pracovníkmi absentuje aj slabá pozitívna korelačná závislosť. Vypočítaný Spirmenov koeficient korelácie je na úrovni 0,07 pri p = 0,05, čo svedči o absencií korelačnej závislosti medzi hierarchiami hodnotení manažérov a výkonných pracovníkov.

## Záver

Aktuálne je trh nastavený tak, že každý stroj, každá technika, aplikácia, ktorá sa vyvinie, je daná do praxe za účelom spresniť, zjednodušiť a posunúť výrobu na vyšší level. Každý zamestnanec, ktorý si chce získať alebo udržať miesto v pracovnom kolektíve prosperujúceho podniku sa musí snažiť udržiavať svoje vedomosti a praktické skúsenosti prispôsobené aktuálnym trendom a súčasnej ekonomike. Zo strany podniku je zasa nevyhnutné pre každého zamestnanca vytvoriť priestor a podmienky pre jeho profesionálny a osobnostný rozvoj. Vzdelávanie, formovanie pracovných schopností, aplikovanie návykov a zručností získaných vzdelávaním a ich využitie v profesionálnej praxi sa v modernej spoločnosti stáva celoživotným procesom. Veľký význam v poslednom období nadobúda oblasť vzdelávania jednotlivcov, podporovanie a presadzovanie individuálneho vzdelávania, ako aj vytvorenie takého prostredia, v ktorom sa tieto znalosti rozvíjajú a systematicky riadia. Investovanie do kvality vzdelávania predstavuje základný faktor rozvoja ľudských zdrojov a celkového rozvoja vôbec.

V článku sme poukázali na neustále meniace sa prostredie, kde zamestnanci ako ľudské zdroje musia napredovať priamo s technikou, ktorá je vždy špecificky priradená podľa konkrétneho pracovného miesta. Všetky doteraz spomenuté informácie v článku sú akýmsi priesečníkom a sú predmetom ďalšieho skúmania, aký bude mať informatizácia a rozvoj techniky vplyv na jednotlivé pracovné miesta. Je to veľká výzva pre zamestnávateľov, príslušné ministerstvá a iné zainteresované inštitúcie, ktoré by mali do budúcna spolu viac kooperovať a hľadať spoločné riešenia tak, aby sa to v konečnom dôsledku nedotklo zamestnancov. Práca vo svete, ktorý bude ešte technickejší, si vyžiada permanentnú rekvalifikáciu. Je to jediný spôsob, ako môžu ľudia reagovať na rýchle zmeny.

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# ASPECTS OF ROBOTICS IMPLEMENTATION WITHIN THE CHANGES ON LABOR MARKET IN POLAND

***Marcel KORDOŠ***[60]

**Abstract:** *The development of technologies generally contributes to improving the position of subjects on the labor market. However, the development of technology also has more long-term effects, because it affects more structural changes on the labor market. The main purpose of this paper is to identify the current condition of robotics in Poland, using data from researches made in recent years concerning technological advancement in Poland and the predictions of the possibilities of robotics. The topic of impact of the level of robotics on unemployment will also be explored. As Poland's pace of automation processes is slower than those of western countries, Poland can adapt solutions that worked for countries that already went through robotics and found ways to deal with the technological unemployment. The greater attention should be paid to the development of jobs that will be created as a result of robotics processes. A large part of them is still neglected.*

**Key words:** *Industry 4.0, New Technologies Implementation, World Economy Development, Automation and Robotics, Job Creation and job loss*

**JEL Classification:** *F63, O31, O51*

## 1. INTRODUCTION

Robotics is a major influence on the economy and will continue to be over the next years. In theory, automation can lead to significant benefits for the whole economy. Greater GDP, higher productivity and increased customization of the consumer experience [41], [42]. However, in some aspects there's a significant resistance to robotics. Robots and progressive automation in many industries are becoming more and more effective in substituting people, what causes fear in employees of losing their jobs [9], [18].

The main purpose of this paper is to identify the current condition of robotics in Poland, using data from researches made in recent years concerning technological advancement in Poland and the predictions of the possibilities of robotics. The topic of impact of the level of robotics on unemployment will also be explored. In the scientific world, there is no consensus as to whether the proliferation of machines will primarily result in the loss of jobs, or the total number of jobs ultimately will not change or even increase. What is certain, is that some professions are more at risk than others. The list of professions at risk of automation and robotics in Poland will be presented. Because computers and machines have an advantage over people in performing certain tasks, and in others they cannot replace an employee, the features of occupations that determine the domination of people or robots in the workplace will be analyzed. Using the data on the employment structure in the European and global labor markets, the scale of the threat robotics in individual countries will be compared to the situation of Poland. As robotics in Poland is still at low level, the problems of unemployment is not significant yet, but may become a serious issue depending whether polish society will adapt to changes.

### *1.1 Robotics – theoretical background*

The development of technologies generally contributes to improving the position of subjects on the labor market. However, the development of technology also has more long-term

[60] Ing., PhD., Alexander Dubček University in Trenčín, Študentská 2, Trenčín 911 52, Slovak Republic, e-mail: marcel.kordos@tnuni.sk

effects, because it affects more structural changes on the labor market. New tools increase work efficiency, which can reduce the demand for work. And what's more, some of the work that has been done so far by people can be done by machines or software. This apply to not only physical work, but also to mental work more and more [40], [44]. This process may have significant consequences for the labor market and the emergence of the phenomenon of technological unemployment, i.e. unemployment, whose main reason is technological change. This problem is not new; especially since the industrial revolution there has been a gradual change in the demand for previously popular professions [17], [27]. However, in recent years there are more and more voices that pay attention to the pace of changes. In the situation of fast-moving changes, employees do not have time to retrain and improve their competences - technologies develop faster than people and institutions are able to adapt. There are also fears that the increase in demand for new professions and those for which demand is growing is not large enough to offset the reduction in demand for work that is being taken over by machines and software [4], [16].

The risk of job automation should be interpreted in terms of the probability of how quickly a given profession can be automated. They should not, however, be interpreted as a percentage of workers in a given profession who will lose their jobs. What's more, it should be remembered that even in the case of jobs with a high level of employment, full automation does not take place overnight, and in the case of a slow continuous change, the adaptation of the population to the conditions must be taken into account. Therefore, the risk factors for automation are primarily used for diagnosis and comparative purposes. High risk of automation is indicated by professions in which many activities can be replaced by computers or machines [20], [31]. The most threatened by the automation are office service employees, financial and statistical employees, office equipment operators, and monetary turnover employees. Subsequently - some workers' occupations, selected groups of sellers, as well as medium financial personnel or other office staff. On the other side, the least endangered professions are teachers, especially targeted at lower levels of education, managers in various industries, doctors and dentists. Representatives of information and communication technologies professions, such as database and computer network specialists, mathematicians and statisticians, are also at low risk. The group, which also does not have to fear a drop in demand due to the development of new technologies, are people who run artistic, cultural and culinary activities [21], [32], [43].

## 2. PROBLEM FORMULATION AND METHODOLOGY

The research task is focused on the analysis of the problematic aspects of Polish economic sectors development in terms of the robotics and automation issues affected by Industry 4.0 elements implementation and find out its consequences. The main goal of this paper is by means of analysis, comparative analysis methods followed by logical deduction to figure out the potential benefits for Polish national economy development coming out of Industry 4.0 aspects being implemented in. The paper is focused on problematic aspect analyses such as the current status of Polish economy environment and possibilities to implement Industry 4.0 technologies like robotics and communication and information technologies into Polish industry sectors. The issue is to figure out whether and to what measure the robotics, new technologies might affect the new job creation along with the labor force adaptability to it.

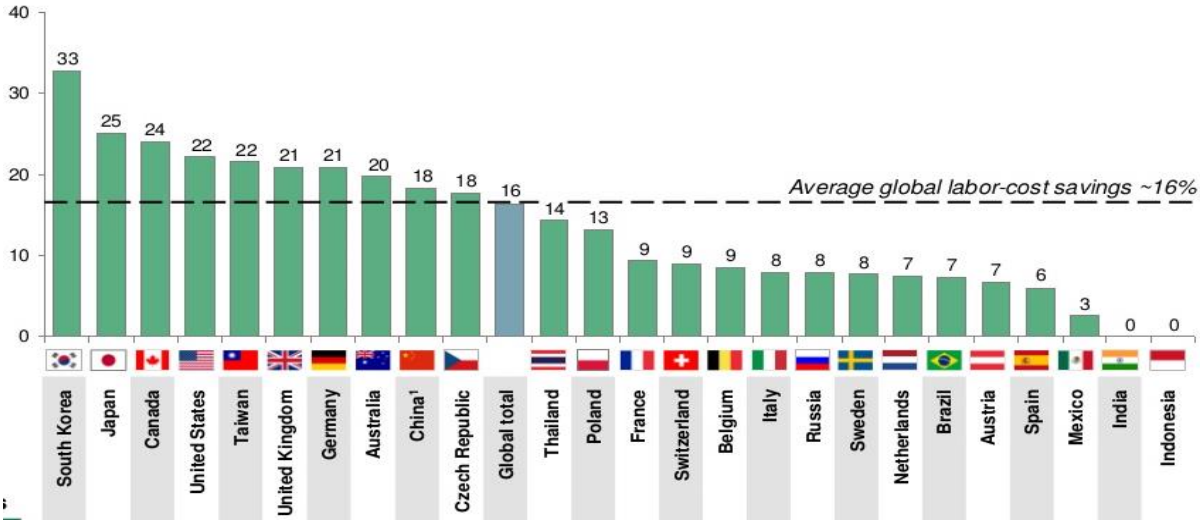
The ways of synthetic and analytic methods will be used in the paper such as the analysis and comparison to illustrate the Slovak tourism environment, synthesis and logical deduction to discuss the impact of Industry 4.0 elements implementation on services in hotel business. Subsequently, the analysis will lead to synthesis and prognosis by means of abstraction method eliminating the less important factors in order to set general statements and opinions.

The analysis of data from scientific and professional publications, periodical and no periodical press as well as international economic organizations such the Statistical office of Polish Republic, will be primarily used and examined. Basic data will be drawn from generally accepted institutions, assessing the international trend agenda such as Eurostat, Polish Ministry of Economy,

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

Robotics and automation refer to the processes of automatically producing goods with the use of robots and control systems with minimal direct human operation. This leads to increase of labor productivity within manufacturing industries, since fewer workers are needed to produce the same number of goods. The prognosis shows, that in year 2025 adoption of advanced industrial robots will result in 10-30% increase in productivity of many sectors. Thanks to robotics, labor costs are expected to decrease on the average by 16%. As the research shown, the highest drop in labor costs will occur in South Korea (with 33% decrease in 2025), Japan (25%) and Canada (24%) [3], [8], [15].

**Figure 1. Labor-cost savings from adoption of advanced industrial robots (%, 2025)**




Source: Eurostat (2019)

In Poland, the decrease of labor cost is expected to be under the average, with a 13% in labor-cost saving. Although Polish companies are using more robotics and automation solutions every year, the fourth industrial revolution has not yet made its way across the entire country. In the area of production automation, Poland continues to stay behind most developed nations and also behind its neighbors. According to the International Federation of Robotics, the average number of installed robots worldwide was 74 in 2016, and in Europe the figure was 99 per 10,000 employees. With a value of 32, Poland is well behind Slovakia (135) and the Czech Republic (101). The biggest barrier in implementing robotized solutions in Poland are high costs of automation and a low level of innovation in the state economy, which results in difficulties in implementing new, more advanced technological solutions. Low number of robot density in Poland is also caused by more than a million workers from neighboring Ukraine on work permits that are relatively easy to obtain. An expert at a Polish employers' union, said it was still cheaper for Polish companies to hire them than it is to automate. [11] In 2016 the data collected by Central Statistical Office shown, that 15.2% of industrial

companies implemented technical innovations. More than a half of these were businesses that had more than 250 employees. [7]

In Poland, there's definitely a lot of place for growth. Robotics is not only an inevitable process, but also a process needed for the growth of Polish economy. The Automation is essential to remain internationally competitive. If one country doesn't automate, production will shift to those countries who do, and then gain comparative advantage. [10] According to estimates, 49% of working time in Poland occupy activities that could be automated using the technologies available today. Global average of the potential of robotics equals 50%. Automation can help employees perform repetitive tasks such as working on a production line or making financial transactions. Employees will be able to do things that are more difficult to automate and often bring more value to the organization. For example, doctors or nurses will be able to spend more time with the patient instead of spending time on administrative matters or documentation. The potential of automation is different for every activity. The highest robotics factor (75%) in activity related to physical work and machine operation in the predictable environment results from the routine nature of the tasks that machines and computers can replace. Two categories with similarly high robotics potential are processing (71%) and data collection (65%) [8], [7]. These activities are most often performed in occupations related to administrative, office and process support, for example, ordering remuneration transfers, documentation of loan applications or issuing invoices. All these activities combine the presence of a finite number of rules. Algorithms and specialized software are beginning to take on many of these responsibilities today. The remaining four groups of tasks are physical work and machinery in an unpredictable environment (39%), work requiring knowledge and experience in making decisions (29%), interaction with other people (22%), and people management (9%). Robotics is a difficult process to implement for these activities. This is due to the fact that the technology is not advanced enough to deal with them. [19]

Research shows that almost one third of the Polish labor market consist of twenty occupations, which are considered the most threatened by robotics in the next 20 years. [Table 1]. According to this data, in near future, every third Pole will be threatened by technological unemployment. [2]

**Table 1. Twenty occupations considered the most threatened by robotics (Poland, 2011)**

| Occupation | Probability of robotization | % of labor market |
|---|---|---|
| Workers in the field of food processing | 0.985 | 1.50% |
| Administrative employees and specialized secretaries | 0.981 | 1.62% |
| Monetary employees | 0.977 | 0.90% |
| Home, office and hotel helpers and cleaners | 0.918 | 2.84% |
| Workers in the field of mining and construction | 0.911 | 1.32% |
| Workers in a rail industry (train dispatchers, train operators) | 0.872 | 0.73% |
| Cashiers | 0.866 | 0.72% |
| Operators of mining machinery | 0.851 | 0.90% |
| Fitters | 0.823 | 1.55% |
| Drivers of trucks and buses | 0.810 | 3.21% |
| Other employees for simple works | 0.784 | 1.03% |

| | | |
|---|---|---|
| Drivers of cars, delivery vans and motorcycles | 0.762 | 1.60% |
| Employees of security services | 0.699 | 2.79% |
| Welders, tinsmiths, assemblers of metal structures | 0.691 | 1.34% |
| Heavy equipment operators | 0.690 | 1.60% |
| Operators of other machines and processing equipment | 0.690 | 0.72% |
| Blacksmiths, locksmiths | 0.687 | 2.89% |
| Cooks | 0.681 | 1.21% |
| Office workers | 0.679 | 2.40% |
| Workers in the field of clothing production | 0.675 | 1.39% |

Source: Eurostat (2019)

The professions of "blue collar", manual workers are considered the most threatened by robotics because they are repetitive and require low level of creativity. Their positions are the most likely to be taken over by machines. In many places the process of replacement has already started. For example, many shopping centers in Poland started incorporating self-service checkout next to the traditional checkout counters. The self-service checkout area allows business owner to place multiple cash desk without requirement of hiring employees for each one of them. Instead, only one employee is needed to control the machines and help in the event of malfunctions that may occur because of machine's imperfections. With the improvement of these machines, traditional checkout counters may eventually disappear completely [11], [29].

On the other hand, professions considered to be secure are those related to unconventional thinking, searching for non-standard solutions or connected with social contacts. Persuasion skills, negotiations or social sensitivity aren't easy to obtain by electronic device. These occupations currently make around one fourth of Polish labor market. [Table 2]

**Table 2. Twenty occupations considered the least threatened by robotics (Poland, 2011)**

| Occupation | Probability of robotics | % of labor market |
|---|---|---|
| General and executive directors | 0.001 | 0.86% |
| Retail and wholesale managers | 0.006 | 0.72% |
| Sales, marketing and development managers | 0.015 | 0.53% |
| Staff in the field of law, social affairs and religion | 0.032 | 0.76% |
| Managers in mining, industry, construction and distribution | 0.040 | 1.60% |
| Specialists in the field of law | 0.041 | 1.00% |
| Managers in institutions of specialized services | 0.045 | 1.23% |
| Managers for other types of services | 0.045 | 0.72% |
| Managers for business and management services | 0.071 | 1.31% |
| Specialists for sales, marketing and PR | 0.072 | 1.44% |
| System analysts and programmers | 0.086 | 0.87% |
| Health care workers | 0.118 | 2.11% |
| Middle school and high school teachers | 0.132 | 1.99% |

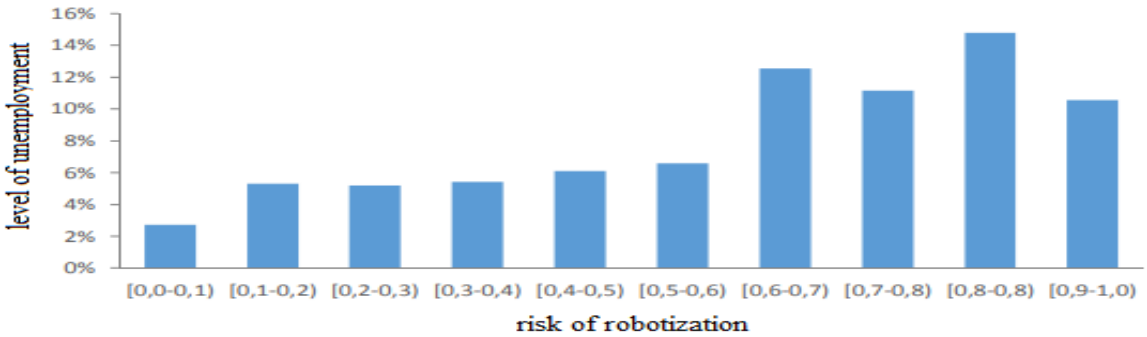
| | | |
|---|---|---|
| Specialists in financial affairs | 0.133 | 1.51% |
| Doctors of all specialties, including dentists | 0.141 | 0.70% |
| Hairdressers, beauticians | 0.156 | 0.57% |
| Primary school teachers and specialists in child-raising | 0.207 | 2.15% |
| Other teaching and education specialists | 0.275 | 1.07% |
| Academic teachers | 0.275 | 0.84% |
| Specialists in administration and management | 0.291 | 2.08% |

Source: Eurostat (2019)

The "safe" professions consist mostly of managers, highly qualified specialists in various industries and teaching staff. These require higher qualifications than those threatened by robotics, which usually do not require much of educational preparation (like cleaner or bodyguard). It means that if in least threatened occupations the employment will increase, there will be problems with employing the dismissed, due to the low level of education. Employees displaced from work by machines will be more likely to find employment in medium-endangered jobs with lower requirements [24], [34].

The higher percentage of unemployment in occupations threatened by robotics was confirmed in Social Diagnosis research from 2015. The unemployment in high-endangered professions was 12%, while in low-risk occupations only 4%. [Fig. 2]

**Figure 2. Level of unemployment depending on the risk of robotics (Poland, 2015)**




Source: Eurostat (2019)

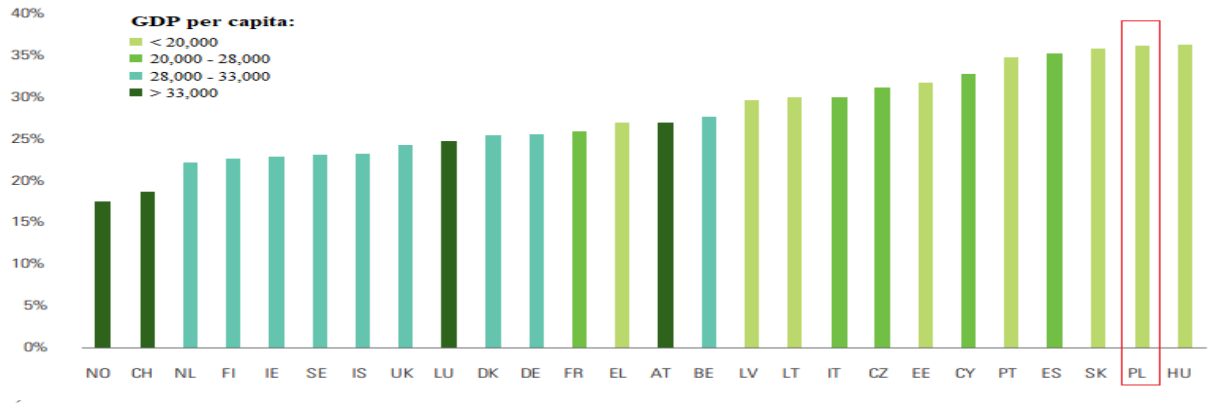
**Picture 3. Structure of employed and unemployed depending on the risk of robotization (Poland 2015)**

Source: Eurostat (2019)

The report from research also analyses the proportion of employed and unemployed depending on the risk of robotics of the occupation. [Picture 3] The distributions for the unemployed and employed were very different. Significantly less unemployed had jobs in low risk automation occupations (14%), and up to two thirds represented occupations characterized as highly endangered. These results show that the relationship between risk of automation and unemployment can be important. The effects of computerization and robotics in the Polish labor market are already visible. [5], [37]

Relationship between risk of robotics and unemployment can differentiate depending on the country. The differences in labor costs make automation more profitable in countries where the relative labor cost to capital is higher. Another thing is that the model does not take into account a number of country-specific factors, such as the strength of trade unions or political conditions. An important assumption adopted in international comparisons is the same probability of robotics of a given occupation in different countries. In fact, differences can occur and reach up to several percentage point. To compare the situation of European countries, the research took into account the percentage of professions with high risk of robotics and compared them to the GDP of the state.

**Picture 4. The percentage of occupations at high risk of automation in Europe, by GDP per capita**




Source: Eurostat (2019)

The impact of automation is the smallest in Norway and Switzerland. In both cases, the percentage of endangered professions does not exceed 19%. At the other side are Hungary and Poland, where over 36% of the labor market remains at risk of automation [12], [25]. The graph shows that countries with lower GDP per capita tend to have a higher percentage of people with high risk of robotics. It overlaps to a large extent with the division into the so-called the old and the new EU, i.e. the countries that joined the EU structures before and after 2004. The two least-threatened countries are Norway and Switzerland, very rich Western European countries that don't belong to the EU. The ranking shows clearly the division between the western and eastern parts of Europe. The structure of labor markets in Western Europe seems to be less susceptible to destruction of jobs due to technological changes compared to the eastern neighbors. A distinction is also made between the countries of the north and the south, in which the latter had worse results. The distinction exists because of different progress of technological revolution and adjustment processes in the labor markets. Perceived security may not the result of states' resistance to change, but because the changes have already partially taken place. This can be illustrated by the example of agriculture: in

Poland still many people work in this sector: 13% of the workforce, compared with 2% in Germany and 3% in France [36], [35]. Low employment in the countries of Western Europe is the result of changes that have already occurred in these countries, while in Poland these changes are currently taking place. For this reason, Poland can benefit from the experience of developed countries.

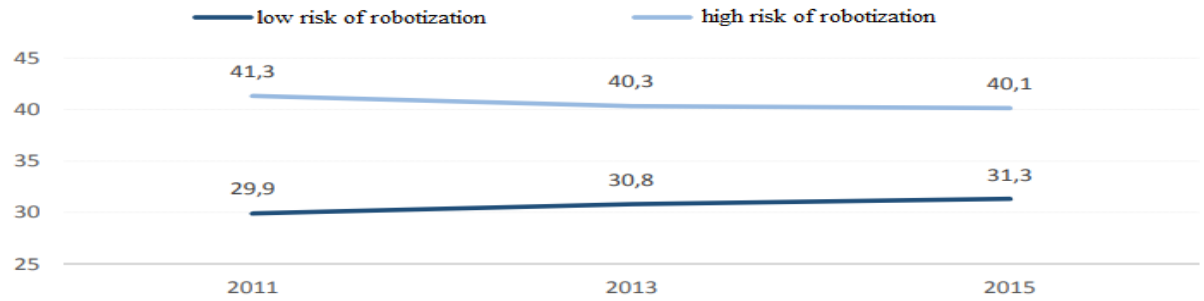
Poland's current situation is also similar to the one of United States from five years prior. In 2015, one third of Polish employees worked in occupations with low risk of automation, while 46% of workers worked in high-risk occupations. These numbers are similar to these from USA from 2010 [33], [22]. These results indicate that, as in other countries, a large proportion of those currently employed work in occupations that do not have good growth prospects over the next 10-20 years. Therefore, it does not mean that all these professions will disappear, but the demand for them may drastically decrease. The ways of their implementation may change so much that they will require completely different competences. One of the important questions is whether technological unemployment is temporary and people who are losing jobs will be able to find employment quickly elsewhere, or whether it is structural and more long-lasting problem. The simplest solution to the problem of technological unemployment would be to reclassify employees representing professions at risk of automation and take up jobs in professions considered safe. In practice, however, this is not so easy - the latter requires specialized studies and experience. [5]

From the point of view of work robotics, the favorable phenomenon observed in Poland is the drive for higher education. A research conducted in 2015, examining the percentage of students in the EU countries showed that 8.5% of the total number of European students receive higher education in Poland, which puts Poland on the sixth place. Better results were achieved by Germany (15.2% of the total number), France (12.4%), United Kingdom (11.9%), Spain (10.1%) and Italy (9.4%). [8]

Young people, especially those with degree, who are just starting their work, are often more proficient in using new technologies and have better preparation to perform professions that are more difficult to automate. People who retire more often work in occupations which popularity is already decreasing. These changes are also observable empirically, but their scale is also not large. What's more, there are exceptions. Between 2013 and 2015, among those entering the labor market, there were fewer people who were employed in professions with a high risk of automation than among people who ended their professional career. Such cases may, however, be related to the current situation on the labor market. Depending on the conditions, the first job may be far from the actual competence of graduates [30], [10].

In general, the structure of the labor market in Poland is gradually changing. The number of people working in professions with low risk of automation is growing, and those who work in high-risk occupations are falling. These changes can be observed on Fig. 5.

**Picture 5. Change in the employment structure in the period 2011-2015 in Poland**




Source: Eurostat (2019)

Over the period of 4 years, the employment rate in professions with low risk of robotics increased by 1.4 percentage points, and employment in professions with high risk of robotics decreased by 1.2 percentage points. Although these changes are not large, they indicate that the labor market is adjusted and, although the phenomenon of technological unemployment is a fact, it is at the same time partly balanced by the adjustment of employees and changes in the professions. [2], [38]

When talking about robotics, the topic brought the most is how robots take away human's job. Less visible is how the process of automation leads to the creation of new jobs in areas such as robot manufacture, research, marketing and software development. The reasons for employment growth will include [33], [7], [39]:

- Increasing income and consumption, especially in emerging economies. GDP per capita in Poland may by 2030 exceed 85% of the current level of Western European countries. Increased earnings will translate into increased expenses. In Poland, new jobs may be created as a result of an increase in internal demand, exports or the number of tourists visiting the country.
- Population aging and needs related to the care of elderly people. According to UN estimates, the number of people over 65 in Poland will increase from 6 million in 2015 to 8-8.5 million in 2030, and therefore the share of older citizens in the population will increase from 16 to 22-24% . This change will increase the demand for health care services for the elderly - both medical and caring. In Poland, this trend may be even more pronounced, because today the number of health care professionals (doctors, nurses or caretakers) is 53% lower than the EU average and amounts to 58 employees per 10,000. residents (in the UE it is 124 employees).
- Development and implementation of new technologies. The Polish economy has so far used only 8 % of its digital potential, while Western European economy 12 %, and the United States – 18%.
- Rising demand for "handmade" products as opposite to mass-produced goods. People in the search of unique, personalized items will turn to traditional manufacturers.
- Investments in infrastructure and buildings. Currently, Poland's value of infrastructure is much lower in relation to GDP (113%) compared to the EU average (229%). The same problem occurs for the value of flats and residential buildings - in Poland, their value is 191% of GDP, while in EU on average it is 460%. Investment in real estate and infrastructure may be an important source of jobs.
- Investments in renewable energy, energy efficiency and climate adaptation. In 2015, the Ministry of Economy of the Republic of Poland estimated that it would be necessary to install as much as 27 gigawatts of power to replace switched off power plants and meet the growing demand for energy. [8], [9]

The potential for automation does not mean that these technologies can be applied in the workplace immediately. Many of them are not ready for widespread use yet. The degree and speed of application of a given technology depend on several factors. There is usually a delay between the presentation of a given technology and its effective use in everyday life and work. It is well seen today on example of autonomous cars. Although they have existed for many years, their use in large-scale daily life requires a lot of engineering work and the solution of many regulatory or ethical issues. Therefore, it should be assumed that the implementation of other existing automation solutions on a larger scale will take place only when the technology reaches the appropriate level of advancement and will be able to find a

wide application in the everyday work environment. The pace of robotics depends on [25], [6]:

- Technology costs, as automation technologies usually involve capital expenditures or operating costs. In the final analysis, their implementation will take place when they are competitive compared to the costs of human labor.
- Labor market dynamics, as demand and supply for labor and wages affect the decisions on automation. A large number of candidates for low-paid or medium-paid jobs may delay companies' decisions to apply technology.
- Regulatory environment, as legal regulations can significantly slow down automation.

Analysis shows that the above factors make the technical potential of automation in Poland achievable not sooner than 2030 in the fastest adoption scenario. In the most conservative scenario, this may not happen until the 2060s. [19]

The final pace of robotics implementation will, however, be affected also by social acceptance for such solutions. Most recent survey has shown, that Polish employees are not afraid of robotics in their workplace. As many as 76% of them think that they will never be replaced by machines. Only 10% of Polish employees have expressed concern that this could happen over the next 6-10 years. The level of optimism of employees from Poland in the context of automation is the highest in Europe. In general, almost 1/3 of European employees feel anxiety about new technologies that can replace them at work. Against the background of the European countries surveyed, Poland performs very well - 46% of people think that their employers will care and prepare the team for the automation process. In Europe, it is only 37%. The most concerned of automation in the next 6-10 years are Italians (18%), French (14%), British (13%) and Spanish (13%) [8].

In Poland, automation is a concern only for 10% of employees. The most distrustful for the development of technology are people aged 35-44. In addition, some industries feel more threatened by replacement by machines: in the financial sector it is 19%, transport and construction 13%. On the other hand, it is the employees of the transport sector who think that their employers are already preparing them for automation (56%), the same for employees from the sales, media and marketing departments (50%). [8]

## 4. CONCLUSION

The development of new technologies has a significant impact on the labor market. They allow the incensement of productivity and efficiency of work, and sometimes also to replacement of the work previously performed by people with the work of software or machines, which, with the falling costs of technology, allows reduction of production costs and services. This situation is conducive to people who have appropriate competences to use new technologies. At the same time, however, the situation of people who do not have sufficient competences or work in professions for which demand decreases, is worsening.

Part of Polish society seems aware of the impotence of high qualification and isn’t afraid of changes on the labor market. The problem may occur with the majority of employees, who still work in occupations with high risk of robotics. Currently, there are no conditions to quickly reclassify large groups of people. There is no guarantee that displaced workers will be seamlessly integrated into a very different labor market. In a mindset of many Polish employees, the risk of robotics seems to be a distant issue, but since changes are inevitable, they should pay more attention to gaining competences relevant on market driven by technology.

As Poland's pace of automation processes is slower than those of western countries, Poland can adapt solutions that worked for countries that already went through robotics and found ways to deal with the technological unemployment. The greater attention should be paid to the development of jobs that will be created as a result of robotics processes. A large part of them is still neglected. For example, many strikes by employees of health care in recent years indicate that the state does not provide an adequate condition for the development of these occupations, which discourages new generations from education in this direction.

To avoid the problem of unemployment, the state should provide as many development opportunities as possible for people who, in the future, will take up jobs in newly created occupations.

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# THE SYNERGY OF TOURISM AND INDUSTRY 4.0 IN SPAIN WITHIN THE EXAMPLE OF AIRBNB AND COLLABORATIVE ECONOMY

***Marcel KORDOŠ*** [61]
***Jakub SOKOL***[62]

**Abstract:** *The collaborative economy is associated with the definition of collaborative consumption, which involves unconventional consumption based on the use of goods and services that, initially, do not come from the market but from individuals normally offered on the Internet. Airbnb is defined as a community market in which its users publish, discover, book and enjoy unique accommodations all over the world. This paper will handle the problematic aspects regarding the economic and social issues within the Spanish tourism covering the Airbnb and collaborative economy implementation processes. to estimate the next obstacles to be faced within job losses issues and to recommend the activities for Spanish entrepreneurs and companies to eliminate the negative impacts of Industry 4.0 implementation that would affect their businesses in tourism and hotel business the Airbnb and collaborative economy issues. Governments of particular countries and international organizations must improve legislation and barriers to prevent the abuses of these companies by the low regulation and the fiscal frauds.*

**Key words:** *Industry 4.0, Airbnb, Uber, World Economy Development, Automation and Robotics, Job Creation and job loss*

**JEL Classification:** *F63, O31, O51*

## 1. INTRODUCTION

The new way of tourism in these times as we call tourism 4.0 is based in the 'collaborative economy' and the robotics of the production of services through the Internet. The collaborative economy is expanding more and more in this information age, sharing goods and services is its mantra and it is something that is attracting more and more people [9], [15]. The Massachusetts Institute of Technology (MIT) calculated, in 2014, the potential of the collaborative economy in 110,000 million dollars, when it was around 26,000 million [7], [18]. Nowadays these marketplaces are a success all over the world, where one of the most important community market platforms, in Spain and in all the world, is Airbnb. The platform categorized within the collaborative economy, founded in 2008 and currently operating in more than 191 countries, already has more than 3.000 million ads worldwide in 65.000 cities and a total of 150.000 million guests [8], [20]. They began in the living room of one of its founders in San Francisco, with an inflatable bed (hence its name, acronym for "airbed and breakfast") and currently its founders Brian Chesky, Joe Gebbia and Nathan Blecharczyk have a leading company valued at more than 30.000 million dollars, surpassing the Marriot hotel corporation (with its buildings included), and what began as a collaborative consumption project "has become the largest hotel corporation in the world without having a only hotel and with an average annual growth of 132% [29],[7].

Focusing on Spain, where tourism is a driver of economic recovery and generates around 12% of GDP (about 120.000 million euros), it is estimated that the economic activity generated by this platform in Spain for 2016 has been of 4.170 million euros that are specified in 560 million euros for the hosts, who rented their apartments to a total of 5,4 million guests, and

[61] Ing., PhD., Alexander Dubček University in Trenčín, Študentská 2, Trenčín 911 52, Slovak Republic, e-mail: marcel.kordos@tnuni.sk
[62] Ing., Alexander Dubček University of Trenčín, Študentská 2, Trenčín 911 52, Slovak Republic, e-mail: jakub.sokol@tnuni.sk

3.520 million euros in tourist spending according to data presented by the web platform itself [7], [5]. In addition to the data presented by the company, the Complutense University of Madrid conducted a study in 2015 about the impact of the platform on the economy, society and the environment in the Spanish capital. The report, based on the data of the reservations made during the period of one year in the city through surveys to 91 hosts and 625 guests, gives figures that support the success of "home sharing". It was estimated that the total economic impact on the Madrid economy would be 323 million euros and 5.130 jobs would be paid thanks to the expenses incurred by the Airbnb hosts and guests [13], [11]. These surveys confirm that, 70% of the hosts agree that this platform and its activity had positively changed their life prospects and an energy saving equivalent to the consumption of 2.950 households was estimated [7], [22]. The study also emphasized the distribution of tourism benefits in different areas of the city of Madrid, where there are many accommodations offers in neighborhoods that are not typically holiday, as opposed to the hostelry industry and the traditional tourism sector. The impact of the P2P platform (peer to peer) has been so high in Spain that it has even generated an entire ecosystem of Start Up companies around it, companies that take advantage of the small "gaps" that Airbnb leaves to obtain a market share while they offer services to both hosts and guests so that both the management of the floors advertised on the web and the stay of the tourists are as pleasant as possible [25]. [33]. Therefore, this report tries to understand the socio-economic impact generated by Airbnb in our country and reflect on the regulatory framework that affects to a certain extent the competition with the traditional tourism sector. To do this, the various chapters that are developed below pursue the following more specific objectives [3], [16]:

- Analyze the operation of Airbnb, the reason for its creation, its growth and the socio-economic context in which it has occurred.
- Understand the context of this type of collaborative economy platforms that are currently changing the way of life and leisure of thousands of people based in the tourism 4.0.
- Analyze the profile, motivations and expectations of people who use this type of accommodation, both at the host and at the host level.
- Study the problem of the regulatory framework on competition with the hostelry and tourism sector.
- Know the regulations on fiscal policy and its possible irregularities in the platform.

## 2. GOAL AND METHODOLOGY

The research task deals with the analysis of the problematic aspects of Spanish tourism sector development in terms of the robotics and automation issues affected by Industry 4.0 elements implementation and find out its consequences. The research will be focused on exploring the Spanish tourism industry analyses and its further development under the Industry 4.0. In general, this paper will handle the problematic aspects regarding the economic and social issues within the Spanish tourism covering the Airbnb and collaborative economy implementation processes. The particular issues will consist of following aspects including: Legal issues with Airbnb, the collaborative economy and tourism 4.0 - legal barriers and unfair competition, Fiscal fraud as well as The social environment around Airbnb.

The ways of synthetic and analytic methods will be used in the paper such as the analysis and comparison to illustrate the Spanish tourism environment, synthesis and logical deduction to discuss the impact of Industry 4.0 elements implementation on services in hotel business within the Airbnb and collaborative economy issues. Subsequently, the analysis will lead to

synthesis and prognosis by means of abstraction method eliminating the less important factors in order to set general statements and opinions. In particular, to estimate the next obstacles to be faced within job losses issues and to recommend the activities for Spanish entrepreneurs and companies to eliminate the negative impacts of Industry 4.0 implementation that would affect their businesses in tourism and hotel business the Airbnb and collaborative economy issues. For the most objective assessment of the changes being awaited by Spanish tourism industry and hotel business due to the implementation of Industry 4.0, the theoretical analysis method has been chosen as the basic research method the researchers were approached by.

## 3. THEORETICAL BECKGROUND

The collaborative economy is associated with the definition of collaborative consumption, which involves unconventional consumption based on the use of goods and services that, initially, do not come from the market but from individuals normally offered on the Internet. It is a type of solidary exchange that seeks to optimize underutilized assets, to avoid extreme capitalism [1], [19]. Within this category of collaborative economy or collaborative consumption are several (well known) platforms such as Bla-Bla Car, Uber, Wallapop or Airbnb, companies that act as intermediaries creating a kind of community market or 'marketplace' where their users practice the exchange of their own goods or services for the benefit of other users through an economic transaction that, in some cases, report revenues for said platforms [35], [36].

Analyzing the terms and platforms that users use to carry out this type of "solidarity exchange", it is necessary to ask whether this type of economic interaction should be categorized as a "collaborative economy" or simply as a new economic form based on the use of Internet [21], [14]. Some authors consider that the expression of 'collaborative economy' is a contradiction in itself, collaborating is a non-commercial social interaction between one person and another while "economy suggests mercantile transactions, the interested change of money for goods or services [4], [30]. There is no doubt that the word collaborate has been carried beyond its reasonable limits as the collaborative economy grew and changed.

Thus, the 'collaborative economy' as such would be formed by models of production, consumption or financing based on the intermediation between supply and demand, generated between equals or from private individual to professional, through digital platforms that do not provide another underlying service and that it implies an efficient and sustainable use of existing and underutilized goods and resources by sharing or exchanging them, and there may or may not be consideration between users [10], [17]. Therefore, Airbnb, where such consideration exists between users, could continue to be categorized as a 'collaborative economy' platform within this new definition proposed by 'Sharing Spain' (a group of companies linked to the collaborative economy) since the activity it carries out is not usually generated from professional to consumer (economy on demand) or provide an underlying service (access economy) [28], [8].

Airbnb is defined as a community market in which its users publish, discover, book and enjoy unique accommodations all over the world. The platform covers around 3.000.000 properties in 191 countries and is already a success in the environment of the collaborative economy that hosts during the peaks of high tourist occupation up to 1 million people per night. Once registered in the platform, users have the option to rent their properties taking the role of host or, conversely, stay in the properties of other users taking the role of guest [23], [17]. All transactions and rentals made are carried out within the platform itself, taking the company a commission of 3% of what the owner charges for the rent and another commission of between 6% and 12% of what the guests pay to stay depending on the duration of the visit. In total,

between 9% and 15% of the total payment made by a guest to stay through this P2P platform go to the hands of the American company. Considering this and taking the data that the company itself offers the expected revenues for the end of 2016 were 1,600 million dollars, and the forecast they do for the year 2020 supposes a year-end closing with revenues exceeding 10,000 million of dollars [7], [32].

In recent years, Airbnb has remodeled its website and its Services offer much more than rentals. Recently they have proposed to offer a new function so that business travelers can also use their services, feeling the need to differentiate reservations with leisure or tourism reasons with those made for work reasons. With this the platform aims to facilitate the latter the search for better options with a new filtering system called "Business Travel Ready" [31]. In addition, Airbnb also offers leisure experiences for tourists, tour guides and lots of information so that staying in any of the more than 65,000 cities where there are advertisements within the platform is much more comforting. Airbnb users, in addition, believe that most of the offer included in this platform is intended for user profiles other than tourists who stay in hotels or hostels, tourists are usually with lower purchasing power, but with the same cultural interest. They also consider that the use of these types of collaborative consumption economies is a positive thing for society and that it is a system to be exploited that takes advantage of the collaboration between citizens to avoid the extreme capitalism that exists today [24], [34].

## 4. PROBLEM SOLUTION / RESULTS / DISCUSSION

Despite the support received from the European Union in several reports issued where they express their approval of this new type of platforms and businesses, Airbnb activity does not leave either governments or hoteliers indifferent, and that is that many cities have sanctioned economically or have tried to impose barriers to this company that practices collaborative consumption. Amsterdam, New York or Quebec are some examples outside our borders, whose authorities criticize that their transactions do not respect local regulations, tourist tax payments, etc. [7], [27]. In New York, the "illegal hotels law" was drafted in 2011 to protect the hotel industry, and imposed sanctions of more than $ 40.000 on a user for violating regulations that prohibit New Yorkers from renting their properties for less than 30 days. Also, in Amsterdam has been fined an owner and user of Airbnb with 13.500 euros for each of the eleven floors announced on the platform, adding a total fine of 297.000 euros on being a prototype of 'illegal hotel' and violate municipal laws that limit 60 days per year and four occupants per apartment rents on Airbnb [7], [26].

The opinion of users, both guests and hosts, is clear, and they believe that the legal barriers that they are trying to impose on Airbnb and the accusations of unfair competition actions are just an excuse for competitors who may see their businesses endangered by means of this new way of using underutilized goods and resources [33]. In addition, users believe that Airbnb presents a type of offer very different from the services of a hotel, since users usually look for cheaper prices from the comfort of a hotel, or the utility of renting a complete apartment for be able to save on gastronomic spending [37], [39]. Despite this, users are involved in tax matters and believe that this economic activity should be regulated with rules that support taxation in each country where they act to avoid the diversion of funds to tax havens, but never creating prohibitive legislation for this sector that encourages collaborative consumption among citizens [6], [12].

### *4.1 Legal issues with Airbnb, the collaborative economy and tourism 4.0 - legal barriers and unfair competition.*

The legal obstacles and opinions against Airbnb are not just outside the borders of Spain, but in cities such as Barcelona and Valencia, or in the autonomous community of Galicia, fines and vetoes have been imposed against the platform [5], [11]. In 2013, the modification of the Urban Leasing Law implied that the rental of homes promoted on platforms such as Airbnb would become part of tourism regulation, which is the responsibility of the autonomous communities. Thus, the Valencian Government imposed sanctions of 30.000 euros on the Airbnb, Homeaway and Rentalia platforms, since they did not demand or reflect in the advertisements the registration number that proves that the homes that are advertised on their websites are tourist, in addition to accuse them of unfair competition and intrusion. Also, in Barcelona, Airbnb and Homeaway were fined 600.000 for announcing illegal tourist flats in November last year, which came after another penalty of 30.000 euros in summer of the same year for both platforms [4], [8].

It should be noted that many of the floors that are managed through Airbnb lack a tourist license, hence the imposition of sanctions. In Mallorca, where there are 11,271 flats announced by the platform as of this year 2017, none has a tourist license according to data from the Terraferida association and InsideAirbnb; in Barcelona for the year 2016 there were a total of 19,724 advertisements in several portals between complete houses, own room and shared room, among them only 9,938 homes were registered and, although the tourism legislation does not include the issue of room rental, The local consistory considers this activity illegal [19],[13].

**Table 1. Non-licencie houses and total number of visitors registered in Aribnb in the year 2016. Spain.**

| | Non-license houses | Total visitors |
|---|---|---|
| Barcelona | 9.786 | 1.240.000 |
| Madrid | 9.000 | 642.000 |
| Mallorca | 11.271 | 590.000 |

Source: Eurostat (2019).

This affects the statements and accusations of the hotel sector, which believe that the inclusion in the P2P platform towards advertisements for unlicensed flats is a form of unfair competition, since the rest of the tourism sector is more regulated and, in In any case, given these innovations in the offer, the hotel sector may have to react, as Juan Molas, president of Cehat, said when he told: they must reinvent themselves to survive the underground economy [8].

In contrast to sanctioning governments is the National Commission for Markets and Competition, which supports platforms that are based on the collaborative economy and urged the president of the autonomous community of Galicia to rectify some of the precepts that, in judgment of the CNMC, "unjustifiably raise the costs of entering the market, discourage some operators that were already participating in the market with new models of service provision and other potential bidders [22], [12]. For its part, the European Union has presented support to this type of markets, developing an opinion on initiative in which they understood that, collaborative consumption represents the advantageous complementation from the innovative, economic and ecological point of view of the economy of the production by the economy of consumption. In addition, it supposes a solution to the economic and financial crisis insofar as it makes possible the exchange in cases of necessity [20], [38], [40].

### *4.2 Fiscal fraud*

In addition to the legal obstacles and sanctions of the governments, there are speculations about the possible tax fraud of 400 million euros by the hosts, who do not declare the revenues generated through the platform, as well as cases of "Airbnb pirates" that can earn more than 3.000 euros per month by renting numerous properties belonging to friends, acquaintances or relatives and that these pirates manage by becoming real estate agents in the underground economy. These cases can occur frequently, since, according to Inside Airbnb data, more than 50% of the hosts announce more than one floor in their profiles [13]. For this, Airbnb's response has been to seek an approach with regional authorities and is waiting for a regulation to regulate the framework of the collaborative economy, as well as to urge and warn all their hosts that they must make the corresponding tax payments. of the income obtained by the platform in their respective administrations [30], [8].

Despite this, the US company declared for the year 2015 in the subsidiary of Spain only gross benefits of € 189.210 whose taxation was € 81.000 for the 35.000 floors announced on the platform; this reverts to the diversion of funds to the operational headquarters in Ireland, where most of its benefits are declared by having a more beneficial regulation for companies [13]. For these reasons, the notice to the hosts is not enough, and for this year 2017 the Spanish Public Treasury published a press release with the actions that would be carried out to prevent the increase of the underground economy through this type of collaborative consumption platforms. The aim is to carry out controls to international entities of digital economy during the Tax Control Plan of 2017. Also, from the Spanish Government, it is intended to have the collaboration of the Tax Administrations of other countries and request informative declarations to the payment mediating platforms, such as PayPal, ApplePay, Google, Amazon; who use these portals of digital economy. During 2017, there were also 8,150 actions to uncover undeclared rentals in our country and the call was notified to 21,500 landlords who were under suspicion of the Tax Agency, to perform the proper taxation through the draft declaration of the annual rent [7], [8].

### *4.3. The social environment around Airbnb*

The economic and social impact of collaborative consumption on our society has been enormous, so much so that only the Airbnb platform is capable of generating more than 4 billion euros in our country between rent consideration and tourist spending generated from of "home sharing". From the platform itself, and thanks to its enormous benefits generated, policies against discrimination and in favor of social integration are promoted, as well as the intensification of innovation through numerous internship programs and university scholarships [11], [18]. Not only does it stay there, but the use of Airbnb by so many people has meant the creation of a startup ecosystem around this business model. For many hosts it is not so simple to rent their properties, so that has led to the creation of many startups that have found a niche market doing the work that the hosts do not want or cannot perform and facilitating the stay of guests on their floors [17], [9].

These startups offer services for both hosts and guests, and their services range from the reception and "check-in" of guests to cleaning services or purchase in supermarkets for guests, incorporating their function to this giant of the " home sharing "as if they were dealing with their own 'room service'. Some examples of this type of companies are [24], [13]:

- Hostmaker: a start-up that started in London in 2014 and is dedicated to set up the floors in terms of decoration, making professional photos for ads, weekly rate adjustment, cleaning, chek-in, etc.
- AirDNA, which analyzes and optimizes rates for hosts based on data from more than 400,000 homes.

- TimeResQ offers greater comfort for guests, from its website you can buy packages with refrigerated food, bath basics or tourist items and receive them in the rented flat to avoid having to go to the supermarket.

The giant of "home sharing" supports all these startups that work in such a way that some of the most profitable ones, such as Hostmaker, Bnbsitter or Pillow, have obtained funding for securities of between 1 and 3 million euros each [14], [36]. Leaving aside the economic part, it is undeniable that the use of Airbnb promotes a type of tourism totally different from what we were used to with traditional lodgings such as hotels, hostels and others. Many of the users comment that the guests themselves are tourists who would not go to a hotel but look for a different way of traveling and interacting with the environment they visit, the culture of sharing both goods and experiences and cultures is fostered and creates experiences very enriching and rewarding [35], [1].

## 4. CONCLUSION

After the preparation of the report, the analysis of the economic data obtained, the sociocultural assessments of the platform and the reading of the sources, it is very accurate to say that Airbnb is a complete success of the collaborative economy and business model based in the tourism industry 4.0 through the Internet tools. Valued at more than 30.000 million dollars and with an expected exponential growth so high, it can generate an incredible economic impact in the 191 countries where it is operating [7], [8]. This is clear that it brings many benefits both to users of the platform and to society in general, but it also has its negative consequences. The success of Airbnb is also based on very little control over advertisements and their users, so much so that lately the news about tax evasion, tax fraud and breach of tourism regulations are the order of the day. Obviously, it is not only this company based on collaborative consumption, but there are millions of people who live 'outside the law' and it is very difficult to act against them. But, focusing about the investigation and under my opinion, so that there are not so many cases of "Airbnb pirates" a specific regulation should be made for this type of rentals that have never been foreseen in the previous tourism regulations. to that it is something new, but also avoiding excessive regulations and that endanger the true end of collaborative consumption. In addition to regulating the rental of apartments for stays of less than 30 days and the rental of rooms, the most important thing should be regular and extreme vigilance in the taxation of the company and the "pirates" who use the platform to profit in the framework of the submerged economy. The last tax presented was 81.000 euros for a company that can generate an economic impact in our country of around 560 million euros in concept of rental compensation, assuming this for the company a profit of 90 million euros approximately (about 16% of the total expenditure). How is it possible that a company that generates such amount of money presents a taxation of around 0.1% of its income [8]?

It's simple, the Spanish affiliated company of Airbnb only declared a profit of € 189.000, the rest of the funds are diverted to the operational center in Ireland where the tax rules are much more flexible and allow obtaining greater benefits for their owners [13]. The initial purpose of the platform was to create a new form of cheaper tourism, encouraging collaborative consumption and the use of underutilized resources, but this new type of business based on the collaborative economy has turned into million-dollar company that, like the vast majority, make use of the so-called 'tax havens' and focus more on their own benefits than on contributing value to society. Finally, our opinion of these new ways of tourism and consumption is that we see the Tourism Industry 4.0 and the incursion of the collaborative economy through the Internet tools in this market is a good way to reach economic growth, but it is also a dangerous way. Governments of particular countries and international

organizations must improve legislation and barriers to prevent the abuses of these companies by the low regulation and the fiscal frauds.

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# INDUSTRY 4.0: THE SOCIAL DIMENSION OF EDUCATION NEEDS

***Vojtěch KOŘEN*[63]**

**Abstract:** *The aim of this paper/essay is to reflect critically on the current state of the public discussion on education needs for the age of industry 4.0 (I.4.0). Nowadays, we often witness uncritical propaganda of technology expansion, artificial intelligence (AI) and automation. On the other hand, we can meet the voices of serious scientists and thinkers who warn against technological development as urgently, stubbornly and demagogically as fighters against the use of steam, trains and aircraft in the past. Unfortunately, this is more a war of attitudes than discussion about serious evidence. The two main parties to the dispute (technooptimists and technopessimists) usually agree on only two things. First: The current expansion of technology is extreme and unstoppable by natural means. Second: In order to succeed in the automated world, people must be able to acquire unique competences. Nevertheless, the majority of competences which are identified as necessary focus on technological skills. Unfortunately, however, technological skills are not enough. The more important question is how we will be able to manage the technological world. Our ability to set our own direction will decide if the purpose of humanity is to serve technology and its owners or the purpose of technology is to serve humanity. Today's most important competence is probably not a technological or anti-technological mindset but critical thinking. This is true for technooptimists and for technopessimists too.*

**Key words:** *4th industrial revolution, Industry 4.0, human capital, labour market, education, educational paradigms*

**JEL Classification:** *E24, J24, J31, J62, O33*

## INTRODUCTION

The Industry 4.0 influences not only production systems, communication, supply chains, marketing, work flow, organization, technological needs, employment and management. The magnitude of the I.4.0 impact is more significant than we are able and often willing to admit. The impact can be recognized in the whole of society. The boom of technologies has an impact on behaviours, value focuses, political preferences, public discourse and so on. Many recent studies report that multidisciplinarity, transdisciplinarity or at least interdisciplinarity is a key factor in the solution of different issues related to I.4.0 (compare: Ivanová & Staněk, 2016; Schwab, 2016; Mařík at AL., 2016; OECD, 2018; Brynjolfsson at AL., 2014; Pereira & Romero, 2017). Such a requirement is logical because if technological development, which is a prerequisite for the existence of I.4.0, affects almost all areas of human life and society, then solutions must be comprehensive and holistic. Unfortunately, sometimes it is possible to recognize that research appears to be multidisciplinary but contains only input from specialists of one discipline on the problems of disciplines in those fields where they are amateurs. This weakness has been identified quite often especially in the area of social changes and educational needs. There are many papers about development and changes in society, about the "age of the new economy" and about educational needs from experts with a background in technologies, machinery and ICT but without a serious link to the reality of our knowledge of sociology, education sciences and so on.

This paper does not have the ambition to solve everything (that is not possible). It is only a contribution to a serious discussion on the topic of learning and educational needs in the age of I.4.0. Although the paper is conceived as a critical essay, its aim is not to criticize, but to

[63] PhDr. Department of Sociology, Andragogy and Cultural Anthropology, tř. Svobody 26, 779 00, Olomouc Czech Republic. e.mail: vojtech.koren01@upol.cz

balance the current prevalence of studies that primarily reflect the socio-technical paradigm and sometimes even naive technooptimism in education and learning rather than solid rigorous knowledge about this issue. The aim is to contribute to a discussion that should be based more on critical thinking than on technocratic utopias or the fear of the apocalypse caused by computers. It is a critical reflection of the present-day discussion about learning and educational needs of I.4.0 in the light of learning, education paradigms and world-view positions.

The theoretical basis for this work is the works of Wolfgang Brezinka (Philosophy of Educational Knowledge (Brezinka, 1992)), Walter Leirman (Four cultures of education: expert, engineer, prophet, communicator (Leirman, 1994)) and Paul Bélanger (Theories in Adult Learning and Education (Bélanger, 2011)).

The following text is structured in four sections.

- Paradigms, cultures and word-view positions in education
- Society and the dark side of technologies
- Reality of educational requirement for Industry 4.0
- Conclusion

## PARADIGMS, CULTURES AND WORD-VIEW POSITIONS IN EDUCATION

In education theory it is possible to identify specific perspectives (paradigms) of education. The typical typology is usually linked with sociological or psychological categories such as constructivism, behaviourism, cognitivism, pragmatism etc. (for example: Illeris (ed.), 2009; Bélanger, 2011). These perspectives (learning theories) rationally reflect the level and orientation of other traditional social sciences (Bélanger, 2011). Wolfgang Brezinka, a theoretician of education, gave another perspective on the possibility of defining education. He describes education by its main social functions (socialization, acculturation, enculturation, personalization, professionalization). He draws attention to the fact that education, as a practice-oriented discipline, is often in practice influenced by cultural and political paradigms. What is used, how it is used and for what it is used, is more determined by social or political assignments, by world-view positions than by educational sciences (Brezinka, 1992).

> *A practical theory for educators cannot be limited to descriptive statements. It can only achieve its purpose when it contains value judgements, norms and instructions for acting. This necessitates the taking of world-view positions. In practical theories much is necessary which is frowned upon in scientific ones (Brezinka, 1992, p. 18).*

In Brezinka's view, it is almost impossible to avoid these influences altogether. Education is always naturally influenced by the methods, approach, content, context, resources and personalities of those who teach and those who learn. At least the content, context, and resources will always be under the influence of doctrines. All we can do is realize this and judge the content and context, but also our own beliefs, critically (Brezinka, 1992).

Close to his perspective is the view of Walter Leirman. He identified and described four main perspectives in education which he called cultures in education: a culture of experts, a culture of engineers, a culture of prophets and a culture of communicators (Leirman, 1994). Every education and access to it is based on a specific cultural perspective. The starting point from which education is viewed forms a culture that influences educational practice and vice versa: each educational culture affects the basic perspective from which the starting points are formed.

The culture of experts presupposes that there is someone knowledgeable, instructed, who is the bearer of complex knowledge. On the other hand, there are people (educated) who can use an expert for their education as someone who knows and can convey this knowledge. The authority of the educator is automatic, his/her expertise is not disputed. This model is usually used in a traditional formal institutional education, nevertheless not only there. This culture strictly uses rational rules of action, analysis, reflection and subsequent optimization of methods in learning. There is no doubt about the scientific nature of this approach. However, it should be emphasized that unverified claims can be taught scientifically correctly. The primary purpose of education in the culture of experts is to fulfil the educational objectives set in an optimal way. The aim is to convey part of the expert's knowledge of the presented content and to learn how to use this knowledge for critical assessment of phenomena in the given area (Leirman, 1996). This culture is based on the notion that someone knows what needs to be learned. Experts know the content of what to teach and the methods of teaching. The problem, however, may be the first premise "someone knows what needs to be learnt". Is this knowledge derived from exact findings or from social assignment and thus desire? It is possible to find some similarity with Brezinka's views here. Learning in the culture of experts is based on a socio-technical paradigm in which experts teach based on the assignment without an urgent need of an evaluation opinion on the assignment (Leirman, 1996).

The culture of engineers is basically very similar to that of experts. It is assumed here that it is known what needs to be taught. Learning should primarily serve to meet the need for professionalization. The primary purpose of education in the culture of engineers is to equip people with professional skills. The main contracting authorities are, directly or indirectly, employers. Education in this culture primarily prepares a person for the profession. It assumes that successful mastery of work competencies is a necessary condition for successful mastery of the social role. Successful mastering of the social role is a precondition for a successful life and fulfilment of social obligations (Leirman, 1996). Education here is primarily the way people are prepared to fulfil the tasks of the profession. It is assumed that the answers and critical questions: what we need, why we need it, are already known or not essential. It is possible to find similar expectations of education in the view of many technocrats linked with I.4.0.

The culture of the prophets, as introduced by Walter Leirman, considers education as a means of spreading goodness. This can take many forms. It can be the spread of religious, philosophical, social, environmental or political beliefs. What is good or bad is evaluated from the perspective of the teacher-prophet (Leirman, 1996). It is possible to recognize this culture not only in religions. The culture of prophets in education can be identified for example in the great project of alphabetization in south America. Strong teacher-prophets influenced socio-political changes in central and eastern Europe in the eighties and nineties of the twentieth century (Leirman, 1994). Education in the culture of prophets is a means of cultural, social, political and ethical change. Unlike the culture of experts and engineers, education here is not only a tool, but often a goal. However, a certain similarity can be found here. Even in the culture of the prophets, there is someone who undoubtedly knows what to learn. However, the paradigm that can be found in the education of the prophets is more a social change than just the acquisition of professional skills. Even here, however, one can argue about the scientific nature of the assignment. Although it may seem at first glance that many educational projects of this culture are positive (emancipation, alphabetization, democratization), this culture also has its dark side. The teaching prophet was not only Martin Luther King, Jan Amos Komensky, or Paulo Freire. The prophets are often propagators of authoritarian regimes, religious fanatics, and sometimes, unfortunately, uncritical, eclectic propagators of many ideologies.

It is also worth remembering that several noble intentions have had a number of negative consequences. Cannot this be similar to the prophets of the bright future of industry 4.0? Are we not in a situation where people tend to adapt to technology rather than vice versa? Leirman's culture of the prophets, whose manifestations can be seen even in a technooptimist-oriented society, suffers from two fundamental observations:

a) We do not know whether the knowledge of a prophet is right.

b) Even the best of intentions do not guarantee a truly positive impact.

Leirman's fourth culture, the culture of communicators, is probably the only one which is focused on the independence, self-management, autonomy, equivalence and equality of teachers and learners. The culture of communicators is focused on the development of the human ability to be independent critically-thinking human and to be not only a useful member of society. In the communicative paradigm, moreover, both the roles often (intentionally and unintentionally) blend. Teachers and learners are both those who learn and those who teach. The central element of learning is the process of sharing through communication (Leirman, 1996). In order to fulfil the declared mission, several conditions must be met:

1. Each piece of content must be open to revision and possible change.
2. The views of the person who teaches are possibilities, or the starting points for thinking, not the only possible conclusions.
3. The ability to work with individual maturity, experience and communication skills is crucial. It is therefore particularly important to respect the rule of equivalence and mutual respect.
4. The truth of the assertions and findings is considered to be contextual and thus relative in context, not objectively valid.
5. A necessary condition is the sufficient maturity of both the teacher and the learner. Only this condition can limit the unbalanced status, rights and expectations.
6. Education and learning are so closely interconnected that the boundary between them practically ceases to exist. Learning is education and education is learning.

Here we can identify a potential problem for the declared educational needs of I.4.0. There is no place for directions, one-way rules and social orders in the communicative paradigm. Another point is that the communicative paradigm is not a simple and fast tool for skills learning. Another important problem is that the culture of communicators is able to fulfil the requests for a dynamic extension of skills changes of I.4.0 only partly.

Walter Leirman (in: Leirman, 1994; Leirman, 1996) gave us a view of education as a cultural phenomenon. It basically does not contradict any of the classical theories of education (behaviourism, cognitivism, pragmatism), but puts them in a cultural context. Classical theoretic concepts form a solid basis for the creation, verification and modification of educational methods and techniques. They provide an answer to the question "HOW TO LEARN?". The cultural context brings a philosophical dimension to the topic of education, which should answer the questions "WHAT IS EDUCATION AND WHY? and “WHAT DO WE NEED TO LEARN?". Leirman's cultures in education essentially describe the main social paradigms that relate to education. Which culture will be preferred, which culture will have more influence, is a matter of social demand. In accordance with Brezinka (Brezinka, 1992) we can say: What is used, how it is used and for what it is used, is more determined by social or political assignments, by world-view positions than by educational theories. The role of science is to point out the benefits and potential risks of each approach. However, “what education should be and why” is a question for society in general, rather than only for science.

## SOCIETY AND THE DARK SIDE OF TECHNOLOGIES

It is a paradox of discussion about I.4.0 that the majority of predictions which are linked with this issue talk about the crucial role of multidisciplinarity, transdisciplinarity and interdisciplinarity but the reality of research is often different than is declared (compare: Ivanová & Staněk, 2016; Schwab, 2016; Mařík at AL., 2016). Much research deals with the phenomenon of I.4.0 only from the perspective of one discipline. Other research appears to be multidisciplinary but contains only comments from specialists of one discipline on the problems of disciplines in whose field they are amateurs. This paradox is probably consequential with the current influence of communication technologies. Information of any kind can be found more easily than 20 years ago. Many publications therefore use simplifications of many complicated issues eclectically. It is so easy to do this in the age of the internet (Spitzer, 2012). In this context, it could be useful to remind ourselves that the words "easy" and "correctly" are not synonyms.

Technology enthusiasm often leads to uncritical technooptimism. Technologies are supposed to be the ultimate solution for everyone and everything, according to many technooptimists. Not too many recent publications are devoted to the economic and social impact of technology, or they are only the politically desirable mainstream (Ivanová & Staněk, 2016).

> *"The main paradox of the situation is that the growing technological complexity in the context of Industry 4.0 technocratic capitalism is in inverse proportionality to the spiritual sphere which is simplified in the postmodern tradition of misconceptions of consumer society and a mass actor-consumer's false sense of involvement in the innovative development of techno-environment and knowledge economy." (Kamensky, 2017, p. 9)*

Manfred Spitzer, and other similarly thinking authors, points out that smart technologies are just like a traditional Swiss knife (the smartphone is nowadays called "the Swiss Knife of the 21st Century"). It is a very useful tool, but if we cease to use anything else and find ourselves in a situation where we do not have it (for example, we lose it) or where it cannot be used (in the middle of a forest without signal and batteries), then we are lost (Spitzer, 2012).

The following is another paradox. There is an expectation that most algorithmizable work of a routine character is going to be replaced by robots and AI. This combines the greatest impacts of I.4.0 with a radical reduction in the need for work in all areas. The only advantage of humans will be creativity and inventions (compare: Ford, 2015; Carr, 2011; Frey & Osborne, 2017). Everything else will be managed by AI. Unfortunately, several studies show us that only a minority of the population is ready to work creatively. We are not able to say if this is a natural problem of our mental capability or a problem of the cultural setting, nevertheless, that is our reality (OECD, 2018).

If the current fascination with technologies and with the "simplification of life" has an influence on our ability to solve problems, and if most algorithmizable work is replaced by machinery and AI, then we create space for the formation of a new sort of elite. In such an environment, the power can easily be concentrated in the hands of a few individuals. The role of the masses will be to serve (perhaps unconsciously) the system in which everyday life will be controlled by machines and their software. If we are not careful enough, we could become part of a matrix whose dimensions could not even be imagined by its creators. The problem is that we will not even realize it (similarly as in the Matrix movie[64]). One example is that we already see that when the voter information proves to be abusive (Cambridge Analytica and

[64] https://en.wikipedia.org/wiki/The_Matrix

Facebook affair from 2018[65]), almost no one is interested except the politicians themselves. Unfortunately, this shows that the masses are willing to swap their independence and freedom of thought for consumer convenience and the ability to be online. But if we give up the control of the world, we will lose the opportunity to control our own lives. Our human existence will only make sense as long as we are useful to the machines and their rulers. Although these considerations may seem paranoid to some, it is more useful to consider them than to ignore them.

The enormous profit from higher production often tends to be used more for other technological innovations than for the people who created it. Governments are often more influenced by investors (it does not matter if they are from private or public sectors) than their voters. Important points linked with I.4.0 are not only technological, infrastructural needs and changing labour market needs. The current level of automatization changes the role of the workforce more than we are able to admit. We are in an age when we provide service to the machinery and not vice versa (Ford, 2015).

> *"Currently, the human is an operator of machines and these machines only passively follow the operator's commands. The main trend of Industry 4.0 will therefore replace this condition by the Prognostics-monitoring system." (Tupa & Benešová, 2017, p. 2196)*

Do we really want this?

> *"The mass social actor does not realise the necessity of applying value-reduced atmosphere of the consumer society, the mechanistic normative environment of the protocols and interfaces of Industry 4.0 new technologies and cyberphysical reality in his/her worldview. The choice of life strategies in the objective complexity of the new society is also difficult. (Kamensky, 2017, p. 11)"*

Another area with a lack of critical and, above all, complex thinking, is productivity. One of the main arguments for developing automation is not the need of humanity, but the need of productivity. The question is whether machine overproductivity (some sources estimate up to 25% growth (compare: Schwab, 2016; Ford, 2015; Pereira & Romero, 2017)) will be able to offset the cost of unemployment. And will the owners of technologies ever share the profit from overproduction? Are we really ready to manage the expected imbalance in social structure?

The OECD admits that I.4.0 and the influence of the use of AI will have an enormous impact on traditional employment models and forms of work cooperation. The ability of many digital professions to do work anywhere is almost unlimited. From one point of view this possibility could make the people who are able to do it more independent. On the other hand, there are a few complications for the current system of employment and labour law rules. Protection of employees by local law is complicated to implement in different countries and it does not matter if we are talking about an independent state in our region or about a country on the opposite side of the globe. Local public services are dependent on local budgets and they are dependent on local taxes, duties and fees (OECD, 2018). Where should the work of an Austrian programmer working for a Mexican company if he or she works in the Bahamas be taxed? Even today there is no clear agreement between the legal systems of individual countries. With the potential for digital work, this problem could become profound. In this case, but not only, personal independence is very apparent. The dependence of a person on information about the standards of individual countries increases. At the same time personal

[65] https://en.wikipedia.org/wiki/Cambridge_Analytica

competences to negotiate contractual terms, which is normally guaranteed by national law, increase.

Another point admitted by the OECD is the risk of regional exclusion and the increase of personal and societal dependency. The ability to invest in new technologies is not the same for everyone and not everywhere. The huge potential of worldwide corporations to invest in technological development again increases their ability to influence national economies, markets, entrepreneurial and human independence. The expected decrease of human work needs will make companies less dependent on the labour market. On the other hand, the potential increase in unemployment will make governments more dependent on company taxes.

> *"It is the algorithmised origin and the existence of cyber-physical reality which is built on the given protocols, excluding the non-linearity of human existence built both on the basis of social convergence and divergence." (Kamensky, 2017, p. 12)*

More important than technological changes are changes of society and in society (compare: Becker, 2013; Spitzer, 2012; Ivanová & Staněk, 2016; OECD, 2018; Schwab, 2016). Unfortunately, most requirements are focused on technical competences (Staněk & Ivanová, 2017; Kordoš, Habánik, 2018) but the development of essential social and cognitive competences is not given attention (for example: Carr, 2011; Spitzer, 2012). The problem for society is that the current ability of technologies to spy, to control, to inform and to influence a single person and all people, is enormous. The extent of the influence of those who possess and control information is growing faster than the ability of governments to create legislation that would protect us from this power. This power could be more dangerous than nuclear weapons because nuclear weapons are not able to influence information, but information can influence the use of nuclear weapons. It may not be necessary to compare the strength of weapons with the power of information, but it is a way to point out that the power of information (thanks to technologies) is now greater than we are willing to admit.

> *"The ideology of postmodernity is still filling the basic spiritual contexts of the formation of agency and its realisation by social myths and trends of technocracy. In the same vein, sacralisation of science and engineering creativity is going on for mass actors with the simultaneous fall of their social status. In such an environment innovation are of value only as a technology of mass consumption. In this case, the typology of agency is extremely simplified and includes only two types: the innovation producer and the consumer and technology as a product." (Kamensky, 2017, p. 11)*

Hand in hand with these conditions we can also identify the risks of social disgrace. Talking and writing about something that seems inevitable is more profitable than doing something that does not have such massive publicity. Making money from equipping schools with computers and tablets is easier if governments believe that it is a necessity without which it is not possible to exist (Spitzer, 2012). Passive searching for information is something quite different from discovering and finding out (Carr, 2011). Predictions which promise a better, easier, funnier world are (understandably) more popular than pointing out that our superficial entertainment and consumption are above all a profitable business for someone else.

## REALITY OF EDUCATIONAL REQUIREMENT FOR INDUSTRY 4.0

If we admit that the next step which we call Industry 4.0 could be only a part of natural evolution - without worrying about other consequences mentioned in this text – then something else has to be added. One problem of inventions could be the fact that new invention, technology and application could be a tool for the distribution of power.

Innovations could be widely useful only if they are widely available. Availability is not only a question of physical ownership, it is a question of our ability to use it too (Ford, 2015). Another important question is the actual potential of people to learn new technologies just in time. (Pereira & Romero, 2017). Even if we admit that the main competences that we will focus on will be competences for the mechanical use of technology, we will still encounter the problem of timeliness (technologies evolve faster than the content of education) and the cognitive limits of those who are learning.

The dictate of higher education needs creates, on the one hand, thousands of unemployed people with university education in southern Europe (e.g. Spain) and, on the other hand, thousands of vacancies for workers, craftsmen and service workers in northern Europe (e.g. Germany, the Czech Republic) (OECD, 2018; EUROSTAT, 2018). We are not sure that our current educational systems are able to fulfil our current needs. How can we be sure that the education system will prepare us for the future? Especially when we believe (or at least it looks that way) that the future will require a completely different knowledge and skills than today (compare: Pereira & Romero, 2017; Schwab, 2016; Ivanová & Staněk, 2016; Mařík at AL., 2016; Tupa & Benešová, 2017). Are we sure that, if we fulfil the following request, it is enough?

> *"It is expected that some professions will be replaced. The emerging technologies have huge effect on the education of people. Only qualified and highly educated employees will be able to control these technologies." (Tupa & Benešová, 2017, p. 2196)*

The paradox of today is that we try to find simple tools to manage our complex world. We do not try to solve our daily ordinary problems by ourselves; we expect quick solutions from "Google" (Carr, 2011). Modern terms like "learning by doing", "agile development", "information sharing", "smart technologies" are often easy excuses or marketing manipulations than real methods which could really be able to solve the majority of our problems. The problem of this sort of term is not that the terms exist, the problem is how they are used and for what they are used. For example: there is no disputing that "learning by doing" is an important part of our daily practical learning and self-development. Nevertheless "learning by doing" does not have a serious ability to replace a complex theoretical knowledge that can be obtained only by studying. This is similar for the other two terms given as an example. Sharing information is certainly useful, but we must not confuse it with knowledge because sharing does not mean understanding. Having access to information does not guarantee the ability to think critically about it. Agile development is not a synonym of usefulness and to use smart technologies unfortunately does not mean to be smart.

> *"Despite various policy statements and slogans about problem-oriented learning, modern education, based on competency-based and agency-oriented approaches, does not perform a function of forming a holistic world view, which is extremely destructive in the conditions of objectifying of the trans-scientific paradigm." (Kamensky, 2017, p. 11)*

Many authors have a relatively clear consensus on which competences are crucial for the I.4.0 to work (Hecklau at AL., 2016). Unfortunately, they focus mainly on technical skills. It is true that many of these authors (for example: Tupa & Benešová, 2017; Schwab, 2016; Becker, 2013; Hecklau at AL., 2016; Ryschka at AL., 2011) also talk about other necessary competences (creativity, sociability, problem solving, teamwork, communication), but these are only to ensure the smoothness and efficiency of work. Preferred competences are focused on work performance. A number of public projects are also aimed at ensuring these (for example: Mařík at AL., 2016; Reich, 2002; Staněk & Ivanová, 2017). Investments are more geared towards ensuring virulent competences than competences to live in an automated, digital company run by data controllers and artificial intelligence.

> *"In fact, this is a challenge to build «Morality 2.0», «Morality 3.0», etc. When a normative component is taken into account as the leading one, most likely an extremely rational morality will be constructed because artificial intelligence is intelligence without consciousness, and, hence, without morality. Is not this confirmation of the «protocol» thinking and the organisation of social life reducing social agency as responsibility and self-responsibility with regard to protocols, norms and algorithms." (Kamensky, 2017, p. 12)*

It is therefore clear that critical thinking is a crucial competence, but almost nobody linked it in the context of I.4.0. Is it a coincidence or intention? Despite all our efforts to propose solutions that will be beneficial to people, we will probably still encounter the complexity and non-linearity of our thinking algorithms. The fact that a computer can defeat a person in such a well-defined space as a chessboard does not mean that it can solve moral dilemmas.

Not even people can always decide exactly what is and is not good, desirable, ethical, moral, and we have a neural network at our disposal, which even the most modern technologies can only dream of. Therefore, human comfort should not take precedence over responsibility. Not technological, but primarily social, political and cultural and critical thinking are the essential competences for the future (compare: Srnicek, 2017; Becker, 2013; Illeris (ed.), 2009; Staněk & Ivanová, 2017)

## CONCLUSION

When we talk about the age of Industry 4.0 it is worth remembering that Lerman's culture of the prophets, whose manifestations can be seen even in a technooptimist-oriented society, suffers from two fundamental shortcomings:

a) We do not know whether the knowledge of a prophet is right.

b) Even the best of intentions does not guarantee a truly positive impact.

Scientists organise conferences about a new, better and beautiful future in the world of I.4.0. Politicians talk about investing in the new age. Voices from the opposite side are easily ignored because they are only the conservative minority and it is fair to admit that opponents of the continued automation and development of artificial intelligence often behave as modern inquisitors. As a result, their support (not too numerous) is based more on the personal mindset of their followers than on serious scientific reasoning. The I.4.0 and all inventions are not dangerous. The problem is on the part of owners and users. The duty of science is to increase the knowledge and understanding of the issue called Industry 4.0. Our duty is to identify the maximum impact of this issue and share our results as much as possible.

In the current discussion about educational needs for the industry 4.0 it is possible to recognize preferences which are mainly focused on socio-technical perspectives. These perspectives are typical for Leirman's culture of experts and culture of engineers in which education is not a mission, but a means. Despite the absence of the humanitarian dimension of education, in which the purpose of education is to 'learn to be human' (Jarvis, 2007), we cannot ignore another problematic consequences of this approach.

**1st)** In areas with dynamic changes and extension of educational content~~s~~ (such as is ITC), it is almost impossible to have one expert on everything. This applies both to the perspective of the culture of experts and to the perspective of the culture of engineers. Being an expert in one area often carries the risk of inability to solve complex problems. The fragmentation of specialization is a natural consequence of this situation. A high degree of specialization significantly complicates the application of multidisciplinarity, transdisciplinarity and interdisciplinarity in solutions. And, as we know, these approaches are essential for the ability

to solve complex challenges of Industry 4.0 (compare: Ivanová & Staněk, 2016; Schwab, 2016; Mařík at AL., 2016). Is this not the reason why there is often an eclectic approach in defining the learning and education needs of the age of I.4.0?

**2nd)** The first purpose of every invention should be to provide a service. Nevertheless, each action usually has consequential results and some of them are unintended and unwanted. For example: After the Velvet Revolution in the Czech Republic and in the Slovak Republic in the early 1990s, accountants were in short supply. The entrepreneurial boom created a huge demand for them. This resulted in a massive increase in opportunities to obtain this qualification (expanding schools, opening of new schools, targeted retraining courses). Ten years later when the market was saturated, there was no shortage of accountants. Today, however, even accountants are an endangered species, as much of their work can be quite easily done by machines. Are we sure that the requirement for new technological qualifications which is presented nowadays as crucial is right? How many highly educated technicians are we really going to need? Are we preparing the places for people to be employed or a sufficient supply of workforce for technology owners? Do we really have rigorous analyses of how many technicians we really need?

**3rd)** The typical requirement for education linked with I.4.0 is mainly focused on technological skills. The argument for this step is the declared effort to equip people with the necessary competences for life (professional and personal). Paradoxically, however, we change the position of man and machine. An important fact has disappeared, technology is meant to serve people and not vice versa. People should not adapt to technology, but technology to people. Otherwise, we give up humanity in favor of technology.

**4th)** Current discourse in I.4.0 reduces education to mere acquisition of skills for serving technologies. The role of technology, led by artificial intelligence, should be to solve sophisticated tasks for people. People's role should be to service technology. On the one hand, this should make life easier for people and reduce the dependence of the masses on elites. On the other hand, such a situation could further reduce people's ability to survive without technology. Do we want to have a society divided into a group of those who can design and operate omnipotent technologies and a group of those who use these technologies, while both cannot exist without them?

**5th)** We are in an age where our ability to extend human life is enormous. This means we must postpone our retirement age at the same time. Inventions like internet, virtual social networks, and communication tools on the one hand, can give us a whole new dimension of the world, but on the other hand, they can manipulate us more than we admit. The reality of Big Brother is here, and we are often more blinded than George Orwell[66] was able to expect. Owners of these technologies are able to accumulate capital and power more effectively than traditional entrepreneurs and landowners.

Each of the paradigms (education cultures) has its limits. The limit of the whole of education is the uncritical prioritization of just one view. The risk of a socio-technical approach (Leirman's culture of experts and the culture of engineers), which is directed primarily at the mere acquisition of skills associated with the use of technology (including communication), does not contribute to understanding. Unfortunately, the sociotechnical perception of educational needs is currently the dominant discourse. The problem with this concept is the frequent absence of a solid analysis of the real needs of education for the future and how long and in what form currently required skills will be needed.

[66] https://en.wikipedia.org/wiki/Nineteen_Eighty-Four

Understanding technologies and the context of their use (not only professional and economic, but also cultural and social) is crucial for a critical distance that can protect us from excessive techno-optimism or techno-pessimism. This could be a typical manifestation of the dark side of education in the culture of prophets. Also, the culture of communicators cannot solve everything, because in practical life it may call into question the legitimacy of the assignment by engineers or prophets, but the fact remains that the assignment exists. We will not fulfil it without practical competences.

The purpose of education, however, is not just the reproduction of knowledge, but also its production. However, narrowing education to mere technology for transferring knowledge and skills reduces the human adaptability (much needed to manage dynamic change) rather than vice versa.

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# THE INFLUENCE OF PERSONALITY TRAITS ON SPECIALISTS' SELF-REGULATION IN THE CONDITIONS OF THE IV INDUSTRIAL REVOLUTION

***Olga KUZMINA***[67]
***Elena KORNILTSEVA***[68]
***Nafisa GAGARINA***[69]

**Abstract:** *The business and corporate personnel are affected by the IV industrial revolution. As a result, the skills not mentioned before are becoming significant. To get competitive personnel the company management should focus the system of employee training on developing the required qualities in the workforce in accordance with market needs and they also should stay current with the latest research on this problem. The article presents the views and positions on the problem of mental self-regulation, which is one of the fundamental issues in general psychology. It emphasizes the impact of new era features such as increasing competition, information explosion, complication of the business and globalization on the demand for specialists who can organize their own activities and self- regulate their emotions and behavior. The empirical study conducted by the authors proved the hypothesis of the relationship between employee personalities and different types of self-regulation. In particular, conclusions were made that extraverts have more self-control than introverts do, anxious people' self-control is lower etc. Self-regulation as an important quality can be purposefully developed in employees to a sufficient level, which will help a person to perform well.*

**Key words:** *employee personality traits, self-regulation, behavior, extraversion, introversion*

**JEL Classification:** *J24, J28, O15, M14*

## 1. INTRODUCTION

Modern age is chaotic and volatile. Its features are global competition, fast communication and information flows, growing complexity of business and globalization. There is growing demand for people who can quickly orient themselves in different situations, successfully organize their own activities in different time conditions, are able to regulate their emotions and general behavior. The problem of individual self-regulation is in the focus of many sciences including psychology. According to O.A. Konopkin, the problem of mental self-regulation is one of the most global and fundamental problems of general psychology [5]. The concept of self-regulation is often found in scientific and other kind of literature, is interdisciplinary in nature and differs in importance and interpretations

P. Janet, arguing that the ability of self-regulation is the highest criterion for personality development, first introduced this term in psychology. He considered self-regulation as a process of mediation of social norms and values, as a system of internal requirements that turn a person into an active subject [4].

A. Freud identified "Ego" as a regulatory agent that mediates attraction to norms and taboos and participates in developing awareness of desires [3]. According to A. Adler, regulation processes are associated with mechanisms of inferiority complex development, which was

[67] Associate Professor, PhD in Psychological Sciences, Ural State University of Economics, 8 Marta Str., 62, Yekaterinburg, 620144, Russia, e-mail: kuzminaov@yandex.ru
[68] Associate Professor, PhD in Philosophical Sciences, Ural State University of Economics, 8 Marta Str., 62, Yekaterinburg, 620144, Russia, e-mail: kornilceva.e@yandex.ru
[69] Senior Lecturer, Ural State University of Economics, 8 Marta Str., 62, Yekaterinburg, 620144, Russia, e-mail: naphissa@mail.ru

considered as a pathological result of a hypertrophic sense of low esteem. He understood "overcompensation" and "falling into disease" as failed self-regulation, based on the anxieties "be better than others", "be not like others" which contradict to established moral norms and values [2].

In Russian psychology, the consideration of self-regulation problems was started by L.S. Vygotsky. He associated the specific human way of regulation with creating and using psychological tools and saw it in the phenomenon of managing one's behavior. He understood signs as artificial stimuli-means, deliberately introduced into the psychological situation and performing the function of auto-stimulation [10]. S.L. Rubinstein linked the highest level of self-regulation with the emergence of worldview feelings, which he understood as conscious value attitude of a person to the world, to other people, to himself" [9].

K.P. Kornilov, who assesses the development trend of the self-regulation concept, indicates that self-regulation means an analysis of the processes of meaning formation, including the level of self-reflection, the system of experiences in the context of self-identification. He considers self-regulation to be the manifestation of the regulatory function of self-consciousness. Self-regulation processes are considered an internal purposeful activity of a person, which is realized through systemic participation of different processes, phenomena and levels of the psyche. According to V.I. Morosanova, O.A. Konopkin and A.K. Osnitsky, self-regulation is the process of initiating and promoting the activity goals, as well as managing the achievement of these goals [5, 8, 7]. B.V. Zeigarnik in her works proves that self-regulation is a conscious process that aims to control one's behavior. She distinguishes two levels of self-regulation. The first, operational-technical level is associated with conscious organization of action through optimization means. The second level is motivational, on which the overall focus of activity is based [11, 12, 13].

S.L. Rubinstein, K.A. Abul'khanova-Slavskaya determine personality through self-regulation, where self-regulation acts as a coordinator of multimodal personal qualities that ensure overcoming contradictions and the functioning of an individual in the activity [9, 1].

## 2. PROBLEM FORMULATION AND METHODOLOGY

Conscious self-regulation of voluntary human activity is a holistic system of mental means by which a person is able to control their purposeful activity. Systems of mental self-regulation have a universal structure for different types of human activity, and in this structure, we can note the main components performing various functions in conscious voluntary control. These include activity goals, model of significant conditions, and program of performed actions, success criteria, result evaluation and correction. These structural elements are interconnected, they have complex architectonics and can be implemented both sequentially and simultaneously [6].

It was proved that the success of various practical activities is ensured by the formed holistic system of self-regulation, and any structural and functional defect (insufficient implementation of any functional component of self-regulation, underdeveloped inter-functional relationships) of the regulation process significantly limits the efficiency of various activities.

The analysis of self-regulation mechanisms is carried out in psychology as part of the analysis of the problems of individual regulation styles, the implementation of various forms of voluntary actions and activity (educational, labor), the regulation of mental states and the age-related aspects of its formation [6, 7].

Despite quite a large amount of research material on this issue, it remains problematic to understand the influence and relationship of personal characteristics on the process of forming and developing conscious self-regulation. In our empirical study, we attempted to establish a correlation between the personal characteristics of specialists and their conscious self-regulation. We suggested that the higher the focus of an individual, which is reflected in extroversion, the more developed self-control is; the more anxiety, aggressiveness, dependence and subordination in the interaction are manifested, the less self-regulation and self-control are expressed.

Diagnostics was carried out using the following methods: the method "Individual-typological questionnaire" (ITO) L.N. Sobchik, the method "Style of self-regulation of behavior" V.I. Morosanova, the method "Study of volitional self-regulation" A.V. Zverkova and E.V. Eidman, the method "Diagnostics of interpersonal relationships" T. Leary.

The Spearman's correlation coefficient was used to identify significant relationships. Statistical processing was carried out using the SPSS STATISTICS 17.00 software package. The subjects in the study were security officers working at the "Serov Ferro-alloy Plant" OJSC. The total number of 72 people. Of these, 50% — women and 50% — men. 17% — under the age of 30, before 18% — under the age of 40, 65% — over the age of 40. All the employees work on a 12-hour schedule. The results of the correlation analysis are shown in table 1.

**Table 1: Indicators of significant correlation relationships of self-regulation and personality characteristics**

| Scales | Planning | Modeling | Result Evaluation | Flexibility | General Level | General Scale | Persistence | Self-control |
|---|---|---|---|---|---|---|---|---|
| **Extraversion** | – | – | **0,351*** | – | – | – | – | **0,484**** |
| **Spontaneity** | – | – | – | – | – | – | **0,366*** | **0,401*** |
| **Aggressiveness** | – | – | – | **–0,341*** | **0,469**** | **0,346*** | **0,402*** | – |
| **Rigidity** | – | – | – | – | – | – | – | **0,378*** |
| **Introversion** | – | – | – | – | – | – | **–0,400*** | – |
| **Anxiety** | – | – | – | – | – | – | – | **–0,434*** |
| **Authority** | **0,387*** | – | – | – | – | – | – | – |
| **Subordination** | – | **–0,483**** | – | – | **–0,519**** | **–0,363*** | **–0,527**** | – |
| **Dependence** | – | – | – | – | – | **–0,346*** | **–0,411*** | – |

Notes: * significance level 0.01; ** significance level 0.05

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

The empirical data shown in table 1, allowed drawing the following conclusions. The higher the extroversion rate, the more people are interested in the results of their activities ($r = 0.351$, with $p < 0.042$) and they need increased self-control ($r = 0.484$, with $p < 0.004$). Extroverts are active, dynamic, open and ready to interact. The higher the desire to expand contacts and interact with other people, the more self-controlling functions they manifest. They try to accurately respond to changes around.

The spontaneity, which is manifested in careless statements and unjustified actions, requires more personal persistence ($r = 0.366$, with $p = 0.033$) and self-control ($r = 0.401$, with $p = 0.019$). The higher the spontaneity of behavior, the more controlling functions should be

manifested. Aggressiveness as a personal quality, manifested in stubbornness and assertiveness in communication situations, directly correlates with self-regulation (r = 0.469, with p = 0.005), will (r = 0.346, with p = 0.045) and persistence (r = 0.402, with p = 0.018). The higher the aggressiveness is manifested, the more the person must show an ability to control and regulate the state.

With the increasing desire to persist in positions and views in a dispute, the need for self-control increases. The higher the rigidity, that is the desire to insist on own way, the more the person should be able to regulate the emotional state (r = 0.378, with p = 0.028). The more closed and reserved a person is, the more this person is focused on the world of his subjective experiences, the less persistence and ability to argue their point of view is needed (r= –0,400, with p = 0,019). The more anxious people are, the lower the level of self-control is (r = –0.434, with p = 0.010). Anxiety is an individual psychological feature, manifesting in individual's experiencing strong anxiety on relatively small occasions, suggests a low probability of regulation and modeling of behavior.

Specialists with higher authority rates are more able to plan their activities (r = 0.378, with p = 0.024) than people who do not possess this feature. Authority acts as an individual's special socio-psychological characteristic with a pronounced incentive effect. Such people are confident and have predictive ability. The higher the rate of aggression, the lower the flexibility of behavior (r = –0.341, with p = 0.048). People prone to subordination model their actions and goals to a lesser extent (r = –0.483, with p = 0.004).People prone to submission have lower general level of self-regulation (r = –0.519, with p = 0.002) and lower indicator on the general volitional scale (r = –0.363, with p = 0.035), besides, the subordinate people are less persistent (r = –0.527, with p = 0.001).

## 4. CONCLUSION

Thus, the conducted study contributes to developing the concept of self-regulation of individual activity, of individual self-regulation determined by individual-psychological characteristics, which increase and decrease the level of self-regulation of voluntary activity. The obtained data can be used by managers to develop effective cooperation with employees and establish the production processes in the conditions of unstable economic development.

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# APPLICATIONS OF STATISTICS IN REGIONAL ECONOMICS IN CONTEXT OF SMART, SUSTAINABLE AND INCLUSIVE GROWTH

***Karol KRAJCO*[70]**
***A. BONDARENKO*[71]**
***S. BONDAR*[72]**
***Nikolay SINIAK*[73]**

**Abstract:** *It's impossible to solve modern tasks of planning, management, forecasting without reliable statistical data and without using statistical methods for processing these data. The desire to explain the present and look into the future has always been characteristic of human nature, and various methods have been used to solve these problems. Statistics in the description of random phenomena use mathematics as a language of science. It means that the real situation is replaced by probability schemes and analyzed by methods of probability theory. The expressive power of mathematics as a language is very great. Serious mathematical methods have been used to analyze statistical observations relatively recently. Mankind has realized the need to collect statistical data on various aspects of society much earlier than the appearance of the associated developed mathematical apparatus. But relatively simple methods of collecting and analyzing data have been an important tool which helps make reasonable decisions. The main hypothesis of the article is that statistical indicators must be used to find a smart territorial specialization.*

**Key words:** *internet of things, legislation, Industry 4.0, society*

**JEL Classification:** *I30, J40*

## 1. INTRODUCTION

### *Engineering Statistics Applications*

Statistics studies random phenomena that essentially cannot be definitely described and predicted. For example, you cannot absolutely accurately predict how many people will be born or die in a country for a given period of time. It is impossible to determine the income of a certain family accurate to a penny (cent, centime) for a certain period of time (you can find a coin of 10 cents on the road, you can win the lottery, get an unexpected inheritance and, conversely, you can lose some of the money due to illness, wrong decision, or stock market crisis). It is impossible to determine up to a minute how long the purchased TV (computer, car) will work until the first breakdown [4].

The life of a person, society, civilization consists of random phenomena. It is important not to give too much will for the society to be stable and life unpredictable (any attempt to exclude completely a case from life is bound to fail.) [1].

Any statistic data are always incomplete and inaccurate and they cannot be different. The objective of statistics is to give reasonable conclusions about the properties of the phenomenon under study by analyzing incomplete and inaccurate data. Statistics have proved that it can cope with such problems.

[70] Assist., PhD., Alexander Dubček University of Trenčín, Študentská 3, 911 51 Trenčín, Slovakia, e-mail: karol.krajco@tnuni.sk
[71] PhD student, Belarussian State Technological University, Minsk, Belarus, senior lecture of Mozyr State Pedagogical University named after I.P.Shamyakin: e-mail: anna141081@mail.ru
[72]Assist. prof., PhD., Mozyr State Pedagogical University named after I.P.Shamyakin
[73]Asst. prof, PhD., University of Information Science and Technology "St. Paul the Apostle", Partizanska bb, Ohrid, 6000, R. Macedonia, e-mail: nikolai.siniak@uist.edu.mk

Indexes are a simple and convenient means of comparing data with each other. The fact is that the calculation of the difference between the two numbers gives little information. Indexes are percentages. Let's give them the exact definition.

## 2. PROBLEM FORMULATION AND METHODOLOGY

### *Individual (private) indexes*

Let it be some ordered set of data, for example, a time series. Choose one of its meanings as the basis. This value is denoted by the letter C and is called the constant of the base period. And now we will express all other data as a percentage of the number C. This operation is called indexing. Thus, the formula for calculating the index I_t has the form:

I_t = y_t / C * 100%

where y_t are the initial values from the time series, I_t is the corresponding index.

It is impossible to build graphs of two rows of different dimensions (price and volume of production) in one coordinate system; index (percentage) series graphs are constructed naturally. Then it becomes possible to compare the behaviour of these series in time.

Several consecutive periods of the time series are often chosen as the base period, Then the constant of the base period is the arithmetic mean of the corresponding values of the time series.

Data from the index series is easily compared with only 100% of the base period. But among themselves, they need to be compared carefully.

### *Aggregate Indexes*

Aggregate indexes are calculated immediately on several times series. Each of the series is multiplied by some weight, and then for each moment of time, these products are added up. A number of amounts are indexed. The scheme for calculating aggregate indices is given in the table:

| t | $w_1 y_{t1}$ | $w_2 y_{t2}$ | ... | $w_n y_{tn}$ | $y_t = \sum w_i y_{ti}$ | $I_t$ |
|---|---|---|---|---|---|---|
| 0 | $w_1 y_{01}$ | $w_2 y_{02}$ | | $w_n y_{0n}$ | $y_0 = \sum w_i y_{0i}$ | $I_0$ |
| 1 | $w_1 y_{11}$ | $w_2 y_{12}$ | | $w_n y_{1n}$ | $y_1 = \sum w_i y_{1i}$ | $I_1$ |
| 2 | $w_1 y_{21}$ | $w_2 y_{22}$ | | $w_n y_{2n}$ | $y_2 = \sum w_i y_{2i}$ | $I_2$ |
| 3 | $w_1 y_{31}$ | $w_2 y_{32}$ | | $w_n y_{3n}$ | $y_3 = \sum w_i y_{3i}$ | $I_3$ |
| ... | ... | ... | | ... | ... | ... |

Here, t are periods or points in time; y_tj - terms of the time series; j is a time series number; j = 1,2,3, ..., n; w_ (j) is the weight by which the terms of the j-th time series are multiplied. The resulting series y_t is indexed by I_t = (y_t / C) * 100%, where C = y_k or C = 1 / m ∑_ (i = k) ^ (k + m) y_t.

Weight is determined or calculated in many different ways. Most often the volumes of production or sales are used as the scale for the price indexes and prices are used for the

calculation of the indexes of the production volume. Moreover, as a rule, they coincide with the value of the base period.

***Average indexes***

Average indexes are calculated on several individual index rows. The series of indexes are multiplied by some weights, and then the sum of these products for each value of t is divided by the sum of all weights ∑_j▒w_j. In order for the average index to coincide with the corresponding aggregate index, the weights of the individual indexes must be the terms of the aggregate index denominator.

*Price indexes*

When calculating price indexes, the volumes of production and sale of goods are chosen as weights. For example, time-series contain only two periods: the base, numbered 0, and the reporting (current), numbered 1. Two basic formulas are used to calculate price indexes - Paasche and Laspeyres.

The weights in the Paasche price index are the number of products for the reporting period, so this price index is calculated by the formula:

$$I_p = \frac{\sum p_1 q_1}{\sum p_0 q_1} * 100\%$$

The cost of production of the reporting period is in the numerator of the fraction and the cost of the same goods in the prices of the base period is in the denominator. This price index shows how much the goods in the reporting period became more expensive (get cheaper) than in the base.

Scales in the Laspeyres price index are the number of products in the base period. Such a price index is calculated by the formula:

$$I_p = \frac{\sum p_1 q_1}{\sum p_0 q_0} * 100\%$$

The Laspeyres price index shows how many times the prices of the base period would have risen (got cheaper) because of the time changes in prices for them for the current period.

In practice, the price index, calculated using the Paasche formula, is usually slightly less than the index calculated using the Laspeyres form.

## 3. RESULTS AND DISCUSSION

***Statistical Applications for Smart Sustainable Development and Inclusive Growth***

The concept of smart sustainable development and inclusive growth are rapidly gaining in importance and relevance as they are seen as vital contributors to addressing the pervasive and challenging social-economic issues of the 21st Century [3]. A fully functioning smart territorial development is the most important factor to enhance the economy of countries in the Eurasian region and promote long-term sustainable development and growth [7].

Many countries around the world, is going through a period of transformation. The global economic crisis disrupted economic and social efforts of many years, revealing several structural weaknesses in the economy, which must be eliminated through structural reforms. Therefore, the European Union and its member states proposed a Europe 2020 strategy to ensure sustainable growth by 2020. The strategy addresses not only the short-term challenges of crisis but also the need for reforms and measures to enhance future growth.

Europe 2020 puts forward three priorities:

- Smart growth – developing an economy based on knowledge and innovation.
- Sustainable growth – promoting a more resource-efficient, greener and more competitive economy.
- Inclusive growth – fostering a high employment economy delivering social and territorial cohesion.

Growth involves numerous aspects that should be based on knowledge and innovation (smart growth) and must include a complex of others aspects: promoting a more resource-efficient, greener and more competitive economy (sustainable growth), fostering a high-employment economy delivering social and territorial cohesion (inclusive growth). According to research undertaken by Paul M. Romer (Nobel Laureate in economics, 2018), knowledge and innovation have an input in production that has increasing marginal productivity and economic growth [6].

The following headline targets were set under Europe 2020:

- The employment rate of the population aged 20–64 should increase from the current 69% to at least 75%, including through the greater involvement of women, older workers and the better integration of migrants in the workforce.
- Both the public and private sectors should invest in research and development. The EU currently has a target of investing 3% in research and development.
- Reduce greenhouse gas emissions by 20% to 30%, increase the share of renewable energy sources in final energy consumption to 20%.
- The drop-out rate of early school leavers should be reduced from the current 15% to 10%.
- The number of Europeans living below the national poverty lines should be reduced by 25%, lifting over 20 million EU citizens out of poverty.

Smart and sustainable territories development and growth is a major challenge due to complex, complicated, and different nature of territories. The exploitation of the territory´s potential is a basic starting point for the social and economic development of regions and a condition for changes that will lead to a new higher quality of life and competitiveness of the region.

Strategy for smart, sustainable and inclusive growth can only be achieved if the territorial dimension of the strategy is taken into account. Territorial competition in the New Economy comprises a variety of strategies, both direct (digitalization, innovation, investment-oriented, traditional and others) and some indirect ones for example related to real estate (digitalization, value creation and governance) for the transition of territories (cities, districts, provinces, geographical regions) into smart, sustainable, liveable and prosperous localities [5], [8]..

Increase of interest to the questions connected with territorial market development must be related, first of all, to the rate of the regional competition for financial, personnel, intellectual and other resources [4]. In recent years some regions of the developing as well as “transition economy” countries (e.g. Belarus), along with the largest cities, began to compete among themselves for the attraction of resources, including high added value investments. These processes led to the awareness that there is a need in marketing philosophy and technologies introduction in order to design market “appeal” and marketing strategy of the territory and its competitiveness. In this regard, each territorial administration tries to offer the most attractive product in the form of internal conditions for accommodation, business and consumers (population, investors, tourists) so that they chose the territory, which corresponds to their

requirements. Thus, any territorial establishment needs elaboration of the marketing concept of development and advance on the global market of territories.

This kind of activity (namely marketing of territories) is carried out at meso-level; thus, it, as well as the sustainable development policy, is designed on the basis of the enterprises' activity analysis, prices and pricing, features and advantages of implementation of activity in the certain region, thus territorial potential is realized not only within the regional dimension, but also beyond it, falling outside regional limits and requirements. This research aims to step far beyond traditional tools of territorial marketing (investment flows attraction, tourism, etc.) and to establish a new statistical approach to the regional development, based on the aggregate, average and price Indexes analyzed before. Usually, a conceptual model is prepared on the basis of the experts' opinions, with the objective of identifying the future potential territorial impacts of Smart Specialization[74]. The main hypothesis of the article is that statistical Indexes must be used to find a smart territorial specialization. We want to understand smart territorial specialization based on these statistical indicators as an instrument to concentrate resources and innovation on strategic priorities, comparative advantages and entrepreneurial discovery processes.

Statistical tools to discover territorial smart profiles and regional patterns of smart growth are two mutually linked, novel conceptual elements in this research. These profiles will appear to be region-specific for establishing a successful link between statistical factors of innovation and growth. This would help to design the right mix of policies to enable smart and inclusive growth by strengthening the potentials and competitiveness of the firms and regions. Thus, smart specialization should be a bottom-up approach; based on regional knowledge, innovation and relational capital and statistical estimation. Smart specialization should also ensure more effective use of public funds, helping to leverage private and foreign investments, stimulate the cooperation between regions and territories, institutional and social capital building transformations and thus maximize the overall innovation potential of Belarus or Slovakia.

The recommendations for the development of regional sustainable development strategies in the Republic Belarus you can find here[75]. Nevertheless, Belarus does not have the accepted strategy of sustainable development and inclusive growth like in European countries. For example, based on the statistical analysis of the development of the Slovak economy there were identified the areas of specialization based on traditional sectors and prospective areas of specialization concerning the fast-growing sectors, which have a high potential for the development of the Slovak economy[76]. Areas of economic specialization in Slovakia was established:

- Automotive and mechanical engineering industries
- Consumer electronics and electrical equipment
- Information and communication products and services
- Production and processing of iron and steel

Prospective areas of specialization:

- Automation, Robotics and Digital Technologies,
- Processing and increasing the value of light metals and their alloys,

[74] See https://cor.europa.eu/en/our-work/Documents/Territorial-impact-assessment/smart-specialisation.pdf
[75] See http://www.economy.gov.by/uploads/files/002835_609621_5.pdf
[76] See https://www.opvai.sk/media/57255/through-knowledge-towards-prosperity-research-and-innovation-strategy-for-smart-specialisation-of-the-slovak-republic.pdf

- Production and processing of polymers and progressive chemical substances (including smart fertilization),
- Creative industry,
- Increasing the value of domestic raw material base,
- Support for smart technologies in the area of processing raw materials and waste in the regions of their occurrence.

Development trends in prospective areas of specialization
- new technologies allowing the transmission, processing and storage of data,
- smart production system,
- smart and industrial transport,
- smart technologies for the intelligent management of smart products consumption,
- progressive chemical technologies for the production of modern fertilizers,
- technologies and services for the active life and ageing, i.e. health care, diagnostics and wellness,
- support of smart technologies in the area of processing raw materials and waste in the regions of their occurrence.

## 4. CONCLUSION

Identifying areas of specialization with used statistical indexes will help to clarify and develop Smart specialization strategy and create conditions for increasing their economic performance and competitiveness through the implementation of R & I activities. To make more efficient their activities it will be needed to complete the necessary structure, mechanisms and linkages which will increase their innovation performance.

While making internal decisions related to smart sustainable development, government and industries should consider these types of evaluations. Further regulatory reforms based on Smart specialization strategy, and crucially enforcement, will be essential for Belarusian regions to move Belarus into the list of countries with a smart and sustainable economy.

Proposed statistical indexes provide a simple yet highly structured approach with the potential to guide not only more systematic statistical analyses to define smart specialization strategy but also more effective engagements of the local industrial and innovation communities in this process.

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# VPLYV PRIEMYSLU 4.0 NA ZMENY V ŠTRUKTÚRE A POČTE PRACOVNÝCH MIEST

## IMPACT OF INDUSTRY 4.0 ON CHANGES IN THE STRUCTURE AND NUMBER OF JOBS

***Emília KRAJŇÁKOVÁ***[77]
***Jaroslav VYHNIČKA***[78]

**Abstrakt:** *Situácia na trhu práce sa permanentne mení pod vplyvom technologických, ekonomických sociálnych, legislatívných a ďalších faktorov.Prebehajúce procesy v súčasnosti sú spojené s konceptom Priemyslu 4.0 a digitalizáciou výroby. Tie ovplyvňujú zmeny na trhu práce, ako aj celkový hospodársky a spoločenský rozvoj. Zavedenie strojov s úmelou inteligenciou zásadným spôsobom ovplyvňuje vznik nových integrovaných a komplexných pracovných pozicií v sfére hospodárskej výroby a zánik „strojových" pracovných miest riadených ľudmi. Hlavným cieľom príspevku je zistiť zmeny v štruktúre, ako aj v počte pracovných miest v moderných výrobných procesoch, pod vplyvom zavedenia do výroby strojov s umelou inteligenciou a digitalizáciou výroby.*

**Kľúčové slová:** *priemysel 4.0, trh práce, umelá inteligencia, digitalizácia výroby*

**Abstract:** *The labor market situation is constantly changing under the influence of technological, economical, social, legislative and other factors. Ongoing processes are currently linked to the Industry 4.0 concept and the digitization of production. They affect labor market changes as well as overall economic and social development. The introduction of machines with the artificial intelligence fundamentally influences the emergence of new integrated and complex jobs in the sphere of economic production and also the disappearance of "machine" jobs managed by people. The main aim of the paper is to identify changes in the structure as well as in the number of jobs in modern production processes, under the influence of introduction into the production of machines with artificial intelligence and production digitization*

**Key words:** *industry 4.0, labor market, artificial intelligence, production digitization*

**JEL Clasification:** *E64,J20, J24*

## ÚVOD

Budúcnosť pracovných miest neustále čelí príležitostiam a rizikám technologického pokroku. Aktuálnou výzvou je Priemysel 4.0, ktorý je postavený na koncepcií, že stroje, ľudia, zariadenia, produkty a logické systémy dokážu navzájom spolupracovať a komunikovať. Toto tesné prepojenie jednotlivých produktov, zariadení, ľudí zvyšuje vo veľkej miere efektívnosť výrobných strojov a zariadení, naproti tomu znižuje náklady a šetrí zdroje (Industry4, 2019). Následne sa to odráža aj samotnej budúcnosti pracovných miest. Zamestnanci sa musia prispôsobiť, byť flexibilní, kompetentní, kreatívni a rozvíjať svoje schopnosti a zručnosti. Je potrebné aby rozširovali svoju poznatkovú bázu, ale usilovali sa aj celoživotne vzdelávať (Záležáková, 2018). Vzniká tak potreba neustáleho prísunu kvalifikovanej pracovnej sily pre aktuálne a dlhodobé potreby priemyslu. Štát by sa mal správať ako partner podnikov pri

[77] doc., Mgr., CSc., Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Adresa Študentská 3, Trenčín 91150, Slovensko, e-mail: emilia.krajnakova@tnuni.sk
[78] Ing., doktorand, Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Adresa Študentská 3, Trenčín 91150, Slovensko, e-mail: jaro.vyhnicka@gmail.com

vytváraní nových pracovných miest, ale aj nastavení systémov pre rekvalifikáciu a rozvoj zručnosti pracovníkov.

## *1 Teoretické východiská skúmania zmien na trhu práce v podmienkach Priemyslu 4.0*

Urbanizácia, digitalizácia, globalizácia, ale aj zmena podnebia vytvárajú nové trendy v zlepšovaní konkurencieschopnosti jednotlivých národných hospodárstiev pôsobením optimalizácie priemyselného systému koncepcie "priemyslu 4.0", ktorej cieľom je integrácia fyzických operácií a súvisiacich procesov výrobných systémov do jednotného informačného priestoru (Maksimschuk & Pershina, 2017). Koncepciu tvorí veľmi široká oblasť, ktorá zahrňa výrobné procesy, efektívnosť, správu údajov, vzťahy so spotrebiteľmi, konkurencieschopnosť, ale aj oveľa viac. Preto sa stal priemysel 4.0 novou témou pre vedcov a vedné odbory podnikovej ekonomiky. Na základe toho vzniká množstvo názorov a príspevkov ktoré pokrývajú rôzne aspekty problematiky (Piccarozzi, Aquilani, Gatti, 2018). Okrem ekonomických merateľných faktorov je potrebné, aby spoločnosti zvážili aj enviromentálne a sociálne vplyvy ako je budúcnosť práce, efektívne využívanie jednotlivých zdrojov s cieľom zabezpečiť trvalú konkurencieschopnosť. Najmä pre malé a stredné podniky to môže byť kľúčovým faktorom úspechu (medzinárodnej) konkurencieschopnosti (Gabriel & Pessl, 2016). Napríklad v slovenských „automobilkách" je zavádzanie prvkov priemyslu 4.0 bežnou obchodnou stratégiou. Podľa Alexandra Matušeka (Volkswagen Slovakia, Think Blue. Factory) sú vo výrobných halách inštalované približne dve tisícky robotov a ďalšie pribúdajú v karosárni a montážnej hale Porsche. Okrem toho využívajú aj rozšírenú virtuálnu realitu, big data, online monitoring výroby či inteligentné rukavice so skenerom (ATP Journal, 2018).

### *1.2 Zmeny v štruktúre a počte pracovných miest pod vplyvom Priemyslu 4.0*

Vývoj pracovných miest a zručností pre úspešnú implementáciu priemyslu 4.0 významne ovplyvní pracovné procesy a pracovné prostredie. Očakáva sa, že sa pracovné miesta zamestnancov zmenia z hľadiska obsahu a vytvoria sa aj nové typy pracovných miest (Pinzone, Fantini, Perini, Garavaglia, Taisch, Miragliotta, 2017). Je to z toho dôvodu, že čelíme znižovaniu zamestnanosti automatizáciou. To spôsobuje, že ľudská pracovná sila nie je v určitej miere konkurencieschopná so strojmi. Ale práve nové typy pracovných miest kompenzujú túto stratu tradičných požiadaviek trhu práce (Ras, Wild, Stahl, Baudet, 2017). Vo všeobecnosti môžeme hovoriť o potrebe vyššej úrovne flexibility a adaptability. To súvisí s potrebou neustáleho vzdelávania, ktorá pramení aj z vlastnej iniciatívy nad úroveň poskytovanú zamestnávateľmi. Existuje zhoda v tom, že digitalizácia a internet vecí by viedol k všeobecne vyššiemu stupňu zložitosti pracovných procesov, ktorý by sa zhodoval s rastúcim dopytom po kvalifikovaných odborníkoch. Priemysel 4.0 taktiež vynúti užšiu medzifunkčnú spoluprácu medzi rôznymi jednotkami spoločnosti, čo vedie k vytvoreniu medzipodnikových partnerských sietí (Bonekamp & Sure, 2015). Jedným zo spôsobov je tzv. priemyselná symbióza, ktorá hovorí o medzipodnikovej spolupráci využívajúcej synergie ponúkanej geografickou blízkosťou podnikov (Ekopriemyselné parky – EIP). Ak sa hranice systému rozšíria na medzipodnikové siete, zvyšuje sa potenciál pre integráciu procesov, pretože sa môžu vzájomne doplňať energetické a materiálové požiadavky a charakteristiky jednotlivých partnerov. Ku príkladu tepelná integrácia sa vyskytuje u veľkých rafinérií, alebo elektrární v kombinácií s partnerom, ktorý môže ďalej využívať odpadové teplo pri nízkej teplote, napríklad pre akvakultúru. Systematické plánovanie vysoko integrovaných lokalít by vďaka priemyslu 4.0, mohlo podporiť tento vývojový proces a to by viedlo k intenzivnejšej výmene energetických a materiálových tokov (Hiete, Ludwig, Schultmann, 2012). Zároveň aj nadnárodné spoločnosti sú dôležitým subjektom pre rozvoj priemyslu 4.0, pretože priamo

ovplyvňujú nové trendy medzinárodného podnikania, globálnej konkurenciashopnosti na medzinárodných trhoch, ako aj hospodárstva jednotlivých štátov, národov (Kordoš & Vojtovič, 2016).

### *1.2 Hrozby a príležtosti na trhu práce v kontexte Priemyslu 4.0*

Budúcnosť pracovných miest v priemysle 4.0, prináša množstvo výziev. Stretávame sa s hrozbami ktoré sa týkaju predovšetkým menej kvalifikovaných ľudí, ktorí disponujú nízkymi digitálnymi zručnosťami, ale sú to aj ľudia nad 50 rokov. Práve občania vo veku 50 a viac rokov tvoria jednu z najpočetnejších sociálno-demografických skupín v slovenskej populácií, ktorá má problémy s nájdením pozície na trhu práce a problém so zamestnaním (Krajňáková, Vojtovič, 2017). Podľa určitých prognóz digitalizácia a automatizácia ohrozuje predovšetkým povolania, na ktoré dnes stačí vzdelanie bez maturity. Hovoríme predovšetkým o takých profesiách, ktoré pozostávajú z rutinných a ľahko algoritmizovateľných činností ako sú administratívni pracovníci, zamestnanci v službách, predaji a pod. (Záležáková, 2018). Súčasná ekonomická výroba je založená predovšetkým na moderných a vysoko efektívnych technológiach, ktoré nevyžadujú kvantitu pracovných síl, ale práve kvalitu. Výsledkom je, že hospodársky rast nie je podmienený zapojením väčšie množstva pracovných síl. Práve táto situácia charakterizuje hospodársky rozvoj nielen na Slovensku, ale aj v ďalších krajinách strednej a východnej Európy (Vojtovič & Krajňáková, 2013). Naproti tomu niektoré názory hovoria o tom že príchodom priemyslu 4.0 sa pracovné miesta nestrácajú, ale z dlhodobejšieho hľadiska vytvárajú. Nasadzovanie robotov a digitalizácie zvyšuje konkurencieschopnosť podnikov. Práve tá je najlepším spôsobom ako udržať alebo navýšiť pracovné miesta, zároveň zvyšovať ziskovosť podnikov a mzdy zamestnancov (Industry4UM, 2018). Počítačové algoritmy a programy, ktoré zhromažďujú dáta a poskytujú náhľady a návrhy, pomáhajú zamestnancom nájsť prítomné nedostatky. Tieto nedostatky sa môžu nachádzať v rôznych oblatiach, ale práve vďaka týmto možnostiam jednoducho na ne zamerajú svoju pozornosť. Učenie sa vďaka digitalizácií stáva určitou hrou a poskytuje množstvo výhod (RectruitMen & Developium Group, 2019) Vo všeobecnosti môžeme konštatovať že v procese formovania a rozvoja pracovných možnosti aj v kontexte priemyslu 4.0, je potrebné účelné a efektíve vzdelávanie.

## 2. CIEĽ A METODOLÓGIA

Cieľom príspevku je na základe analýzy prognóz zistiť zmeny v štruktúre, ale aj budúcom počte pracovných miest v moderných výrobných procesoch. Predovšetkým pod vplyvom zavádzania strojov s umelou inteligenciou do výroby a digitalizáciou samotnej výroby. Pre vyhotovenie nasledujúceho príspevku bolo využívaných niekoľko odlišných metód. Hovoríme o metódach, ktoré boli využívané pri získavaní potrebných informácií a zdrojov, ale aj na spracovanie získaných poznatkov a ich následnú interpretáciu. Pomocou analýzy sme v príspevku interpretovali dostupné získané informácie a údaje týkajúce sa vývoja zamestnanosti v Slovenskej republike ale aj v Európskej únií v kontexte priemyslu 4.0. Vďaka tomu bolo možné posúdiť vplyv priemyslu 4.0 na zmeny v jednotlivých oblastiach priemyslu a teda aj v počte pracovných miest. Následne sme pomocou syntézy mohli sledovať jednotlivé vzťahy medzi faktami a ich charakter vzájomných súvislostí. S využitím nasledovných metód sme dosiahli, že príspevok má charakter jednotného súvislého celku k danej problematike. Medzi ďalšie relevantné metódy priradujeme indukciu a dedukciu. Bolo taktiež potrebné sa zamerať na pojmy, ktoré skúmali daný jav a problematiku príspevku. Teda v našom prípade šlo predovšetkým o problematiku priemyslu 4.0. Zistiť teoretické východiská skúmania zmien na trhu práce v daných podmienkach, ale aj zmeny v štruktúre a počte jednotlivých pracovných miest pod vplyvom tohto priemyslu. Z toho následne vyplývali príležitosti, ale aj

hrozby ktoré tento priemysel prináša. Následné zistenia umožňovali konštatovať zhodnotenia, ale aj formovať samotné smerovanie príspevku.

## 3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

Rozvoj inteligentného priemyslu v kontexte priemyselnej revolúcie 4.0 podnieti politikov k vytvoreniu a zavedeniu nových opatrení a stratégií, ktoré umožnia priemyslu Slovenskej republiky transformáciu do úrovne inteligetného priemyslu a vytvoriť pre ňu aj dostatočné podmienky. Určitým základným nosným parametrom pre tento udržateľný rozvoj je mať dostatok kvalifikovanej pracovnej sily, ktorá je schopná pracovať v podmienkach inteligentného priemyslu ako na úrovni priemyselných podnikov, tak aj na úrovni malých a stredných podnikov, ich dodávateľov alebo odberateľov.

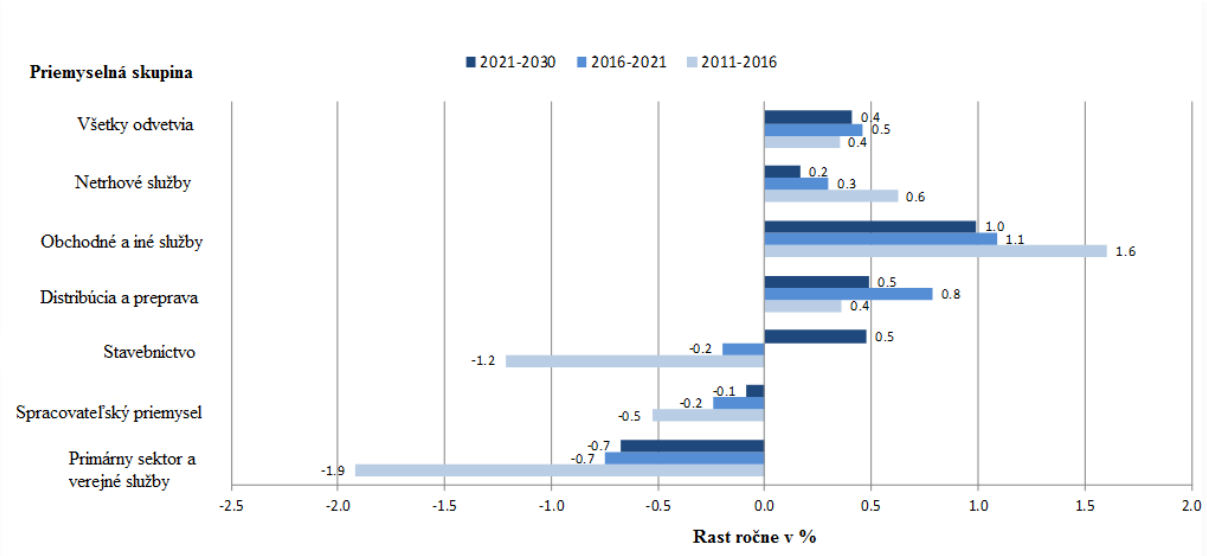
**Tabuľka 1: Prognóza vývoja zamestnanosti SR podľa odvetví hospodárstva (v tisícoch)**

| **Zamestnanosť podľa odvetví (tis.)** | **2014** | **2015** | **2016** | **2020** | **2025** | **2030** |
|---|---|---|---|---|---|---|
| Priemyselná výroba | 550,4 | 598,3 | 610,3 | 552,9 | 514,5 | 515,1 |
| Veľkoobchod a maloobchod | 284,2 | 296,9 | 310,5 | 311,4 | 312,4 | 312,4 |
| Stavebníctvo | 223,3 | 213,6 | 229,4 | 231,5 | 233,5 | 233,3 |
| Verejná správa a obrana | 211,0 | 217,3 | 222,4 | 223,0 | 223,2 | 222,8 |
| Zdravotníctvo a sociálna pomoc | 175,6 | 181,0 | 181,5 | 179,8 | 177,8 | 177,9 |
| Vzdelávanie | 166,9 | 175,2 | 177,0 | 187,6 | 192,9 | 184,1 |
| Ostatné | 752,2 | 741,9 | 761,2 | 757,9 | 754,1 | 759,7 |
| **Hospodárstvo spolu** | 2 363,00 | 2 424,00 | 2 492,10 | 2 444,07 | 2 408,40 | 2 405,08 |

Zdroj: Analýza dopadov digitálnej transformácie na podnikateľov v súkromnom a verejnom sektore (2017)

V predchádzajúcej Tabuľke 1 je možné pozorovať prognózu vývoja zamestnanosti v Slovenskej republike podľa jednotlivých odvetví hospodárstva. Táto štatistika poukazuje predovšetkým na to, aké zmeny môžeme postupne očakávať po transformácií na inteligentný priemysel, ale aj prebiehajúce v najbližších rokoch. Na základe toho je možné poukázať na výrazný pokles pracovných miest v priemyselnej výrobe o vyše 95 tisíc do roku 2030 s porovnaní s rokom 2016. To bude spôsobené predovšetkým postupnou automatizáciou jednotlivých pracovných činností, ku príkladu v automobilovom priemysle. Ohrozená môže byť aj individuálna špecifická výroba a to najmä vďaka 3D tlači. Naproti tomu do roku 2030 môžeme očakávať rast pracovných príležitosti pretovšetkým v oblasti IT a komunikácie (v danej tabuľke ako súčasť ostatných odvetví). Tu sa očakáva nárast o približne o 2 400 nových pracovných pozícií. Ak sa na túto problematiku pozeráme z pohľadu Európskej únie, portál Skills Panorama (Graf 1, 2018) uvádza, že prognóza klesajúcich trendov zamestnanosti v období rokov 2011 – 2016 by sa mala zmierniť vo väčšine sektorov hospodárskej činnosti. Inverzný charakter má mať sektor stavebníctva kde očakávame mierne stúpanie po roku 2020. Vo Francúzsku a na Malte by mal stavebný sektor zaznamenať dokonca najvyšší medziročný rast v rokoch 2016 – 2030 spomedzi všetkých odvetví. Primárny sektor a verejné služby sa budú naďalej zmenšovať, najvýraznejší pokles však očakávame v ťažobnom priemysle, okrem Dánska a Luxemburska kde je očakávaný najvyšší ročný rast. Najvyšší nárast zamestnanosti v členských štátoch Európskej únie bude možný pozorovať predovšetkým v oblasti podnikania a ostatných službách (IT) v obdobiach 2016-2021, ale aj 2021 – 2030.

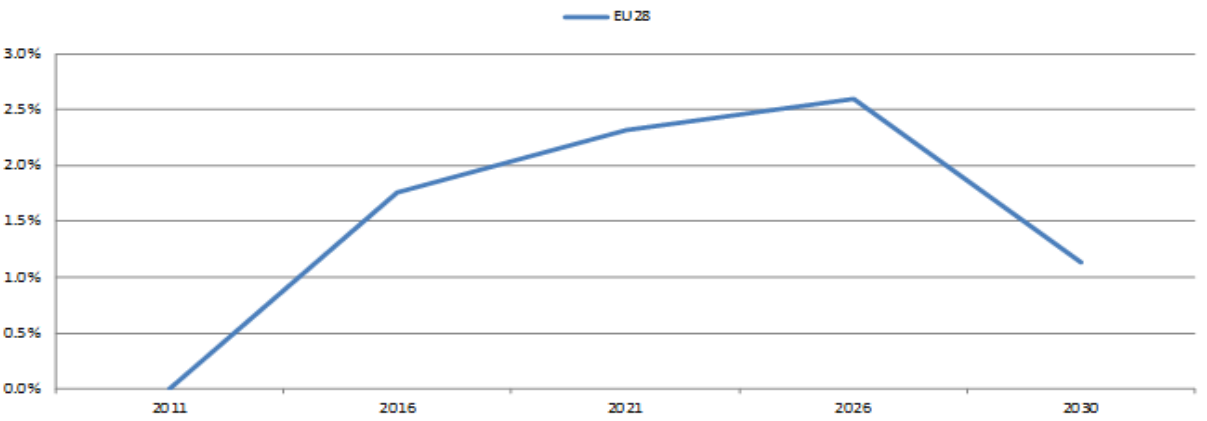
**Graf 1: EU 28 – Rast zamestnanosti podľa odvetvia hospodárskej činnosti**




Zdroj: Vlastný preklad podľa Skills Panorama (2018)

Je možné predpokladať, že úroveň zamestnanosti sa v EÚ podľa Skill Panorama (Graf 2) od roku 2016 ďalej bude zvyšovať. V období 2021 – 2026 sa odhaduje jedna z najvyšších mier nárastu zamestnanosti až o 2,6 %, potom bude nasledovať mierne spomalenie až pokles. To odráža najmä klesajúce demografické trendy v Európe. Členské štáty Európskej únie, od ktorých sa očakáva, že v prognózovanom období zaznamenajú najvyššiu mieru rastu sú Cyprus, Írsko, Luxembursko, Malta a Španielsko.

**Graf 2: EU 28 – Rast zamestnanosti v % (2011-2030)**




Zdroj: Skills Panorama (2018)

## 4. ZÁVER

Z príspevku bolo zistené, že skúsenosti z pracovných pozícií čoraz častejšie siahajú za základné aspekty formálneho vzdelávania. V budúcnosti sa budú musieť zamestnávatelia zamerať na konkrétne zručnosti pre špecifické pracovné pozície. Na dosiahnutie najlepšej stratégie bude potrebné, aby jednotlivé firmy pôsobiace v priemysle 4.0 spolupracovali

efektívne s úradmi práce na rozvoji správneho vyhodnocovania a zamerania sa na správne pracovné skúsenosti potrebné na nové pracovné príležitosti. Takýto prístup bude zároveň vyžadovať aj od útvaru riadenia ľudských zdrojov častejšiu stratégiu rozšíreného hľadania ľudí na pracovné pozície, ktoré sú mimo svojich firiem a preto bude potrebné nájsť lepší spôsob identifikácie potenciálnych talentov na dané pracovné pozície. V príspevku sme poukázali na to, že v Slovenskej republike môžeme očakávať postupnú transformáciu na inteligentný priemysel už v najbližších rokoch. Vychádzajúc z prognózy je možné očakávať výrazný pokles pracovných miest v priemyselnej výrobe do roku 2030. Naproti tomu očakávame rast pracovných príležitostí predovšetkým v oblasti informačných technológií a komunikácie. Z pohľadu Európskej únie prognóza poukazuje na klesajúci trend zamestnanosti v období rokov 2011 – 2016, vo väčšine sektorov hospodárskej činnosti. Inverzný charakter zaznamenávame v stavebníctve, kde je očakávaný mierny nárast po roku 2020. Predovšetkým vo Francúzsku a Malte by mal stavebný sektor zaznamenať najvyšší medziročný rast v rokoch 2016 – 2030 spomedzi ostatných odvetví. Aj z pohľadu Euróspkej únie hovoríme o najvyššom pozorovateľnom náraste v oblasti podnikania a informačných technológiach v obdobiach 2016 – 2021, ale aj 2021 – 2030. Prínosom príspevku je informovať o existencií prognóz zamestnanosti v Slovenskej republike a Európskej únií. Vďaka nim je možné konštatovať určité zmeny v štruktúre, ale aj počte pracovných miest v moderných výrobných procesoch. Avšak tieto zmeny zo sebou prinášajú zánik pracovných miest, ako aj ich vznik. Vďaka tomu je možné konštatovať existenciu perspektívy pre budúcnosť, vznik a vývín pracovných miest v kontexte priemyselnej revolúcie 4.0.

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# INDUSTRY 4.0 AND PROBLEMS OF LABOR MIGRATION

***Alexander KUZNETSOV***[79]
***Yuri ERMAKOV***[80]

**Abstract:** *The article is devoted to the problems arising in connection with the intensification of labor migration processes associated with the formation of Industry 4.0. Globalization and the information revolution, which caused cultural and ethno-confessional diversity, exacerbate the manifestation in the mass consciousness of various prejudices and fears: xenophobia as a reaction to a meeting with a stranger and unknown culture, ethnophobia, migrant phobia, anti-Semitism, which lead to infringement of human rights, nationalism, discrimination and with them intolerance. Such processes change society even deeper than political revolutions. From the family to the state, from corporations to educational institutions, from the altar to the throne, from gender issues to finance - not a single public institution will be left without shocks. The paper cites and analyzes the data obtained in the course of our recent opinion polls. The levels of tolerance are compared with respect to labor migrants of the host community of different microdistricts of Yekaterinburg.*

**Keywords:** *Industry 4.0, labor migrants, host community, tolerance*

**JEL Classification:** *A14, J61, O15*

## 1. INTRODUCTION

In 2018, “Foreign Affairs” No. 3 published an article by Walter Russell Mead a professor of foreign policy and humanities at Bard College, a journalist for The Wall Street Journal, an emeritus professor at the Hudson Institute, “How American Democracy Fails Its Way to Success”. He talks about the benefits that Industry 4.0 technology provides to the average person who will gain access to unique services based on information that is now available only to the very rich. However, he notes: “As Americans struggle to make sense of a series of uncomfortable economic changes and disturbing political developments, a worrying picture emerges: of ineffective politicians, frequent scandals, racial backsliding, polarized and irresponsible news media, populists spouting quack economic remedies, growing suspicion of elites and experts, frightening outbreaks of violence, major job losses, high-profile terrorist attacks, anti-immigrant agitation, declining social mobility, giant corporations dominating the economy, rising inequality, and the appearance of a new class of super-empowered billionaires in finance and technology-heavy industries” [3], [9].

The globalization and digitalization of the economy are causing great shifts in the labor market, changing the nature of employment for many jobs. “Employees are not only forced to change their place of work and even industry during their working lives, but also to raid the "economy of free earnings" by driving passengers in Uber taxis, renting rooms through Airbnb, selling goods on the eBay portal and performing various tasks on the principle of underemployment” [3]. But almost all of these occupations are traditionally associated with labor migrants. This circumstance aggravates the problem of competition in the labor market of visitors and local residents. This is especially true for the largest city in the Ural region of Yekaterinburg, where, as in other megacities of Russia, “a higher percentage of the population with university education is looking for higher wages” [7].

[79]Associate Professor, PhD in Philosophical Sciences, Ural Federal University, Mira Str., 19, Yekaterinburg, 620002, Russia, e-mail: kuznetsov0403@mail.ru
[80] Professor, Doctor in Philosophical Sciences, Ural Federal University, Mira Str., 19, Yekaterinburg, 620002, Russia, e-mail: ermakovurii60@gmail.com

In this regard, there is a need to regulate various aspects of life through the implementation of a policy of tolerance, mutual respect for national and religious values, traditions and beliefs. Indeed, tolerance, in this case, is the only way to live together peacefully. “Are we ready?” - our Polish colleagues ask a question about this [4].

The Concept of State Migration Policy of the Russian Federation for the period until 2025 emphasizes the need to develop conditions for the adaptation and integration of migrants, protect their rights and freedoms, and ensure social security. ”The direct result of the lack of state adaptation and integration programs is the isolation of migrants from the host society and the growing negative attitude towards migrants [8]. To organize integration and adaptation programs it is necessary to involve all interested parties (governments of countries of origin of migrants, migrants themselves, business structures, non-governmental organizations), to fully utilize the potential of the media” [5].

In Russia, programs are being developed and implemented to form attitudes of tolerant behavior. For example, the “Tolerance” program was created in St. Petersburg, the aim of which is “to improve the efforts of the executive bodies of state power of St. Petersburg and civil society of St. Petersburg in the formation and strengthening of a tolerant urban environment based on values in St. Petersburg multinational Russian society, all-Russian civic identity and St. Petersburg socio-cultural identity, creating conditions for successful social integration and cultural-language howling adaptation of migrants” [6].

The effectiveness of these programs depends on the scientific justification of the methods and organizational mechanisms for monitoring public opinion, the development and implementation of a system of curricula and trainings for a wide variety of categories of citizens. The need to develop programs focused on the specific situation prevailing in Yekaterinburg actualizes sociological research on the attitude of the host community to labor migrants.

## 2. PROBLEM FORMULATION AND METHODOLOGY

The problem of competition in the labor market of Yekaterinburg for migrants and local residents has been studied quite well, and there are the latest studies on this topic. It is argued that competition is relatively limited because foreign labor is in demand only in the field of low-skilled menial work [2].

Monitoring of the attitude of residents of the Ural megalopolis to migrants of different nationalities is ongoing; the results of recent opinion polls are published [1]. But labor migrants not only have different countries of origin, but they are also unevenly distributed within a huge metropolis with 1.5 million inhabitants. It seems us interesting to elaborate on the topic and study the peculiarities of the attitude towards labor migrants of residents in various microdistricts of the city. Despite the lack of open sources of official data on the resettlement of labor migrants in the city of Yekaterinburg, microdistricts with a pronounced specificity on this basis can be distinguished.

So the Botanichesky microdistrict is one of the youngest districts of the city, named after the adjacent Botanical Garden of the Ural Branch of the Russian Academy of Sciences. Botanichesky is a bedroom residential neighborhood with modern apartment houses of high comfort. There are practically no industrial and logistics enterprises here. About 60 thousand people live here. There are three comprehensive schools, five kindergartens, which are municipal budgetary institutions. Thus, there are few jobs for migrants and their presence in the microdistrict is noticeably weak.

The formation of the Sortirovka microdistrict is associated with the construction in 1929 of the Sverdlovsk-Sorting railway station. Since the 1960s, mass housing construction has been carried out here with 5-story buildings, since the 1980s, 9-16-story buildings have been built. It is uncomfortable, cramped and cheap blocks of flats. Its population today is about 90 thousand people. The microdistrict houses the most important logistics centers and a large clothing market. These are traditional places of migrant employment, so their concentration here is maximal.

In order to find out whether the local population of Yekaterinburg is tolerant of labor migrants, we conducted a study from November 6 to 17, 2018, in two districts of the city of Yekaterinburg. The survey was conducted using a standardized interview technique by students who had practice in the laboratory of sociological and political science studies of the Ural Federal University. Respondents were determined by random sampling, the sample size was 350 people. Next, questionnaires were selected for respondents permanently residing in the micro-districts of interest to us. In total, 100 people were selected for each microdistrict according to related parameters (gender, age, level of education). The study is devoted to the problem of cohabitation of indigenous people and foreign labor migrants. It made it possible to identify in which situations the host population is ready to interact with foreigners who come to work, what character traits and behavioral features are considered to be most characteristic of them, and whether local residents feel threat emanating from them.

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

The main indicator of tolerant attitude towards migrants, we consider the willingness to interact with them in situations involving a different degree of proximity. The expression of readiness “to support when representatives of my people unjustly criticize”, we defined as the farthest of the proposed interaction distances, and “readiness to rent out an apartment” as the closest. We defined intermediate interaction distances as “readiness to hire”, and relatively closer as “readiness to work together”. We calculated the tolerance index and ranked these situations. The index is calculated using the weighted arithmetic average formula, where 2 is “absolutely ready” to interact, and -2 is “not at all ready”.

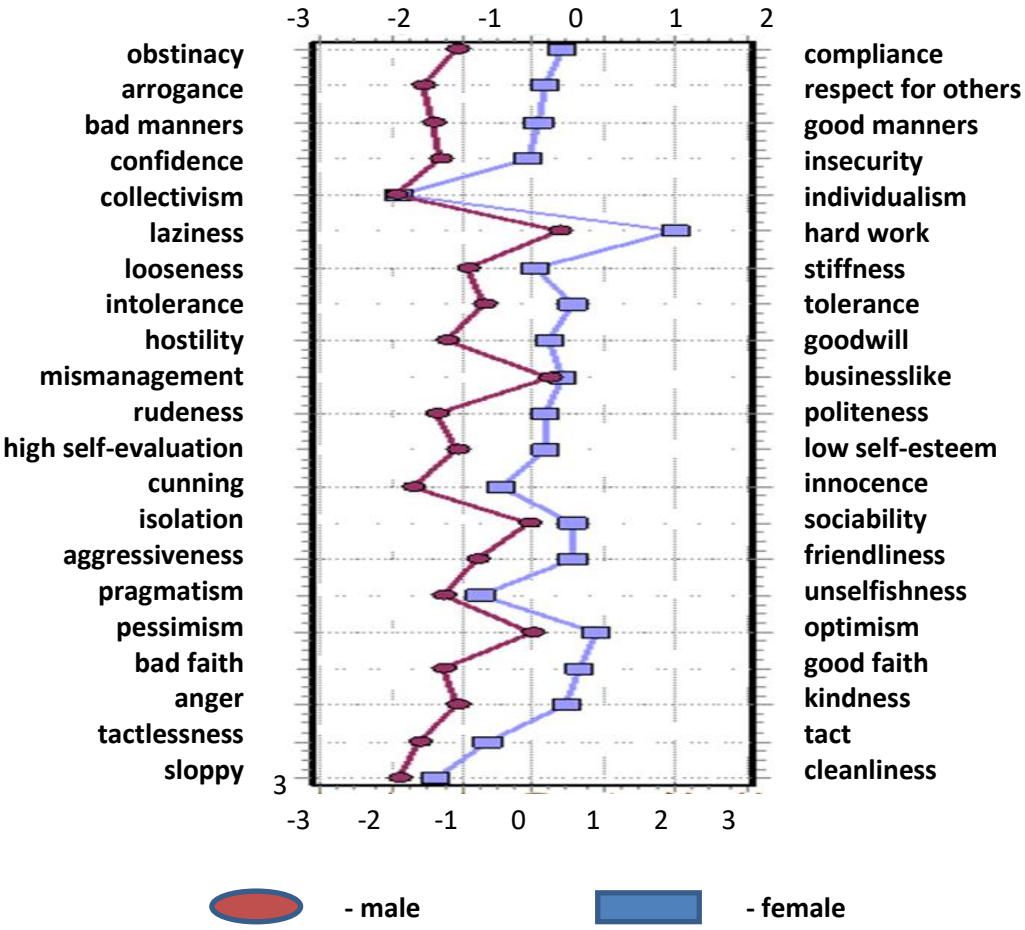
So in the course of our study, it turned out that to a greater extent the residents of Yekaterinburg are ready to interact with migrants from a distance, that is, "to support when representatives of my people criticize unjustly." For this option, the index is 0.43. Also, respondents are more likely to hire a labor migrant, which is significantly higher than their readiness to work together (0.39 and 0.01, respectively). But residents of Yekaterinburg are more likely not ready to lease an apartment to representatives of this social category (-1.01).

**Table 1. Distribution of willingness to interact**

| | Readiness to support (%) | Readiness to hire (%) | Readiness to work together (%) | Readiness to rent an apartment (%) |
|---|---|---|---|---|
| Absolutely ready | 56 (28,00) | 40 (20,00) | 23 (11,50) | 14 (7,00) |
| Rather ready | 72 (36,00) | 84 (42,00) | 84 (42,00) | 27 (13,50) |
| Rather not ready | 46 (23,00) | 65 (32,50) | 57 (28,50) | 61 (30,50) |
| Not at all ready | 26 (13,00) | 11 (5,50) | 36 (18,00) | 98 (49,00) |
| Total | 200 (100,00) | 200 (100,00) | 200 (100,00) | 200 (100,00) |
| Index | 0,43 | 0,39 | 0,01 | -1,01 |
| Rank | I | II | III | IV |

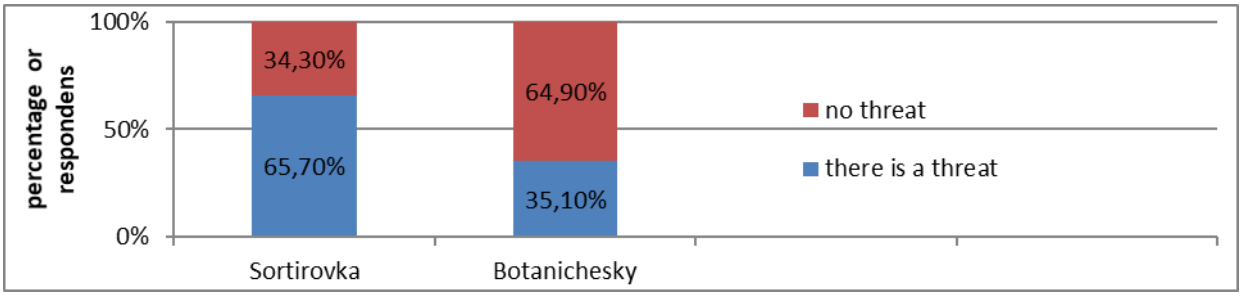
Further, the respondents were offered a series consisting of pairs of opposite personal and behavioral characteristics, which in their opinion are inherent in migrants. When assessing these characteristics of labor migrants, the opinions of female and male differ, but in both groups there is a clear shift towards negative characteristics. Among the negative, there are collectivism, cunning and sloppiness (collectivism in this case, we interpreted as the suppression of the personality of the individual). Hard work was called a clear positive quality, as well as optimism (especially in the female group).

**Figure 1: Personality traits attributed to migrants**




According to our assumption, the residents of Botanichesky and Sortirovka differently relate to labor migrants, namely, residents of Sortirovka, a microdistrict with a higher density of migrants, consider them a factor of destabilization.

**Figure 2: Dependence of the perception of migrants as a factor of destabilization on the area of residence**




As a result of processing the survey data, we obtained the following distribution – 65.70% of the residents of Sortirovka and only 35.10% of the inhabitants of the microdistrict Botanichesky perceive migrants as a threat to themselves. The Cramer pair correlation coefficient is 0.3 with a probability of error of 0.07, which indicates the existence of a strong relationship between the variables. Therefore, our hypothesis was confirmed - the microdistrict of residence affects the perception of local labor migrants as a factor in destabilizing the social environment. The average value of this indicator for two microdistricts – 54.10% is probably close to the average for Yekaterinburg as a whole. But we see how much the picture changes with the regionalization of this indicator.

## 4. CONCLUSION

Thus, the submitted work contributes to developing studies of problems arising in connection with the intensification of labor migration processes associated with Industry 4.0. The obtained results expand the empirical base of research into the problem of tolerant attitude of the host community to labor migrants.

In the collective representations of the residents of Yekaterinburg, the reproduction of negative stereotypes is recorded: migrants do not inspire confidence among the majority of respondents and are perceived by half of the respondents as a destabilizing factor. Most of the respondents are not ready for close contacts with foreign labor migrants; they feel discomfort from the neighborhood, living with them in the same city. The main reasons are fears for their own safety and family, as well as inappropriate behavior. These attitudes are especially pronounced in areas of compact residence of labor migrants.

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# ZEFEKTÍVNENIE PROCESU VZDELÁVANIA A HODNOTENIA ODBORNEJ SPÔSOBILOSTI ZAMESTNANCOV SÚKROMNÝCH BEZPEČNOSTNÝCH SLUŽIEB

# STREAMLINING PROFESSIONAL QUALIFICATION ASSESSMENT PROCESS FOR PRIVATE SECURITY EMPLOYEES

***Patrik LAHUTA*** [81]
***Mária HUDÁKOVÁ*** [82]

**Abstrakt:** *Koncepcia Industry 4.0 v súčasnosti predstavuje celospoločenskú zmenu, v oblasti priemyslu, technickej štandardizácie, bezpečnosti, vzdelávania, právneho rámca, výskumu, špecializácie pracovníkov a mnohých ďalších oblastí. Ide o zmenu v oblasti technológií, procesov v rôznych oblastiach či už je to výrobný podnik alebo podnik služieb. Bolo preukázané, že vplyvom Industry 4.0 dokázali zahraničné spoločnosti zvýšiť kvalitu vzdelania aj v oblasti odbornej spôsobilosti zamestnancov vykonávajúcich fyzickú ochranu a pátranie. Majitelia súkromných bezpečnostných služieb na území Slovenskej republiky v súčasnosti vnímajú potrebu zefektívniť proces vzdelávania a hodnotenia (skúšky) odbornej spôsobilosti pre osoby vykonávajúce fyzickú ochranu a pátranie. V súčasnosti je realizovaný proces preverovania odbornej spôsobilosti iba v teoretickej rovine na základe testov. Z toho vyplýva, že je potrebné doplniť tento proces vzdelávania a hodnotenia o praktickú časť t. j. o simuláciu z reálnych situácií, v ktorej by bolo vhodne preveriť zamestnanca aj z pohľadu pripravenosti na podmienky implementácie koncepcie Industry 4.0.* ***Hlavným cieľom*** *článku je navrhnúť model zefektívnenia procesu vzdelávania a hodnotenia (skúšky) odbornej spôsobilosti osôb vykonávajúcich fyzickú ochranu a pátranie zahrňujúci nielen teoretické preskúšanie vedomosti, ale aj preverenie praktických zručnosti formou simulácii z reálnych situácii. Takáto forma poskytuje príležitosť preveriť správanie, ktoré je požadované pri výkone práce ako aj pri implementovaní prvkov koncepcie Industry 4.0 v praxi. Východiskom navrhovaného modelu je spracovaná analýza z praktických skúsenosti majiteľov domácich a zahraničných súkromných bezpečnostných služieb, ako aj analýza procesu hodnotenia odbornej spôsobilosti osôb vykonávajúcich fyzickú ochranu a pátranie v zahraničí. Spracované výsledky sú prínosom pre majiteľov súkromných bezpečnostných služieb na území Slovenskej republiky, aby dosiahli vyššiu kvalifikačnú úroveň a odbornú spôsobilosť svojich zamestnancov, ktorí budú pripravení na podmienky vyplývajúce z implementácie koncepcie Industry 4.0.*

**Kľúčové slová:** *hodnotenie, odborná spôsobilosť, bezpečnosť, Súkromné bezpečnostné služby, Industry 4.0*

**Abstract:** *The Industry 4.0 concept in recent years of societal change in the industry, technical standardization, security, education, legal framework, research, staff specialization and many other areas. It is a change in technology, processes in different areas, be it a manufacturing or service business. It has been proven that by the influence of Industry 4.0 foreign companies have been able to improve the quality of education also in the area of professional competence of employees performing physical protection and search. Owners of private security services on the territory of the Slovak Republic currently perceive the need to streamline the process of assessment (tests) of professional competence for persons performing physical protection and search. At present, the process of verification of professional competence is carried out only on the theoretical level based on tests. This implies that this evaluation process needs to be complemented by a practical part t. j. o simulation from real situations in which it would be appropriate to verify the employee also in terms of readiness for the conditions of implementation of the Industry 4.0 concept.* ***The main aim*** *of the article is to*

[81] Ing., Katedra krízového manažmentu Fakulty bezpečnostného inžinierstva na Žilinskej univerzite v Žiline, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: patrik.lahuta@fbi.uniza.sk
[82] Doc. Ing. PhD., Katedra krízového manažmentu Fakulty bezpečnostného inžinierstva na Žilinskej univerzite v Žiline, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: maria.hudakova@fbi.uniza.sk

*propose a model of the streamling the process of education and assessment (examination) of professional competence of persons performing physical protection and search including not only theoretical examination of knowledge but also verification of practical skills in the form of simulations from real situations. Such a form provides an opportunity to test the behaviour that is required in the performance of work as well as in implementing the elements of the Industry 4.0 concept in practice. The proposed model is based on an analysis of the practical experience of the owners of domestic and foreign private security services, as well as an analysis of the process of assessing the professional competence of persons performing physical protection and search abroad. The results are beneficial for the owners of private security services in the territory of the Slovak Republic to achieve a higher qualification level and professional competence of their employees who will be prepared for the conditions resulting from the implementation of the Industry 4.0 concept.*

**Keywords:** assessment, professional qualification, security, private security services, Industry 4.0

**JEL Classification:** *M55, I20, H89, I21*

## 1. ÚVOD

Podnikateľská činnosť v oblasti súkromných bezpečnostných služieb na území Slovenskej republiky obsahuje rôzne špecifiká (Buganová, Lusková, 2014). Táto oblasť podnikania je pre majiteľov a prevádzkovateľov náročnejšia, pretože okrem základných náležitostí pre podnikanie, musia byť bezúhonný, spĺňať zdravotnú a odbornú spôsobilosť. Všetky špecifiká, ktoré musia prevádzkovatelia súkromných bezpečnostných služieb spĺňať sú obsiahnuté v zákone o súkromných bezpečnostných službách č. 473/2005 Z.z. Tento zákon poskytuje informácie v oblasti bezpečnostných služieb, od základných ustanovení až po účinnosť zákona (Zvaková, 2018). Rôzne zmeny v podnikateľskom prostredí, v bezpečnostných službách ako aj vplyvy implementácie koncepcie Industry 4.0 vytvárajú potrebu zefektívnenia prípravy odbornej spôsobilosti u zamestnancov vykonávajúcich fyzickú ochranu a pátranie.

Súčasný stav vykonávania fyzickej ochrany a pátrania na území Slovenskej republiky sa vykonáva podľa určitých pravidiel, noriem a zákonov. Pre odbornú spôsobilosť vykonávať fyzickú ochranu a pátranie je potrebné získať preukaz typu S. Medzi základné požiadavky na získanie tohto preukazu podľa zákona č. 473/2005 Z.z. patria: absolvovanie vzdelávania odbornej spôsobilosti s vykonaním príslušnej skúšky, dosiahnutie veku 18 rokov, spôsobilosť na právne úkony v plnom rozsahu, bezúhonnosť, spoľahlivosť a zdravotná spôsobilosť.

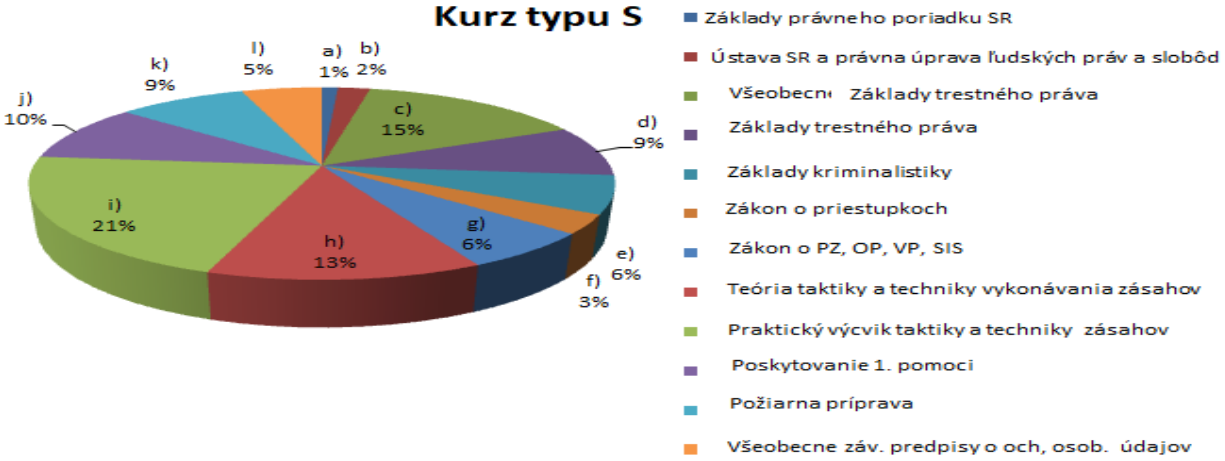
Vzdelávanie odbornej spôsobilosti sa v podmienkach Slovenskej republiky vykonáva najčastejšie formou *kurzov* a absolvovaním *skúšky* so získaním príslušného certifikátu (Kurzy a poradenstvo, 2018). *Kurz odbornej spôsobilosti* podľa zákona č. 473/2005 Z.z. by mal obsahovať nasledujúce základné oblasti vzdelávania, z ktorých uchádzač získa vedomosti (Zákony pre ľudí, 2018; Hofreiter, 2004):

a) základy právneho poriadku Slovenskej republiky, 1 hod.,
b) ústava Slovenskej republiky a právna úprava ľudských práv a slobôd, 2 hod.,
c) všeobecne záväzné právne predpisy týkajúce sa poskytovania služieb v oblasti súkromnej bezpečnosti, 14 hod.,
d) základy trestného práva, 8 hod.,
e) základy kriminalistiky, 6 hod.,
f) zákon o priestupkoch, 3 hod.,
g) zákon o Policajnom zbore, zákon o obecnej polícii, zákon o Vojenskej polícii a zákon o Slovenskej informačnej službe, 6 hod.,
h) teória taktiky a techniky vykonávania zásahov a riešenie krízových situácií, 8 hodín,

i) praktický výcvik taktiky a techniky vykonávania zásahov a riešenie krízových situácií, 12 hod.,
j) poskytovanie prvej pomoci, 8 hod.,
k) požiarna príprava, 5 hod.,
l) všeobecne záväzné právne predpisy týkajúce sa ochrany osobných údajov, 5 hod.

Pre úspešné zvládnutie kurzu odbornej prípravy je potrebné podľa vyhlášky Ministerstva vnútra SR absolvovať určitý počet hodín v jednotlivých oblastiach vzdelávania, obr. 1.

**Obr. 1 Percentuálne rozdelenie hodín oblasti vzdelávania pre kurzu S**




Zdroj: Vlastné spracovanie podľa vyhlášky Ministerstva vnútra Slovenskej republiky č.634/2005 Z.z. z 5. Decembra 2005.

*Skúška odbornej spôsobilosti* pre uchádzačov podľa zákona č. 473/2005 Z.z. pozostáva z dvoch častí (Zákony pre ľudí, 2018; Kočan, Selinger, 2013):

1. *Písomná časť realizovaná formou testu*. Test pozostáva z 24 otázok a každá otázka má tri odpovede, z ktorých je len jedna správna. Na úspešné zvládnutie testu je potrebné, aby uchádzač získal 80 % bodov z celkového počtu bodov. Test trvá 40 min., súčasťou ktorého je aj vyplnenie osobných údajov.
2. *Ústna časť realizovaná formou odpovedí.* Táto časť pozostáva z dvoch otázok, ktoré si uchádzač môže vybrať, t.j. jednu otázku si vyberá z oblasti súkromných bezpečnostných služieb a druhú z jedného zo štyroch predmetov:
   - Trestný zákon.
   - Trestný poriadok.
   - Kriminalistika.
   - Priestupkový zákon.

Podľa názorov mnohých prevádzkovateľov súkromných bezpečnostných služieb má skúška odbornej spôsobilosti veľa nedostatkov, ktoré by sa mohli eliminovať. Kurz odbornej spôsobilosti v zahraničných krajinách je praktickejší a uchádzačov o preukaz typu S, efektívnejšie pripraví na samotný výkon (Ivančo a kol., 2018; Hofreiter, 2016; Súkromná bezpečnostná služba, 2018). Podľa praktických skúsenosti prevádzkovateľov súkromných bezpečnostných služieb na Slovensku a v porovnaní so zahraničnými krajinami je možné uviesť nedostatky spojené s vykonávaním vzdelávania v odbornej príprave na fyzickú ochranu a pátranie (Zákon č. 473/2005):

1. Absencia praktických ukážok.
2. Neefektívne rozdelenie počtu hodín jednotlivým oblastiam vzdelávania.
3. Zjednodušená forma písomnej časti skúšky.

Na základe praktických skúsenosti a poznatkov majiteľov prevádzkujúcich súkromné bezpečnostné služby, alebo zamestnancov priamo vykonávajúcich fyzickú ochranu alebo pátranie je možné konštatovať, že kurz odbornej prípravy a skúška odbornej spôsobilosti sú na veľmi teoretickej úrovni (Veľas a kol, 2017). Najvýznamnejším nedostatkom je absencia praktických ukážok jednotlivých situácií, používania prístrojov, na kurze odbornej spôsobilosti. Z toho vyplýva nedostatočná pripravenosť na zvládnutie určitých praktických situácií u nových zamestnancov SBS služieb. Ďalším problémom je neefektívne rozdelenie počtu hodín jednotlivým oblastiam vzdelávania v kurze odbornej spôsobilosti. Podľa odborníkov z praxe je potrebné niektorým oblastiam vzdelávania venovať dlhší čas výučby a iných zase kratší (Zvaková, Ivančo, 2018). Tretí závažný nedostatok vidia odborníci z praxe v zjednodušenej forme písomnej časti realizovanou pomocou testov. Odpovede na jednotlivé otázky ponúkajú iba tri možnosti, pri ktorý je veľmi jednoduché zvoliť správnu odpoveď (Vyhláška č. 634/2005).

## 2. CIEĽ A METODOLÓGIA

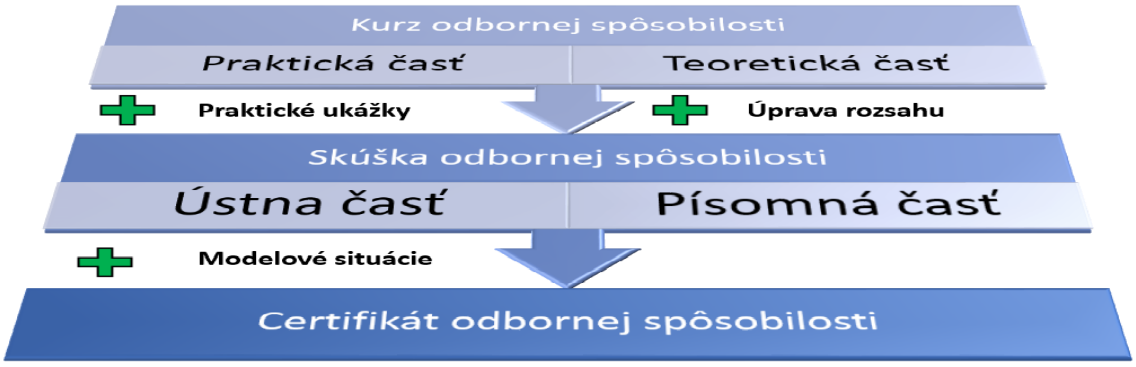
*Cieľom článku* je navrhnúť zefektívnenie procesu vzdelávania a hodnotenia (skúšky) odbornej spôsobilosti osôb vykonávajúcich fyzickú ochranu a pátranie zahrňujúci nielen teoretické preskúšanie vedomosti, ale aj preverenie praktických zručnosti formou simulácii z reálnych situácii. Takáto forma poskytuje príležitosť preveriť správanie, ktoré je požadované pri výkone práce ako aj pri implementovaní prvkov koncepcie Industry 4.0 v praxi.

Na splnenie stanoveného cieľa boli použité vedecké metódy ako je východisková analýza a dedukcia. Východisková analýza bola použitá v procese poznávania súčasného stavu a riešenia rôznych problémov skúmanej problematiky. Pozostávala z analýzy poznatkov z odbornej domácej a zahraničnej literatúry, vedeckých článkov, z praktických skúsenosti a poznatkov majiteľov prevádzkujúcich súkromné bezpečnostné služby na území Slovenskej republiky, zahraničných súkromných bezpečnostných služieb, členov Slovenskej komory súkromnej bezpečnosti a zamestnancov priamo vykonávajúcich fyzickú ochranu alebo pátranie. Metóda dedukcie bola použitá na tvorbu zefektívnenia procesu vzdelávania a hodnotenia (skúšky) odbornej spôsobilosti osôb vykonávajúcich fyzickú ochranu a pátranie.

## 3. VÝSLEDKY

Na základe predchádzajúcich zistení bol spracovaný návrh zefektívnenia procesu vzdelávania a hodnotenia odbornej spôsobilosti osôb vykonávajúcich fyzickú ochranu a pátranie.

**Obr. 2** Návrh zefektívnenia procesu vzdelávania a hodnotenia odbornej spôsobilosti osôb




Zdroj: Vlastné spracovanie.2018

Navrhnutý proces pozostáva z troch časti:

1. Vzdelávanie odbornej spôsobilosti - prvá časť pozostáva z úpravy absolvovaných hodín v jednotlivých oblastiach vzdelávania z dôvodu precvičenia modelových situácii, ktoré môžu nastať pri výkone práce.
2. Praktické ukážky vo vzdelávaní - druhá časť je postavená na vytvorení databázy všetkých oblastí vzdelávania a prostriedkov, ktoré sa používajú pri výkone služby a vytvorením videozáznamov na používanie jednotlivých prostriedkov.
3. Modelové situácie - tretia časť je orientovaná na doplnenie praktickej skúšky odbornej spôsobilosti pomocou modelových situácií.

## 1. Vzdelávanie odbornej spôsobilosti

Na základe praktických skúsenosti a poznatkov manažérov prevádzkujúcimi súkromné bezpečnostné služby, členov Slovenskej komory súkromnej bezpečnosti a zamestnancov priamo vykonávajúcich fyzickú ochranu alebo pátranie je potrebné upraviť hodiny v jednotlivých oblastiach vzdelávania v kurze odbornej spôsobilosti typu S. Navrhované prerozdelenie hodín je hlavne z dôvodu detailnejšieho vysvetlenia všetkých modelových situácií v praxi a ostatných náležitosti, ktoré môžu nastať vo výkone služby. Ide hlavne o tieto oblasti vzdelávania, ktorým sa navýši počet vyučujúcich hodín, tab. 1.:

- Teória taktiky a techniky vykonávania zásahov a riešenie krízových situácií = 4 hod.
- Praktický výcvik taktiky a techniky zásahov a riešenie krízových situácií = 8 hod.
- poskytovanie prvej pomoci = 2 hod.
- požiarna príprava = 3 hod.

**Tab. 1: Návrh prerozdelenia hodín v jednotlivých oblastiach vzdelávania**

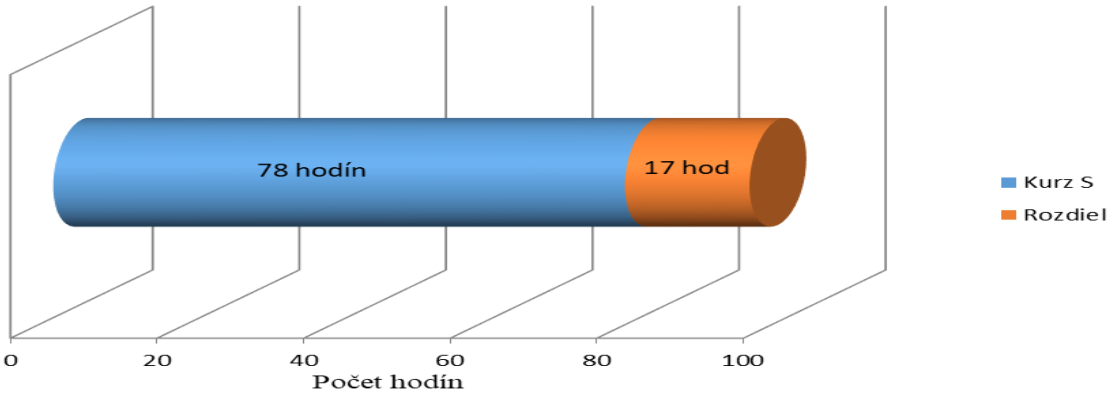
| **Kurz typu S** | |
|---|---|
| Predmet | Hodiny |
| Základy právneho poriadku Slovenskej republiky | 1 |
| Ústava Slovenskej republiky a právna úprava ľudských práv a slobôd | 2 |
| všeobecne záv. právne predpisy týkajúce sa poskytovania služieb v oblasti súkromnej bezp. | 14 |
| základy trestného práva | 8 |
| základy kriminalistiky | 6 |
| zákon o priestupkoch, | 3 |
| zákon o PZ , zákon o obecnej polícii, zákon o Vojenskej polícii a zákon o SIS | 6 |
| teória taktiky a techniky vykonávania zásahov a riešenie krízových situácií | 12 |
| praktický výcvik taktiky a techniky vykonávania zásahov a riešenie krízových situácií | 20 |
| poskytovanie prvej pomoci, | 10 |
| požiarna príprava, | 8 |
| všeobecne záväzné právne predpisy týkajúce sa ochrany osobných údajov. | 5 |
| **Spolu** | **95** |

Zdroj: Vlastné spracovanie.2018

Súčasný kurz vzdelávania zahŕňa 78 hodín a po navrhovanej úprave zahŕňa až 95 hodín. Išlo by o navýšenie tým oblastiam vzdelávania, pri ktorých dochádza k praktickým ukážkam formou videozáznamu a rôznym simuláciám. Praktický výcvik taktiky a techniky

vykonávania zásahov a riešenie krízových situácií bude obohatený až o 8 hodín výcviku. Celkovo sa kurz predĺži o 17 hodín t.j. o 21,8 %, obr. 2.

**Obr. 3: Návrh navýšenia hodín v kurze vzdelávania odbornej spôsobilosti**




Zdroj: Vlastné spracovanie.2018

## 2. Praktické ukážky vo vzdelávaní

Na základe databázy prostriedkov a prístrojov je potrebné vytvoriť videozáznamy, ktoré budú slúžiť ako manuál na zaobchádzanie s jednotlivými prostriedkami. Je potrebné vytvoriť dokumentáciu a príslušnými videozáznamami v trvaní okolo dvoch minút. V tejto časti bude kladený dôraz na popis prostriedku, t. j. či ide o obranný, alebo útočný prostriedok, o jeho funkciu a spôsob zaobchádzania s týmto prostriedkom, tab. 2.

**Tab. 2: Návrh dokumentácie jednotlivých prostriedkov**

| Dokumentácia jednotlivých prostriedkov | | | | |
|---|---|---|---|---|
| **Vecné bezpečnostné prostriedky** | | | | |
| **Č. prostriedku** | **Č. videa** | **Názov prostriedku** | **Kategorizácia prostriedku** | **Dĺžka vid.** |
| O11 | 1 | Taktická vesta | obranné prostriedky | 1:46 |
| O12 | 2 | Nepriestrelná vesta | obranné prostriedky | 1:32 |
| O13 | 3 | Plynový sprej | obranné prostriedky | 1:25 |
| O14 | 4 | Paralyzér | obranné prostriedky | 1:16 |
| **Zbrane** | | | | |
| Z11 | 5 | Nôž | Chladné zbrane | 2:02 |
| Z12 | 6 | Dýka | Chladné zbrane | 1:38 |
| Z21 | 7 | Teleskopický obušok | Úderné zbrane | 2:32 |
| Z22 | 8 | Tonfa | Úderné zbrane | 1:48 |
| Z31 | 9 | Kuša | Mechanické zbrane | 1:50 |
| Z41 | 10 | Plynová pištoľ | Plynové zbrane | 2:05 |
| Z42 | 11 | Vetrovka | Plynové zbrane | 1:59 |
| Z51 | 12 | Glock 17 | Palné zbrane | 2:18 |
| Z52 | 13 | Glock 19 | Palné zbrane | 2:16 |
| **Prostriedky spojenia** | | | | |
| S11 | 14 | Profesionalne DPMR | Vyslielačky | 1:42 |
| S12 | 15 | Vys. CB do auta | Vyslielačky | 1:35 |
| P11 | 16 | Mobilné CB antény | Príslušnestvo | 2:35 |
| P12 | 17 | zosilňovač GSM sygnálu | Príslušnestvo | 2:02 |
| **Písomnosti** | | | | |
| E11 | 18 | Evidencia zásahov | Evidencie | 1:26 |
| E12 | 19 | Ev. inšpekčnej knihy dozoru | Evidencie | 1:58 |
| E13 | 20 | Ev. osôb poverených výkonom fyz. ochrany | Evidencie | 1:45 |
| E14 | 21 | Evidencia služieb podľa zásahu | Evidencie | 2:02 |

Zdroj: Vlastné spracovanie podľa CIGÁNIK,Ľ., SELINGER,P. Náuka o zbraniach a strelive. 2002, s.169

V dokumente je potrebné uviesť popis a číslo prostriedku, ale aj číslo videa, pomocou ktoré bude možné nazrieť k jednotlivým aspektom prostriedku. Všetky prostriedky budú rozdelené do skupín, pre ľahšiu manipuláciu s hľadaním jednotlivých prostriedkov. Tieto dokumenty budú obsahovať knihy, zákony a vyhlášky, s ktorými prichádzajú do kontaktu osoby vykonávajúce fyzickú ochranu a pátranie. Je potrebné neustále zabezpečiť aktualizáciu novo prijatých zákonov a vyhlášok Ministerstva vnútra Slovenskej republiky.

Následne je možné vytvoriť aplikáciu, ktorú si bude môcť stiahnuť osoba, ktorá vlastní preukaz odbornej spôsobilosti. Uchádzači o preukaz odbornej spôsobilosti by mali zdieľaný prístup do databázy, kde by si mohli pozrieť jednotlivé videá. Aplikácia bude nestále doplnená o novo pridané prostriedky a ostatné náležitosti podľa zákona a vyhlášok.

## 3. Modelové situácie

Cieľom tejto časti skúšky je overiť, či je uchádzač schopný uplatniť teoretické znalosti v praxi, správne konať a vyriešiť zadanie konkrétnej situácie. Je potrebné, aby komisia vyžadovala od uchádzača názorne predvedenie riešenia s použitím teoretických poznatkov a s príslušnými bezpečnostnými prostriedkami a so zhodnotením právnej podstaty jeho činnosti.

V tejto časti skúšky budú realizované modelové situácie s piatimi prvkami, ktoré si musí uchádzač vymenovať a zdôvodniť. Každá modelová situácia bude hodnotená 1 bodom, ktorý bude predstavovať 100 % odpovede. Každý prvok bude hodnotený zlomkom bodov. Napríklad ak sa bude v modelovej situácií nachádzať 5 prvkov, tak každý prvok bude hodnotený 1/5 bodu. To sa následne prepočíta na percentá, a určí na koľko percent uchádzač odpovedal na danú modelovú situáciu.

Jednotlivé otázky budú rozdelené do troch skupín, podľa náročnosti modelových situácií podľa závažnosti v praxi. To znamená, koľko jednotlivých krokov, musí osoba vykonávajúca fyzickú ochranu a pátranie vykonať v danej situácií, o závažnosti priestupkov, či došlo k ublíženiu na zdraví iným osobám aké prostriedky treba použiť a podobne. Modelové situácie je potrebné rozdeliť do troch skupín a to skupiny: A1, A2, A3. Uchádzač si vyberie tri typové situácie, vždy jednu zo skupiny A1, jednu zo skupiny A2 a jednu zo skupiny A3. Týmto spôsobom sa overí celý rozsah kompetencií stanovených hodnotiacim štandardom. Príklad zadania modelovej situácie skupiny A1:

*Pri obchôdzke objektu, kde sa nikto už nemá vyskytovať, ste objavil neznámu osobu, ktorá leží bez známok vedomia pri rozvodni elektrickej energie, ktorá iskrí. Zhodnoťte situáciu a popíšte svoju činnosť. Dôležité prvky Vašej činnosti názorné predveďte a použite vhodné prostriedky. Popíšte a ukážte spôsob overovania životných funkcií a postup obnovenia základných životných funkcií pri úraze elektrickým prúdom. Privolajte telefónom zdravotnícku záchrannú službu a uvedomte ďalšie príslušné osoby.*

## 4. ZÁVER

Prínosom príspevku je návrh zefektívnenia procesu vzdelávania a hodnotenia (skúšky) odbornej spôsobilosti osôb vykonávajúcich fyzickú ochranu a pátranie zahrňujúci nielen teoretické preskúšanie vedomosti, ale aj preverenie praktických zručnosti formou simulácii z reálnych situácii. Takáto forma poskytuje príležitosť preveriť správanie, ktoré je požadované pri výkone práce ako aj pri implementovaní prvkov koncepcie Industry 4.0 v praxi. Spracované výsledky sú prínosom pre majiteľov súkromných bezpečnostných služieb na území Slovenskej republiky, aby dosiahli vyššiu kvalifikačnú úroveň a odbornú spôsobilosť svojich zamestnancov, ktorí budú pripravení na podmienky vyplývajúce z implementácie koncepcie Industry 4.0.

***Dodatok***

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# VPLYV ĽUDSKÉHO FAKTORA NA IMPLEMENTÁCIU PROJEKTOV KONCEPCIE INDUSTRY 4.0 VO VÝROBNÝCH PODNIKOCH

# THE IMPACT OF HUMAN FACTOR ON PROJECTS OF IMPLEMENTATION CONCEPT INDUSTRY 4.0 IN MANUFACTURING ENTERPRISES

***Matej MASÁR*[83]**
***Mária HUDÁKOVÁ*[84]**

**Abstrakt:** *Majitelia a manažéri v podnikoch v súčasnosti vnímajú potrebu implementácie prvkov Industry 4.0. Samotná implementácia koncepcie zvyčajne prebieha formou projektov, pri ktorej sa vyskytujú určite obmedzenia. Z pohľadu teoretických východísk v domácich a zahraničných vedeckých zdrojov ako aj praktických skúseností projektových manažérov v podniku vyplýva, že najčastejším zdrojom rizík pri riadení projektov je zlyhanie ľudského faktora. V súvislosti s úspešnou realizáciou projektov je veľmi dôležité včas, ešte v prípravnej fáze projektu, posúdiť vplyv ľudského faktora, ktorý môže kedykoľvek zlyhať a ohroziť realizáciu projektu. Je potrebné, aby projektoví manažéri disponovali potrebnou kvalifikačnou úrovňou, s príslušnými skúsenostiam, znalosťami a samotnou emočnou inteligenciou.* ***Hlavným cieľom článku*** *je navrhnúť proces manažmentu rizík v iniciačnej fáze riadenia projektu, použiteľný pri implementácii koncepcie Industry 4.0 vo výrobných podnikoch. Navrhnutý proces vychádza zo skúseností autorov článku pri jeho implementácii vo výrobných podnikoch na Slovensku, ako aj ďalších odborníkov z praxe, ktorí sa venujú uvedenej problematike. Spracované výsledky sú určené pre projektových manažérov v podnikoch, aby si uvedomili význam v aplikácii manažmentu rizík projektov. Prispievajú k presnejšiemu definovaniu úloh projektových manažérov ešte v iniciačnej fáze riadenia projektu. Zvýrazňujú väčšiu potrebu prepojenia manažmentu rizík s projektovým manažmentom a väčšiu pozornosť hodnoteniu ľudského faktora pri riadení projektov. Efektívna aplikácia manažmentu rizík projektov dopĺňa a zvyšuje možnosti úspešného dokončenia projektu v správnom čase, so správnymi nákladmi a v správnej kvalite výstupov projektu.*

***Kľúčové slová:*** *Manažment rizík, ľudský faktor, Industry 4.0, výrobný podnik*

**Abstract:** *Managers and owners of enterprises feel the need to implement concept of Industry 4.0 into their enterprises nowadays. Managers and owners implement concept as project in their enterprises often. Based on theoretical background, several authors and practical skills of project managers is the most risk source human factor. It is very important to assess influent of human factor in initiation project phase. It is necessary to involve knowledge, skills, communication and emotional intelligence in the process of implementation concept Industry 4.0 in manufacturing enterprises.* ***The main aim of this paper*** *is to establish proposed process of risk management, which may be used in projects of implementation concept Industry 4.0 in manufacturing enterprises in initiation project phase. Process will be established based on skills of authors with implementation this concept in manufacturing enterprises in Slovakia. Results are suited for project managers, who should mind importance of project risk management application. Results assist to the effective defined roles, improve interlinking project management and risk management and improve assess human factor in initiation project phase. Effectiveness of risk management application in project management may improve project realisation and fulfill project goals.*

***Keywords:*** *Enterprise risk management, Human factor, Industry 4.0, manufacturing enterprise*

**JEL Classification:** *L64, M11, J50, M54*

[83] Ing., Žilinská univerzita v Žiline, Fakulta bezpečnostného inžinierstva, katedra krízového manažmentu, Univerzitá 8215/1, 010 01 Žilina, Slovensko, e-mail: matej.masar@fbi.uniza.sk
[84] doc. Ing. PhD., Žilinská univerzita v Žiline, Fakulta bezpečnostného inžinierstva, katedra krízového manažmentu, Univerzitá 8215/1, 010 01 Žilina, Slovensko, e-mail: maria.hudakova@fbi.uniza.sk

## 1. ÚVOD

V súčasnom dynamickom podnikateľskom prostredí je potrebné, aby si podniky neustále udržiavali výkonnosť, ale aj konkurencieschopnosť voči ostatným subjektom v odvetví. Úspešné podniky sa snažia zavádzať nové technológie za účelom zvýšenia kvality a efektívností využitia zdrojov v podniku (Falk, 2015; Tassey, 2014). Svoju konkurenčnú výhodu vidia aj v aplikácii prvkov koncepcie Industry 4.0, ktorá prináša značný pokrok v oblasti implementácie informačných technológií, na základe ktorej môžu podniky očakávať vyššiu úroveň jednotlivých výrobných procesov. Koncepcia Industry 4.0 je postavená na 11 základných pilieroch t. j.: mobilné zariadenia, IoT platformy, lokalizačné technológie, pokročilé rozhrania človek-stroju, autentifikácia a odhalenie podvodov, 3D tlač, smart senzorika, analýza veľkých objemov dát a pokročilá algoritmizácia, viacúrovňová interakcia so zákazníkmi a profilovanie klientov, rozšírená realita a cloud computing.

Podľa autorov Berawi (2018) a Gruzkov (2019) sa úspešná implementácia uvedených pilierov koncepcie Industry 4.0 najčastejšie realizuje formou projektovaného riadenia. Pri efektívnom projektovom riadení je potrebné zaoberať sa vplyvmi, ktoré negatívne alebo pozitívne vplývajú na projekt. Tieto vplyvy sa odzrkadľujú v rizikách, či už v pozitívnych alebo negatívnych. Jedným z negatívnych rizík je aj zlyhanie ľudského faktora, ktoré je potrebne včas identifikovať, posúdiť a neustále sledovať od prípravnej fázy realizácie projektu až po ukončovaciu fázu projektu. Projektoví manažéri by mali identifikovať a hodnotiť riziká projektov a navrhovať opatrenia na správne využitie pozitívnych rizík (príležitosti) a zníženie negatívnych rizík (hrozieb). Efektívnym posúdením rizík projektov už v prípravnej fáze projektu je možné zabezpečiť väčšiu šancu na úspešnú realizáciu projektu (Taraba, 2015; Luskova, 2011; Soviar, 2019).

## 2. SÚČASNÝ STAV IMPLEMENTÁCIE KONCEPCIE INDUSTRY 4.0 VO SVETE NA SLOVENSKU

V súčasnosti viaceré celosvetové organizácie orientujú svoje prieskumy aj na oblasť implementácie koncepcie Industry 4.0 s cieľom analyzovať tzv. „dobrú prax" úspešných podnikoch a vytvoriť odporúčania, ktoré dokážu pomôcť ostatným podnikom implementovať koncepciu do praxe. Jeden z týchto prieskumov vykonala spoločnosť PWC v roku 2016 a výsledky zverejnila v dokumente s názvom: Industry 4.0 - Budovanie digitálneho podniku. Prieskumu sa zúčastnilo viac než 2 000 podnikov z 26 krajín sveta. Z pohľadu zastúpenia jednotlivých odvetví, takmer 21% tvorili priemyselné podniky, 18% podniky z oblasti stavebníctva, 11% chemické podniky, 10% podniky z elektrotechnického odvetvia, 9% z oblasti dopravy, 9% z oblasti automobilového priemyslu, 22% podniky z ostatných odvetví. Z prieskumu vyplýva, že podniky, ktoré efektívne implementovali koncepciu Industry 4.0 (PWC, 2016):

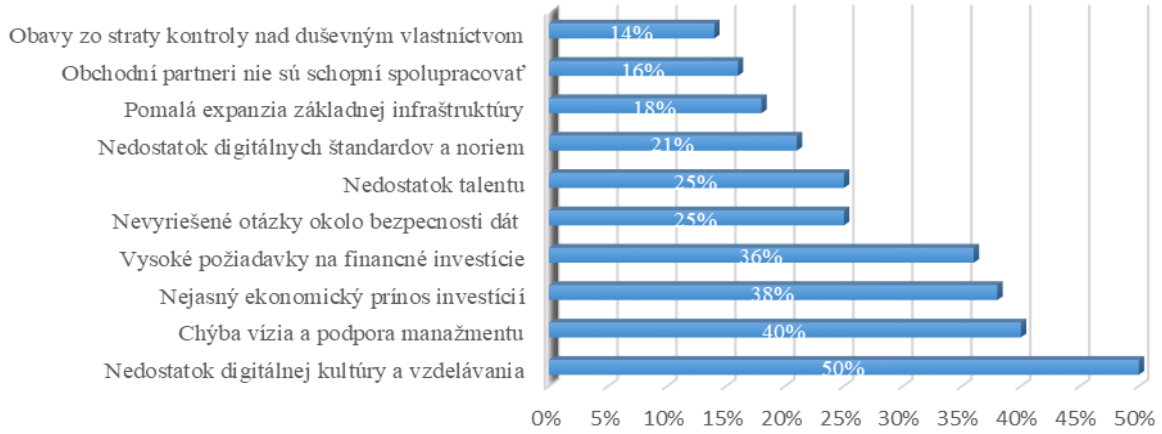
- dosiahli ročný nárast zisku v priemere o 2,9%,
- zvýšili inovácie produktov a digitálnych služieb,
- investovali do koncepcie vo výške priemerne 5% EBITDA podniku,
- zamerali pozornosť na neustále vzdelávanie a rozširovanie kvalifikácie zamestnancov,
- lepšie zvládali riadenie zmien,
- považovali efektívnu implementáciu za kľúčový prvok úspechu a zvyšovania konkurencieschopnosti podniku,
- zvýšili digitálnu dôveru podniku a k ich partnerom.

Medzi ďalšie kľúčové závery spoločnosti PWC (2016) z oblasti implementácie koncepcie Industry 4.0 patria:

- Od slov k činom – úspešné podniky viac realizujú ako rozprávajú. Dokážu omnoho efektívnejšie pracovať na rozširovaní portfólia a výskume nových produktov.
- Digitalizácia podporuje rast výkonnosti podnikov – podniky dokážu prekvapivo znižovať náklady a naopak zvyšovať svoje zisky, pričom sa tento stav neodzrkadľuje na znižovaní počtu, ale skôr na zvyšovaní počtu ľudských zdrojov.
- Rozvíjanie tzv. digitálnych vzťahov so zákazníkmi – podniky na základe rozvoja digitálnych vzťahov sa dokážu omnoho lepšie prispôsobiť potrebám zákazníkov. Podniky využívajú dátové analýzy v snahe, čo najlepšie porozumieť požiadavkám zákazníkov.
- Dôraz na ľudský faktor a podnikovú kultúru – najčastejším problémom, prečo podniky nedokážu vhodne implementovať koncepciu Industry 4.0 sú ľudské zdroje a podniková kultúry v podniku.
- Dátová analytika a digitálna dôvera – podniky, ktoré úspešne implementovali koncepciu Industry 4.0, sa neustále zaoberajú rizikami a snažia sa riešiť hlavne prevádzkové riziká, bezpečnostné riziká a riziká informačných systémov.
- Neustále zmeny – zmeny prebiehajú nielen na najnižšej operatívnej úrovni riadenia podniku, ale aj na strategickej úrovní v podobe investícií.
- Veľké investície majú významný dopad – úspešné podniky najčastejšie investujú do digitalizácie jednotlivých procesov ako aj do vzdelávania zamestnancov.

Podľa prieskumu spoločnosti PWC v roku 2016 boli zistené faktory, ktoré najviac spomaľujú digitalizáciu činností v podniku (obrázok 1). Podniky vnímajú najväčšie nedostatky najmä v oblasti vzdelávania a v nedostatočnej digitálnej kultúry vo svojom podniku. Zamestnancom chýba odbornosť najmä v oblasti uchovávania, analýzy a spracovávania dát. Tento fakt uvádzajú aj autori Diez-Olivan (2019) a O´Donovan (2019), ktorí poukazujú na nedostatočné znalosti a skúsenosti zamestnancov v podnikoch z pohľadu práce s údajmi. Mnoho podnikov zabúda aj na nutnosť prispôsobiť podnikovú kultúru súčasným trendom, ako i požiadavkám koncepcie Industry 4.0. Chýbajúca vízia a nedostatočná podpora manažmentu je druhým najväčším identifikovaným problémom. Manažment podniku v mnohých prípadoch nemá dostatok potrebných informácii o prínose koncepcie Industry 4.0. Podpora manažmentu chýba aj z dôvodu vysokej finančnej náročnosti na implementáciu zmien a technického vybavenia, na čo poukazujú aj autori Haviernikova (2018) a Zubov (2018).

**Obrázok 1: Faktory, ktoré najviac spomaľujú digitalizáciu činností v podniku**




Upravené podľa: PWC (2016, s.17)

Ďalšie faktory, ktoré môžu spomaľovať digitalizáciu činností v podniku sú v oblasti bezpečnosti údajov a procesov. Aj z tohto dôvodu mnoho podnikov pristupuje k implementácií koncepcie veľmi pomaly, pretože ich údaje môžu byť zneužité a mnohokrát aj napadnuté (Kordos, 2019; Kordos, 2018). Nedostatkom je aj neochota a nepripravenosť partnerov na spustenie digitalizácie a tým aj zefektívnenie jednotlivých procesov v podniku.

Prax v zahraničí poukazuje na fakt, že mnoho zamestnancov v podnikoch, v ktorých sa koncepcia Industry 4.0 implementuje, nerozumie zmenám, ktoré koncepcia so sebou prináša a pociťujú obavy zo straty pracovného miesta. U týchto zamestnancoch je na prvom mieste vyvolaná potreba zmeny vnútornej podnikovej kultúry a až na druhom mieste ochrana osobných údajov, či bezpečnosť dát (Bartosek, 2018).

Aj podnikateľské prostredie *na Slovensku* vyvoláva potrebu zavádzať koncepciu Industry 4.0. Niektoré podniky sú s implementáciou koncepcie mnohokrát len na začiatku. V roku 2018 spracovala spoločnosť „Industry4um“ prieskum, ktorého sa zúčastnilo 73 podnikov zo Slovenska. Z uvedených respondentov tvorilo 45% manažérov strategickej úrovne riadenia, 34% manažérov operatívnej úrovne riadenia a 21% ostatných zamestnancov. Cieľom prieskumu bolo posúdiť súčasný stav implementácie koncepcie Industry 4.0 a porovnať ho s predchádzajúcim rokom 2017. Z uvedeného prieskumu vyplýva, že (Industry4um, 2019):

- 59% podnikov na Slovensku považuje koncepciu Industry 4.0 za dôležitú pre budúcnosť,
- 77% podnikov najčastejšie využíva koncepciu Industry 4.0 na efektívnosť výrobného procesu a 62% podnikov na efektívne riadenie procesov,
- 73% podnikov pociťuje potrebu implementovať koncepciu najmä v procese výroby,
- až 56% podnikov očakáva, že pri implementácie koncepcie bude musieť zmeniť model podnikania,
- 60% podnikov očakáva zmenu interných predpisov,
- len 37% podnikov poskytuje zamestnancom vzdelávanie v oblasti implementácie koncepcie Industry 4.0 formou školení, seminárov, konferencií,
- 36% podnikov vytvára vhodné podmienky na rozvoj vzdelávania ohľadom implementácie koncepcie,
- 48% podnikov aktívne využívajú internet vecí (IoT) na zlepšovanie výkonu a kvality, 48% podnikov na efektívny zber, triedenie, spracovávanie dát a 64% podnikov na predikovanie stavu a údržby jednotlivých technických zariadení vo výrobe.

## 3. CIEĽ A METODOLÓGIA

*Hlavným cieľom* článku je navrhnúť proces manažmentu rizík v iniciačnej fáze riadenia projektu, použiteľný pri implementácii koncepcie Industry 4.0 vo výrobných podnikoch. Navrhnutý proces vychádza zo skúseností autorov článku pri jeho implementácii vo výrobných podnikoch na Slovensku, ako aj ďalších odborníkov z praxe, ktorí sa venujú uvedenej problematike.

Na splnenie stanoveného cieľa boli použite vedecké metódy ako je východisková analýza a dedukcia. Východisková analýza bola použitá v procese poznávania súčasného stavu a riešenia rôznych problémov skúmanej problematiky. Pozostávala z analýzy poznatkov z odbornej domácej a zahraničnej literatúry, vedeckých článkov, analýzy výsledkov prostredníctvom celosvetových prieskumov realizovaných rôznymi organizáciami, zo skúsenosti projektových manažérov a ďalších odborníkov z praxe ako aj vlastných poznatkov v riešenej problematike.

Metóda dedukcie bola použitá na tvorbu procesu manažmentu rizík vo iniciačnej fáze riadenia projektu pri implementácie koncepcie Industry 4.0 vo výrobných podnikoch. Navrhnutý proces bol vytvorený pomocou grafického rámca, ktorý bližšie špecifikuje jednotlivé kroky a dôležité charakteristiky procesu manažmentu rizík projektov použiteľný pri implementácii koncepcie Industry 4.0 vo výrobných podnikoch. Tvorba postupu navrhovaného procesu zostáva z nasledujúcich krokov:

- popis najčastejších zdrojov personálnych rizík pri riadení projektov,
- popis navrhovaného procesu manažmentu rizík v iniciačnej fáze riadenia projektu,
- vytvorenie grafickej schémy procesu manažmentu rizík projektov,
- popis využiteľnosti vytvoreného procesu.

## VÝSLEDKY A DISKUSIA

V súvislosti s implementáciou koncepcie Industry 4.0 vo výrobných podnikoch pomocou riadenia projektov sa zvyčajne vyskytujú *tri typy projektov,* v ktorých jednoznačne dochádza k *zlyhaniu ľudského faktora z dôvodu podceňovania zdrojov personálnych rizík.*

1. *Prvý typ projektu je projekt bez stanoveného cieľa.* Manažérom chýba smer a dôvod realizácie projektu. Medzi najčastejšie zdroje rizík tohto typu projektu patria chýbajúci cieľ a prínos projektu, pokles výsledkov a tímovej spolupráce. Tieto zdroje rizík sa vyskytujú najčastejšie v projektoch, kde sú značné nedostatky v oblasti manažérskeho rozhodovania, pri riešení úloh nečakaných okolností a nedostatočnej zodpovednosti pri riadení projektu.
2. *Druhý typ projektu je projekt bez úspechu*. Manažéri realizujú uvedený typ projektu, ale neefektívnym riadením dochádza k stagnácii projektu a dlhodobo neprináša úspech. Hlavným zdrojom rizík pri tomto type projekte je projektový manažér, ktorý si nechce pripustiť neúspech, taktiež projektový tím s chýbajúcimi informáciami o realizácii projektu a top manažment s veľkou snahou projekt realizovať.
3. *Tretý typ projektu je projekt bez výsledkov***.** Manažéri realizujú projekt s pridelenými finančnými prostriedkami a ľudskými zdrojmi, pričom nie je jasné odkiaľ dodatočné zdroje pochádzajú. Zdrojom rizík pri tomto type projektu je veľký záujem top manažmentom o realizáciu projektu bez očakávané úžitku, či výsledkov projektu.

Z analýzy poznatkov domácej a zahraničnej literatúry, vedeckých článkov, analýzy výsledkov z celosvetových prieskumov, skúsenosti projektových manažérov, odborníkov z praxe a vlastných poznatkov v riešenej problematike je možné vyzdvihnúť najčastejšie *zdroje rizík* pri riadení projektov:

- nedostatočná kvalifikačná úroveň zamestnancov projektového tímu,
- nezhody v tíme (obavy z konfliktov),
- nereálne, resp. chýbajúce ciele projektu,
- neznalosť očakávaných výstupov,
- chýbajúci a neúplný rozpočet projektu (stanovený na základe odhadov),
- príliš úzky časový rámec projektu.

Pri úspešnej realizácii projektu sú veľmi potrebné vedomosti, zručnosti a praktické skúsenosti projektového manažéra ako aj jeho osobná zrelosť. *Osobnostnú stránku projektového manažéra* ovplyvňuje viacero faktorov napr. emócie, motivácia, jeho potreby, duševná záťaž, intuícia, ale i spôsob rozhodovania. V procese prípravy, realizácie a ukončenia projektu sa najčastejšie vyskytujú *zdroje rizík zlyhania projektového manažéra*:

- *ne akceptácia neúspechu projektu projektovým manažérom* - ak projektový manažér chce silou mocou projekt dokončiť bez ohľadu na to, či bude mať podnik z realizácie projektu úspech, alebo nie.
- *chýbajúce skúseností a znalostí projektových manažérov v oblasti manažmentu rizík projektov* - pre neefektívne posúdenie rizík a v snahe dokončiť projekt v stanovenom čase sa snažia riziká obísť, namiesto toho aby ich v projekte riadili. V mnohých prípadoch to končí navýšením rozpočtu a prekročením časového plánu projektu.
- *nedostatočná osobnostná zrelosť projektových manažérov* - ak projektoví manažéri si obľúbia projekt a nechcú pripustiť jeho zrušenie. Základné znaky, pri ktorých je možné spozorovať tzv. „ochranu projektu projektovým manažérom“ sú:
    - ochrana projektov pred zásahmi druhých,
    - odmietanie konštruktívnej kritiky projektu a činností projektového manažéra,
    - neefektívne alokovanie zdrojov do projektu.

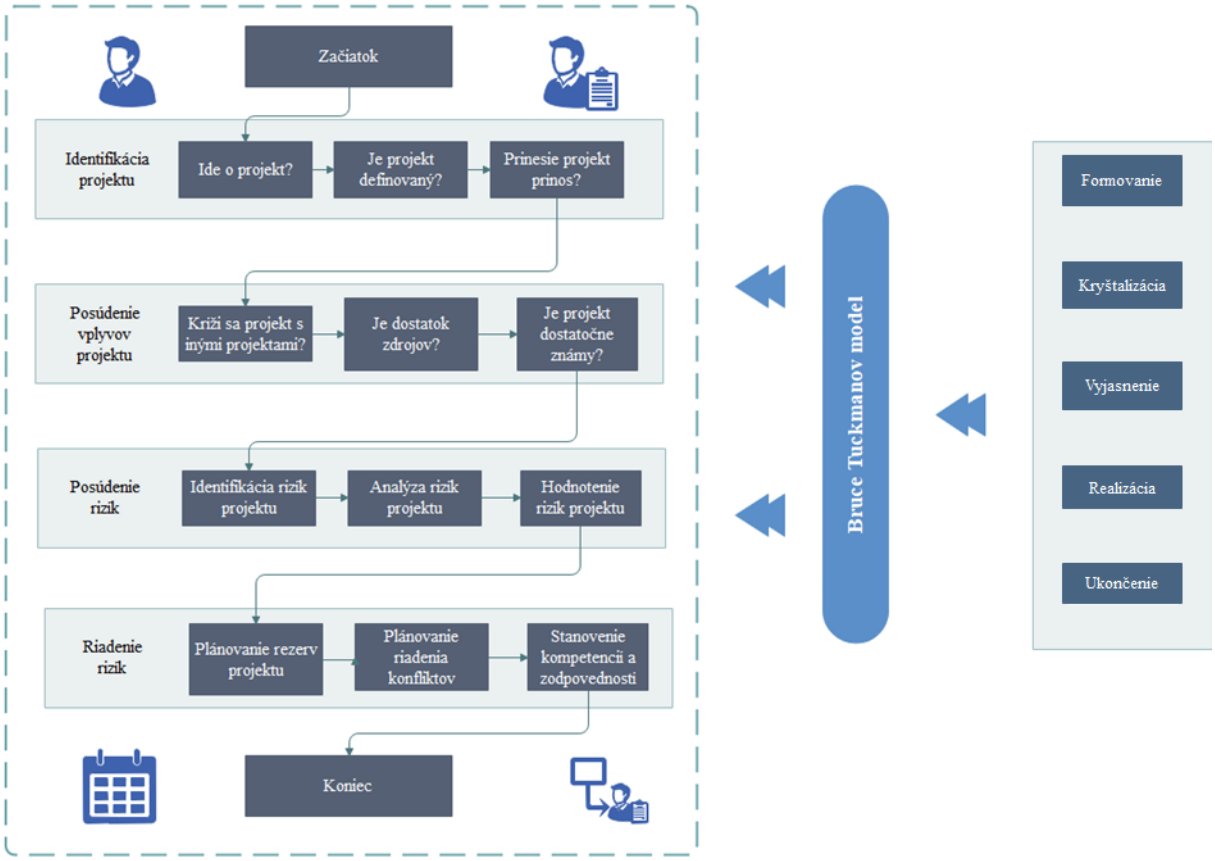
  Mnohokrát kombinácia uvedených znakov spôsobí v podniku domino efekt, vďaka ktorému dôjde z predčasnému zániku nielen ochraňovaného projektu, ale i ďalších projektov, na ktorých sa projektový manažér podieľa.

Na základe vyššie uvedeného bol navrhnutý proces manažmentu rizík v procese implementácie koncepcie Industry 4.0 vo výrobných podnikoch (obr. 2), ktorý vychádza z vlastných skúsenosti autorov ako aj dobrej praxe z oblasti manažmentu rizík projektov v procese implementácie koncepcie Industry 4.0 vo výrobných podnikoch. Navrhnutý proces manažmentu rizík sa skladá zo štyroch základných fáz:

1. *Fáza identifikácia projektu* - pozostáva zo základných otázok, ktoré by si mal projektový manažér zodpovedať, aby pochopil charakter projektu. Odpovede mu pomôžu ľahšie pochopiť a neskôr vhodne identifikovať zdroje rizík.
2. *Fáza posúdenia vplyvov projektu* - obsahuje otázky, na základe ktorých projektový manažér dokáže vhodne predísť neúspechu projektu spôsobeným krížením sa projektov, nedostatkom ľudských zdrojov, ale aj povedomím o projekte v podniku.
3. *Fáza posúdenia rizík* - vychádza zo známeho a zaužívaného procesu manažmentu rizík a obsahuje základné kroky t.j. identifikácia, analýza a hodnotenie rizík projektu. Na základe fáz identifikácie projektu a posúdenia vplyvov projektu, projektový manažér dokáže efektívne posúdiť riziká nielen z pohľadu zdrojov personálnych rizík, ale i z pohľadu cieľov a rozpočtu projektu.
4. *Fáza riadenia rizík* - odzrkadľuje skúsenosti projektových manažérov, odborníkov z praxe a vlastných poznatkov v riešenej problematike. Pozostáva z:
    - plánovania rezerv projektu (nevyhnutné na zníženie rizík),
    - plánovania riadenia konfliktov (zamedzenie negatívnych vplyvov personálnych rizík),
    - stanovenie kompetencií a zodpovedností (zamedzenie vyhýbaniu sa zodpovednosti).

Navrhnutý proces je vhodne doplnený o Bruce Tuckmanov model, ktorý môžu projektoví manažéri aplikovať v každej činnosti riadenia projektu. Správnou aplikáciou modelu môžu projektoví manažéri dospieť k zníženiu možných konfliktov v projektovom tíme a výskytu zdrojov personálnych rizík v projekte.

**Obrázok 2: Návrh procesu manažmentu rizík vo iniciačnej fáze riadenia projektu pri implementácie koncepcie Industry 4.0 vo výrobných podnikoch**




Zdroj: vlastné spracovanie (2019)

*Bruce Tuckmanov model* (tzv. časové hodiny) sa vyznačuje opakovateľnosťou t.j. že prebieha neustále a so 100% istotou sa vyskytne piatich fázach, pričom sa líši len dĺžka trvania každej fázy. Model pozostáva z nasledujúcich základných fáz:

1. Formovanie (forming) – fáza, ktorá sa objavuje pri riešení problému, či realizácií resp. prípravy v podobe úvodného stretnutia k aktivite (tzv. Kick off task meeting),
2. Kryštalizácia (storming) – predstavuje fázu, v ktorej sa vyskytujú počiatočné mocenské boje, členovia tímu si chcú zobrať čo najmenej aktivít a podieľať sa na projekte čo najviac,
3. Vyjasnenie (norming) – fáza, ktorá prichádza v bode, keď projektový manažér nastaví pravidlá, zodpovednosti a dochádza k postupnej stabilite situácie, odstraňovaním konfliktov, objavuje sa prvotná tímová spolupráca a dochádza k tvorbe projektovej kultúre,
4. Realizácia (preforming) – v tejto fáze tím prejavuje vysoký stupeň spolupatričnosti a spolupráce, prejavuje sa tímová, ale i osobná zodpovednosť úloh na realizácii projektu, dosahujú sa očakávané výkony,
5. Ukončenie (adjourning) – v poslednej fáze dochádza k ukončeniu úloh projektu a k vyhodnocovaniu výsledkov, vytvára sa poučenie z minulosti (tzv. lesson learnt).

Projekt, či už ide o výrobný, vývojový, či implementačný je najviac ohrozený z pohľadu zlyhania ľudského faktora (človek s myšlienkou projekt pripravuje, realizuje a ukončuje). Na druhej strane je potrebné vyzdvihnúť, že poučením sa z chýb, môže dôjsť k zlepšeniu nasledujúcich projektov.

Projekt je úspešný len vtedy, ak dôjde k značnému rozvoju potenciálu nielen projektových manažérov, ale aj členov projektového tímu. Netreba pritom zabúdať na kolegiálny prístup, rešpekt, priaznivú atmosféru a motiváciu, ktorá prinesie očakávané výsledky projektového tímu. Dôležitým prvkom pri riadení projektu je celkový úspech projektu tzn. či sa v projekte dodržal stanovený rozpočet, zdroje a predovšetkým splnenie samotného cieľa projektu. Z pohľadu ľudského faktora je však nevyhnutné brať do úvahy i top manažment, nakoľko práve nedostatočná podpora zo strany top manažmentu je najčastejším a vyskytujúcim sa rizikom, ktoré projektoví manažéri pociťujú. Vhodnou informovanosťou, napredovaním projektu a hlavne pravidelným výkazníctvom sa dá toto riziko efektívne znížovať, nakoľko sa odstránia obavy top manažmentu z neúspechu projektu.

## ZÁVER

Vhodnou implementáciou projektu koncepcie Industry 4.0 vo výrobných podnikoch, je možné dosahovať dlhodobo úspech v podnikateľskej činnosti. Je však pri tom nevyhnutné efektívne riadiť i ľudský faktor, ktorý je významným prvkom každej jednej zmeny, projektu, či aktivity.

Spracované výsledky sú určené pre projektových manažérov pri implementácie prvkov koncepcie Industry 4.0 v podnikoch, aby si uvedomili význam v aplikácii manažmentu rizík projektov. Prispievajú k presnejšiemu definovaniu úloh projektových manažérov ešte v iniciačnej fáze riadenia projektu. Zvýrazňujú väčšiu potrebu prepojenia manažmentu rizík s projektovým manažmentom a väčšiu pozornosť hodnoteniu ľudského faktora pri riadení projektov. Od projektových manažérov sa očakáva získanie vedomosti, skúsenosti a odhodlania riziká nielen identifikovať, analyzovať, či hodnotiť ale navrhovať opatrenia na ich zníženie s využitím príslušných technik, nástrojov či softvérovej podpory.

Efektívna aplikácia manažmentu rizík projektov dopĺňa a zvyšuje možnosti úspešného dokončenia projektu v správnom čase, so správnymi nákladmi a v správnej kvalite výstupov projektu. Vhodne zabezpečuje identifikáciu a riešenie potenciálnych príležitostí a hrozieb, ktoré môžu ovplyvniť projekt.

### *Dodatok*

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# ZMENA V ZRUČNOSTIACH A ŠTRUKTÚRE PROFESIÍ AKO VÝZVA VYPLÝVAJÚCA ZO ZAVÁDZANIA PRIEMYSLU 4.0

# CHANGES IN SKILLS AND PROFESSION STRUCTURE AS A CHALLENGE ARISING FROM THE ESTABLISHMENT OF INDUSTRY 4.0

***Tatiana MASÁROVÁ***[85]
***Jakub SOKOL***[86]

**Abstrakt:** *V záujme posilnenie svojej konkurencieschopnosti potrebuje Európa nové stratégie a prístupy, akou je koncept Priemysel 4.0. Technológie Priemyslu 4.0 sľubujú obrovský vplyv na ekonomiku a spoločnosť. Hlavným cieľom príspevku je zistiť vplyv konceptu Priemysl 4.0 na zručnosti a štruktúru profesií. Nasledujúce úlohy boli vymedzené pre realizáciu nášho cieľa: identifikovať novovznikajúce zručnosti pre prácu 4.0, zistiť vplyv konceptu Priemysel 4.0 na hrozby a príležitosti v profesiách. Výskumné metódy použité v príspevku: teoretické všeobecné metódy vedeckého poznania: indukcia, dedukcia, analýza, syntéza dostupných bibliografických odkazov, vedecká abstrakcia pri generalizácii výsledkov.*

**Kľúčové slová:** *Priemysel 4.0, profesia, zručnosť*

**Abstract:** *To strengthen its competitiveness Europe needs new strategies and approaches as proposed by Industry 4.0 initiative. Industry 4.0 technologies promise major impact on economy and society. The main objective of this paper is to find out the impact of Industry 4.0 initiative on skills and profession structure. Following tasks have been specified for the realization of our objective: to identify emerging skills for work 4.0, to find out the impact of Industry 4.0 initiative on threats and opportunities in professions. Research methods used in the paper: theoretical general methods of scientific knowledge – induction, deduction, analysis, synthesis of available bibliographic references, scientific abstraction for generalization of the results.*

**Key words:** *Industry 4.0, profession, skill*

**JEL Classification:** *I29, J48,O33*

## 1. ÚVOD

Digitalizácia čoraz viac ovplyvňuje trh práce, mení sa charakter práce naprieč všetkými odvetviami a povolaniami. Dôsledkom automatizácie povolaní bude zaniknutie mnohých pracovných pozícií, ale aj vytvorenie nových, ktoré budú potrebovať ľudí s novými technickými a personálnymi zručnosťami. Otázka rozvoja ľudských zdrojov je v súvislosti s konceptom Industry 4.0 jednou z rozhodujúcich. Technologický vývoj kladie nekompromisné nároky aj na kvalifikáciu a odbornosť zamestnancov. Trh práce dnes trpí akútnym nedostatkom kvalifikovaných pracovníkov. Jediným aktuálnym a aj dlhodobým riešením je postupná automatizácia a robotizácia všetkého, čo je rutinné alebo opakované, algoritmizovateľné. Najhoršie bude zvládnuť prechod, pretože ešte nejakú dobu bude rásť dopyt po tradičnej pracovnej sile, ale ten sa bude postupne vytrácať. Pritom paralelne budú prichádzať požiadavky na nové vedomosti a zručnosti, na nové pracovné miesta.

[85] Ing. Tatiana Masárová, PhD., Trenčianska unuverzita Alexandra Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, Trenčín 911 50, Slovenská republika, e-mail: tatiana.masarova@tnuni.sk
[86] Ing. Jakub Sokol, Trenčianska unuverzita Alexandra Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, Trenčín 911 50, Slovenská republika, e-mail: jakub.sokol@tnuni.sk

## 2. CIEĽ A METODOLÓGIA

Predložený príspevok má teoretický charakter. Hlavným cieľom príspevku je zistiť vplyv konceptu Priemysel 4.0 na zručnosti a štruktúru profesií. Pre realizáciu vedeného cieľa boli vymedzené nasledovné úlohy: identifikovať novovznikajúce zručnosti pre prácu 4.0, zistiť vplyv konceptu Priemysel 4.0 na hrozby a príležitosti v profesiách. Výskumné metódy použité v príspevku: teoretické všeobecné metódy vedeckého poznania: indukcia, dedukcia, analýza, syntéza dostupných bibliografických odkazov, vedecká abstrakcia pri generalizácii výsledkov. Príspevok má význam pre terminológiu sociálnej sféry: pre oblast sociálnej politiky a trhu práce a politiky zamestnanosti.

## 3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

### *3.1 Očakávané zmeny v zručnostiach pre prácu 4.0*

Málokto bude dlhodobo vykonávať tú istú prácu, pretože väčšina súčasných pracovných miest postupne zanikne a vzniknú iné, s úplne inými požiadavkami na vedomosti a zručnosti. Zmena bude trvalým stavom. Pre absolútnu väčšinu ľudí nebudú stačiť vedomosti získané v mladosti. Zamestnávatelia a pracovníci budú čeliť novej výzve na trhu práce. Spoločnosti budú pod rastúcim tlakom na znižovanie marží a rast efektivity a budú nútení produkovať viac, s rovnakým alebo menším množstvom ľudských zdrojov. Hlavným motorom ekonomického rastu sa stane prístup k pracovníkom so správnymi schopnosťami a zručnosťami. Požiadavky spoločností na pracovníkov sa s technologickým pokrokom budú meniť stále rýchlejšie. Omnoho rýchlejším tempom, než sa vyvíja kvalifikačná štruktúra spoločnosti (ManpowerGroup, 2018). Pod vplyvom štvrtej priemyselnej revolúcie dôjde k zmenám a trhu práce výrazne sa zmení sa nielen typ profesie, ale aj jeho štruktúra, profesionálny profil zamestnancov a ich kompetenčné modely, dôjde aj k zániku niektorých profesií a vznikne potreba nových, aj takých o akých ešte nemáme ani predstavu. Industry 4.0 bude potrebovať ľudí s technickým vzdelaním a analytickými schopnosťami, nové pracovné pozície, si budú vyžadovať kreatívne a odborné zručnosti, e vedenie a inovatívne inžinierstvo. Zároveň sa zmení kvalita zručností ľudí a taktiež sa zmení aj hodnota daných zručností ľudí.

Najvyššiu prioritu budú mať pri technických zručnostiach: IT vedomosti a schopnosti, spracovanie a analýza dát a informácií, štatistické poznatky, organizačné a procesné znalosti, schopnosť komunikovať s modernými rozhraniami (človek/stroj; človek/robot). Strednú prioritu budú mať pri technických zručnostiach: riadenie vedomostí, interdisciplinárne/všeobecné poznatky o technológiách a organizáciách, špecializované znalosti výrobných činností a procesov, povedomie o IT bezpečnosti a ochrane osobných údajov. Nízku prioritu budú mať pri technických zručnostiach: počítačové programovanie/schopnosť kódovania, špecializované vedomosti o technológiách, znalosť ergonómie, znalosť právnych záležitostí. Najvyššiu prioritu budú mať pri personálnych zručnostiach: časový a osobný management, adaptabilita a schopnosť prispôsobiť sa zmenám, schopnosť pracovať v tíme, sociálne zručnosti, komunikačné schopnosti. Strednú prioritu budú mať pri personálnych zručnostiach: dôvera v nové technológie, uchopenie konceptu kontinuálneho zlepšovania a celoživotného vzdelávania (Gehrke, et al., 2015). Čoraz viac sa od jednotlivca v súčasnom prostredí požaduje zmysel pre zodpovednosť, tolerancia rizika, podnikateľský duch, výkonnostný potenciál a konkurencieschopnosť (Strunz, Vojtovič, 2016).

Budúce reformy v oblasti školstva sa budú musieť zamerať na oblasti vedy, technológií a IT zručností, kde je predpokladaný najväčší prílev nových pracovných príležitostí. Čo najväčšie množstvo absolventov by malo byť pripravených na digitálnu transformáciu jednotlivých odvetví priemyslu a služieb. Súčasťou reformy by malo byť vytvorenie aplikovateľných interdisciplinárnych učebných osnov a vzdelávacích programov. Z dôvodu očakávaného významného nedostatku vysokokvalifikovaných pracovníkov v blízkej budúcnosti je potrebné podporovať aj rekvalifikáciu pracovnej sily pomocou efektívnejšieho využívania tréningových centier na plné využívanie potenciálu slovenskej pracovnej sily. Ďalším aspektom súvisiacim s reformou školstva je potreba zapojenia firiem do rozvoja koncepcií celoživotného vzdelávania (Ministerstvo školstva, vedy, výskumu a športu Slovenskej republiky, 2016). Hlavnou slabinou slovenskej pracovnej sily je slabá miera IT zručností. Preto sa požaduje zvýšenie financovania informatických študijných odborov, v opačnom prípade sa slovenská ekonomika dostane na periféria európskeho hospodárskeho priestoru (Budinský, 2017).

### *3.2 Novovznikajúce zručnosti a kompetencie pre prácu 4.0*

V budúcich zamestnaniach sa očakáva, že porastie význam ľudských zručností, ktoré sa takmer s určitosťou nedajú zautomatizovať K takýmto zručnostiam možno zaradiť:

- ✓ Schopnosť dávať zmysel

V digitálnej ekonomike sa od pracovníkov vyžaduje plánovanie svojej vlastnej zmysluplnej kariéry, jednotlivec si sám vytýči ciele, vytvorí časový harmonogram, reguluje pracovné zaťaženie a vzdeláva sa tak, aby si doplnil chýbajúce zručnosti pre organizáciu, v ktorej pracuje.

- ✓ Zručnosti v sociálnej inteligencii

Pracovníci , ktorí disponujú rozvinutou sociálnou inteligenciou si dokážu vytvoriť empatickú väzbu s ľuďmi okolo sebe, podľa toho voliť vhodné slová, ton hlasu a gestá. Verbálna, paralingvistická a nonverbálna komunikácia pracovníka závisí od emócií partnera /ov, s ktorým pracovník komunikuje.

- ✓ Riadenie kognitívneho zaťaženia

Pracovník je schopný filtrovať informácie podľa dôležitosti a maximalizovať poznávaciu schopnosť pomocou rôznych nástrojov a techník.

- ✓ Novátorské a adaptačné myslenie

Je to myslenie, pri ktorom pracovník dokáže prispôsobiť uvažovanie špecifickým podmienkam, dokáže v danom momente a rýchlo nájsť riešenie, ktoré prekračuje očakávané alternatívy riešenia.

- ✓ Interkultúrne zručnosti

Rastúci význam migrácie, vznik pracovných tímov s kultúrnou, náboženskou, rodovou a jazykovou rôznorodosťou si bude vyžadovať pracovníkov, ktorí budú musieť hovoriť viacerými cudzími jazykmi, rozumieť rôznym kultúrnym významom.

- ✓ Transdisciplinárne zručnosti

V digitálnej ekonomike budú žiadaní odborníci, ktorí budú mať do hĺbky osvojené znalosti aspoň z jednej oblasti a zároveň budú schopní porozumieť širokej škále disciplín.

- ✓ Dizajnové zmýšľanie

Nová generácia pracovníkov musí dokázať rozoznať vplyv pracovného prostredia na ľudský mozog, upraviť pracovné prostredie tak, aby im uľahčilo dosiahnuť zadané úlohy.

- ✓ Výpočtové myslenie

Uvedené myslenie predpokladá, že pracovníci budú čoraz viac potrebovať schopnosť premeniť dáta na relevantné a užitočné informácie, ktoré môžu zvýšiť produktivitu práce a viesť k ďalšej inovácii.

- ✓ Nová mediálna gramotnosť

Pracovník musí byť schopný kriticky vyhodnotiť nové komunikačné technológie, zavádzať mechanizmy dôvery a rozlišovať dôveryhodné informácie od fám.

- ✓ Schopnosť spolupracovať vo virtuálnom svete

Myslí sa spolupráca medzi geograficky vzdialenými pracovníkmi, ktorá vyžaduje špecifické komunikačné zručnosti napr. schopnosť interpretovať emócie v texte, efektívne vyjadrenie myšlienok, minimalizáciu neistoty (Popovic,Tomas 2009; Willyerd, 2016).

### *3.3 Očakávané zmeny v štruktúre profesií v kontexte konceptu Priemysel 4.0*

*Hrozby v profesiách*

Najviac budú ohrození menej kvalifikovaní pracovníci, s nízkymi digitálnymi zručnosťami, ale aj, ako sa už stáva štandardom, ľudia nad 50 rokov. Podľa prognóz kompjuterizácia ohrozuje predovšetkým povolania, na ktoré dnes stačí vzdelanie bez maturity. Hrozba sa týka takých profesií, ktoré pozostávajú z rutinných, ľahko algoritmizovateľných činností: úradníci spracovávajúci číselné údaje, všeobecní a pomocní administratívni pracovníci, vodiči motocyklov a automobilov a vôbec pracovníci v doprave a logistike, zamestnanci v službách, predaji, stavebníctve a pod. Niektoré z týchto pozícií sú už dnes nahraditeľné technológiami, ale vzhľadom k veľkému nepomeru medzi mzdovými nákladmi a nákladmi na automatizáciu na trhu práce stále prežívajú. Nahrádzanie ľudí technikou však nebude prebiehať naraz a kontinuálne.

*Najmenej ohrozené profesie*

Naopak najmenej ohrozené sú profesie, ktoré vďaka svojim sociálnym, organizačným, fyzickým, kreatívnym, či intelektuálnom požiadavkám nebude v dohľadnej dobe možné nahradiť automatizáciou ani digitalizáciou. Jedná sa predovšetkým o riadiace pozície vo vzdelávaní, zdravotníctve, v sociálnych a ďalších oblastiach. O svoje miesta sa nemusia báť ani všeobecné sestry, pôrodné asistentky, veterinári a učitelia. Najviac žiadaní budú špecialisti na databázy a siete, riadiaci pracovníci v informačných a komunikačných technológiách, analytici a vývojári softvéru či počítačových aplikácií. Tieto pozície majú vo svete digitalizácie a automatizácie najväčší pozitívny potenciál. Navyše pribúda ľudí s vyšším vzdelaním, ktorí pre zamestnávateľov môžu byť atraktívnejším ale zároveň sa prejavuje nedostatok špecialistov, ktorí programujú, udržujú a nastavujú roboty.

*Vznikajúce profesie*

Niektorí autori uvažujú nad novými rodinami pracovných miest s ohľadom na sociálne, ekonomické a technologické transformácie spojené s postupným zavádzaním digitálnej ekonomiky, (Binsfeld, Whalley, Pugalis, 2016; Spiezia, View, & Spiezia, 2016). Nižšie nasleduje zoznam rodín pracovných miest a do nich patriacich povolaní, na ktorých sa špecialisti najčastejšie zhodujú (rodiny pracovných miest sú zoradené abecedne).

- ✓ Rodina pracovných miest Ekonomika

*Bankári alternatívnych peňazí:* narastajúce množstvo on-line transakcií zvýši dopyt po virtuálnych peniazoch (Bitcoin, Ethereum, Litecoin, Ripple, Bitcoin Cash, Eos, Ripple, ...) a od bánk bude vyžadovať vytvorenie podobných mien.

*Pozícia náborového pracovníka zameraného na budúcnosť:* rýchle zmeny na trhu práce a novovznikajúce pokročilé technológie vyžadujú expertov, ktorí dokážu predvídať zmeny v povolaniach/vznik nových povolaní a vytipovať jednotlivcov s vhodným profilom na pozície, ktoré zatiaľ ešte ani nie sú v ponuke.

*Poradcovia v oblasti produktivity:* odborníci na časový manažment a manažment celkovej spokojnosti

- ✓ Rodina pracovných miest Inžinierstvo / Technológia

*Inžinieri 3D/4D tlače:* zaobchádza sa s 3D/4D tlačovými technológiami za účelom doručovania služieb a tvorby inovatívnych artefaktov.

*Operátori dronov:* drony sa budú využívať na dodávanie množstva výrobkov a na verejné služby, ako sú zber odpadu alebo monitorovanie dopravy.

*Experti v oblasti mikrobiálnej rovnováhy:* kvôli novovznikajúcim formám baktérií a tendencii rodičov vyhýbať sa očkovaniu narastajú obavy z nebezpečných bakteriálnych činiteľov; špecialisti, ktorí budú vedieť vyhodnotiť dopad baktérií na ľudské zdravie a prognózovať vývoj pandémií, sú potrební čoraz viac.

*Konzultant v oblasti ochrany súkromia:* nárast zdieľania osobných informácií v stále viac virtualizovanom svete prinesie so sebou potrebu špecialistov na ochranu osobných údajov a tvorbu on-line reputácie.

- ✓ Rodina pracovných miest Poľnohospodárstvo

*Mestskí poľnohospodári:* profesia vznikne ako prostriedok na zníženie nákladov za prepravu jedla; v mestách sa už teraz začínajú objavovať integrované záhrady aj budovy postavené špeciálne s týmto účelom.

*Odborníci na rastliny a dreviny:* špecialisti na manipuláciu stromov a rastlín, vrátane genetických, rastových, tkanivových a iných manipulácií; uvedený typ manipulácie môže byť užitočný v ústretovosti voči zákazníkovým preferenciám a pri rozvoji rastlín odolnejším voči klimatickým zmenám.

*Technici robotov používaných na žatvu:* roboty budú monitorovať hladiny vody a typy pôdy; budú zbierať dáta, ktoré je možné uchovávať a analyzovať, a tak pomáhať poľnohospodárom robiť rozhodnutia ohľadom žatvy, presádzania a používania pesticídov; údržba robotov a ich nastavovanie podľa potrieb rozličných plodín bude vyžadovať špecializovaných technikov.

- ✓ Rodina pracovných miest Vzdelávania

*Demontáž profesií:* budeme svedkami prechodu z konvenčného vzdelávania k dynamickejšiemu modelu; aj on-line učenie bude potrebné štruktúrovať spôsobom, ktorý umožní virtuálne formy socializácie a mobility.

*Odborníci na učenie sa pre individuálnych klientov:* umelá inteligencia povedie k vzniku prístrojov, ktoré budú schopné vytvárať učebné materiály šité na mieru, ašpirácie a učebný štýl jednotlivých študentov; kamery zabudované do prístrojov a systémy strojového videnia budú analyzovať výraz tváre a reč tela študentov, aby zhodnotili ich záujem a angažovanosť v procese učenia, aby odhadli, akú náročnosť pripisujú jednotlivým témam

a aby odhalili včasné príznaky porúch učenia; odborníci na učenie sa pre jednotlivcov budú potrební, aby sprevádzali študentov procesom meta-učenia sa a podporili ich pri definovaní učebných potrieb a cieľov; prekonávanie prekážok pri učení sa bude čoskoro vyžadovať intervencie špecialistov z oblastí ako sú psychológia, neurovedy, pedagogika.

- ✓ Rodina pracovných miest Zdravie

*Nano-lekári:* lekári špecializujúci sa na detekciu chorôb, vývoj liekov a monitorovanie tela zvnútra.

*Poskytovatelia služieb pre osemdesiatnikov:* zvýšenie priemernej dĺžky života zvýši počet ľudí starších ako 80 rokov; vytvorí sa dopyt po tovaroch a službách, ktoré na trhu v súčasnosti neexistujú.

*Pamäťoví chirurgovia:* lekári schopní odstrániť zlé spomienky alebo zmeniť zakorenené správanie.

*Výrobcovia orgánov a častí tela:* odborníci využívajúci inovatívnu technológiu na výrobu celkom nových zdravých orgánov, ktoré bude možné použiť u ľudí.

*Lekár s veľkými dátami:* zdravotná starostlivosť bude poskytovaná na základe zdravotného záznamu pacienta, ako aj automaticky zhromaždených informácií o životnom štýle; lekári budú potrebovať zručnosti na efektívne využívanie veľkých dátových systémov a pokročilých nástrojov na vizualizáciu informácií.

- ✓ Rodina pracovných miest Životné prostredie

*Špecialisti na obnovu druhov:* ľudia, ktorí dokážu znovu vytvoriť vyhynuté druhy z genetického materiálu.

*Odborníci v oblasti obnovy životného prostredia:* odborníci schopní aplikovať inovatívnu technológiu napríklad na čistenie znečisteného ovzdušia a atmosféry alebo na zníženie teploty Zeme.

*Špecialisti na klimatické zmeny:* odborníci na vývoj a aplikáciu techník a technológií, ktoré dokážu monitorovať a kontrolovať zmeny podnebia, a tým zabezpečiť budúcnosť ľudského druhu ("10 New Jobs People Will Have by the Year 2030," n.d. , "8 New Jobs People Will Have In 2025," n.d.).

## 4. ZÁVER

Bude nevyhnutné, aby sa školstvo preorientovalo na nové typy zamestnaní, po ktorých bude zvýšený dopyt. Z dlhodobého hľadiska je možné očakávať, že približne pätina pracovníkov zmení zamestnanie mimo oblasti, na ktorú sa pôvodne zaúčali. Nové pracovné príležitosti vyplývajúce zo zavádzania automatizácie si budú vyžadovať pracovníkov s novými zručnosťami a schopnosťami, ktoré v súčasnosti nemajú. Zlepšenie kvalifikácie pracovníkov je dôležité naprieč odvetviami priemyslu a služieb, vo všetkých častiach hodnotového reťazca – od vývoja, cez produkciu až po predaj. Domnievame sa, že je ťažké odhadnúť, aké zamestnania v blízkej budúcnosti vzniknú, ale aké kompetencie a zručnosti sú v digitálnej ekonomike kľúčové sa určiť dá.

### *Dodatok*

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# INDUSTRY 4.0 IN INDIA AND ITS IMPACT ON LABOUR MARKET

***Farheen NAZ*[87]**
***Róbert MAGDA*[88]**

**Abstract:** *The firms and enterprises in India and everywhere throughout the world have adapted computerization and mechanical advancements that are driven by gadgets and data innovation. But as far as industry 4.0 is concerned, India is at the emerging stage towards adaptation of it. The government of India is focusing on advanced manufacturing competencies, technological upgradation, digitization and ICT integration in manufacturing sector through projects like 'Make in India' and 'Skill India'. The fourth industrial revolution or Industry 4.0 including Artificial Intelligence, big data analytics, the Internet of Things (IoT), 3D-printing, propelled mechanical technology, neuroscience and robotics are at nascent stage in India as it is still fronting manufacturing processes of industry 1.0 and 2.0. The fourth industrial revolution will benefit India's manufacturing sector, e-commerce companies and small and medium enterprises by enhancing productivity and technological advancement but according to the International Labour Organization (ILO DWT for South Asia and Country Office for India, 2018) the effect of industry 4.0 in India will disrupt job creation in future. The aim of this paper is to understand the benefits and repercussions of industry 4.0 on the big populated country like India and critical analysis has been done to analyse the impact of fourth industrial revolution on job creation and labour market in India.*

***Keywords:*** *Industry 4.0, Robotics, Artificial Intelligence, Labour Market, India*

**JEL Classification:** *E24, J24, J31, J62, O33*

## INTRODUCTION

It has been seen that the growth of an economy depends on technological advancement. The change in manufacturing system, advancement in technology and creation of new production system actually leads to gain more productivity. The industries, firms and companies all over the world are acquiring latest technological advancements in order to compete with existing need of the phase. The driving force of gadgets and data innovation is going deep into the roots of production processes of the industries and enterprises.

As we have already witnessed three industrial revolutions and now fourth industrial revolution is spreading its arms all around the globe. This new technological innovation has discovered its bend of movement and has changed and reshaped the manner in which things are seen in the manufacturing sector. Research and improvement prompting advancements and technological improvement had significant effects not exclusively to the development directions yet in addition to the interest for work and social associations. After industry 4.0 the businesses and companies will face a great leap towards Information and Communications Technology (ICT). This includes development in manufacturing processes, data tools and analytics that use Internet of Things, 3-D printing, management of the product lifecycle, cyber physical production systems, robotics etc (Liao et, al. 2018).

As far as India is concerned, it is at the beginning stage of industry 4.0 and taking very small steps towards evolving with fourth industrial revolution. India is a developing economy where there are ample opportunities ahead for development, technological boom and mechanization. Industry 4.0 is bringing a strong competition among industries to become a leading industry in

[87] PhD student, Doctoral School Of Management and Business Administration, Szent Istvan University, Páter Károly út 1, Godollo,Hungary, email: ask2farheen@gmail.com
[88] prof., Szent István University, Páter Károly út 1, Gödöllő H-2100, Hungary; North West University, South Africa, e-mail: Magda.Robert@gtk.szie.hu

the world. This fourth industrial revolution will open doors for innovations, automation and smart solutions and this innovation is a chance to change the financial principles of the businesses. India in its stage of advancement and mechanization needs to get adjusted with the fast pace of technological momentum and this will enrich the advancement of economy of India.

India is a developing economy and is at the cusp of the industrial revolution 4.0. Since 1970 Enterprises in India and everywhere throughout the world have adapted computerization and mechanical advancements (Sagar BS, 2017). Business visionaries, CEOs, organization authors and new businesses are quickly receiving advances including AI, the Internet of Things (IoT), 3D-printing, propelled mechanical technology and neuroscience. From numerous points of view, organizations in India are guaranteeing their survival by embracing these innovations (Victor et. al. 2018). The individuals who receive quicker and preferable will be more focused over others, and certainly in a superior position to contend with worldwide participants. Their survival comes at the expense of occupations or jobs which is a great threat to the labour market in India.

The issue of technology and job market is a subject of consideration in a country like India where labour capital is in abundance. The new technological advancement or Industry 4.0 will create new jobs but on the other hand many jobs will get superseded with automation and robotics. The future jobs are at risk not only manual jobs with repetitive task that are at high risk, but non-routine cognitive jobs also have some risk due to the advancement of technologies. This fourth industrial revolution will open doors for innovations, automation and smart solutions and this innovation is a chance to change the financial principles of the businesses. India in its stage of advancement and mechanization needs to get adjusted with the fast pace of technological momentum and this will enrich the advancement of economy of India but the consequence of industry 4.0 on job market should be taken into consideration.

## LITERATURE REVIEW

The first industrial revolution started nearly around 1760 and since then there is no looking back from the technological development. The first industrial revolution is commonly known as industry 1.0 which induced steam and hydro power and included reduction of labour. Then it was displaced by industry 2.0 which came up with advancements and technological development including electric power. The industry 2.0 became the prime driver of development back then and it created a platform for new technologies to put a foot on. Information and Communications Technologies (ICT) became the key driver of industry 3.0 as computerization came into existence that empowered assembling and administration segments to accomplish numerous increases.

Today the world is facing fourth industrial revolution that includes Internet of Things (IoT), sensors, 'digital physical' frameworks, robotics, cyber physical system, neuroscience, automation etc (Vuksanović et.al. 2016). This technological advancement is changing manufacturing and administrations over the whole supply chains of the businesses. A key segment of such changes is decentralized control. Intelligent segments work in each phase of the framework through which a section, request or data moves. Decentralized control makes it simpler to include, process and execute as required, making it smoother to meet the expanding consumer requests. Gradually we are continuously moving towards Industry 4.0, a fascinating idea presented by German organizations, for example, Siemens at the worldwide level (AIMA, 2018).

Industry 4.0 is the most recent modern transformation, however rather than steam trains and materials, this age is utilizing man-made brainpower i.e. artificial intelligence (AI), always

showing signs of change the manner in which machines gather and translate information. Assembling in this new time of machine learning requires minimal human intercession, changing from an information and yield way to deal with a smooth discussion among people and robots (Pierre-Olivier Bédard-Maltais, 2017). Machines are currently prepared to settle on choices and give specialized help, which has prompted more straightforward correspondence. The inundation of artificial intelligence (AI) innovation can result in expanded work effectiveness yet could likewise accompany downsides, similar to information security breaks and less human employments (Rojko A, 2017). Nonetheless, on the positive side, work security and viability can increment exponentially. Where wellbeing and security are concerned, machines can compute and decide hazard factors, enhancing the workplace. For business pioneers, this can mean an expansion consequently due to augmented productivity.

## ECONOMIC STRUCTURE OF INDIA

For decades, the economy of India is facing continuing structural changes. Although the structural transformation pace was rather slow previously, which gained momentum after the implementation of the new economic policies. Around approximately seven decades ago Indian economy was dominated by agriculture and rural sector. The shift from agriculture to industrial economy has taken a great leap but rather with a slow pace. It was observed that in the decade of nineties the new macroeconomic policies in Indian economy have augmented the speed in structural transformation and took the country on the path of high growth. Now, India is considered as among the fastest growing economy in the world with a GDP growth rate of 8.2 per cent in the first quarter of 2018-19[89].

Although, around 49% of working population is still involved in agriculture sector, that contributes to 14.39 % to GDP of the Indian economy. On the other hand, service sector adds to 54.15 % to the GDP and the contribution of manufacturing sector is the lowest that is 18.32 % (Ministry of Statistics and Implementation Program, 2019). As far as employment is concerned in these sectors, service sector produces 27% employment while manufacturing sector produces mere 16% employment (Ghose, 2016). The economy of India has seen growth in past few decades but not much rise in employment.

## WORKFORCE OF INDIA

India is the second largest country after China in terms of population in the world. The total population of India is 1.37 billion out of which urban population is 31.14% and rural population comprises to 68.86% (Ministry of Statistics and Implementation Program, 2019). A majority of the labour force around 83% is involved in unorganised sector and 91% is involved in informal jobs. In urban and rural workforce there is major inequality as far as employment environments are concerned. Around 69% of total workforce of urban areas is employed in unorganised sector which adds to 50% of the national income and nearly 73% are working without any job agreement (ILO, 2018).

There are three major sectors in India i.e, agriculture, industry and service sector. The total workforce including all these sectors is under 466 million out of 1.37 billion people in 2015 (Labour Bureau Report on Employment & Unemployment Survey, 2013-14). According to

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India; World Bank; 2010 to 2018, 43.86% of workforce is engaged in agriculture sector, 24.6% is working in industry and 31.4% of the total workforce is engaged in service sector as in 2018 (Table 1).

**Table 1: Workforce distribution in different sectors, 2010-2018**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| **Agriculture** | 51.06% | 48.96% | 47% | 46.6% | 46.07% | 45.56% | 45.12% | 44.52% | 43,86% |
| **Industry** | 22.38% | 23.52% | 24.36% | 24.36% | 24.38% | 24.34% | 24.29% | 24.47% | 24.69% |
| **Service** | 26.57% | 27.52% | 28.64% | 29.04% | 29.55% | 30.1% | 30.59% | 31.01% | 31.45% |

Source: India; World Bank; 2010 to 2018

The figures show that the majority of the workforce is engaged in agriculture sector which includes self-employment and job without agreement also. The other services sectors including education, health care, monetary services etc have high number of workers and conventional jobs. The structured manufacturing sector also comprises high share of agreement workers. In addition to these, the number of self-employed workers corresponds to 52%, regular workers correspond to 18% and daily wage workers correspond to 30% (Mehta, 2018). The above data proves that the high number of workers actually working just for survival and to meet their daily needs in India.

## AUTOMATION IN INDIA

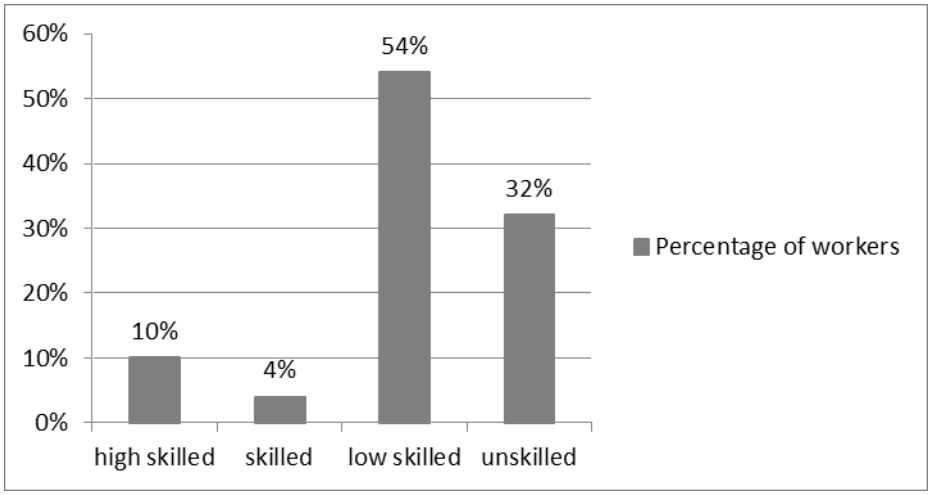
It is believed that the impact of technology on jobs will be more in developing countries as compare to developed countries. The report says that the percentage of jobs in India and China that have great risk with automation corresponds to 69% and 77% respectively for both countries (Global Perspectives & Solutions, 2016) as compare to USA and OECD countries that have risk of 47% and 57% jobs respectively. According to the report of World Bank, by the end of 2025, working population of India will increase to 70% and could be in great threat because of automation. The main sectors of jobs that will be affected include health care, education, architecture, insurance, journalism, human resource, marketing and management (Mashelkar 2018).

The automation requires skilled and educated workforce to work in hand with technological advancements. According to the report of Periodic Labour Force Survey (PLFS) 2017-18, the percentage of population getting technical teaching in 2017-18 is only 1.8%. Also, the high number of formally skilled workers is facing difficulty in finding job and approximately 33% of the young workers who has formal training were unemployed in 2017-18.

In addition to this, the jobs that can easily be automated with technological upgradation includes low skilled and unskilled jobs and more than half of the present working force is engaged in such jobs. According to the employment and unemployment survey of Labour Bureau (2015–2016), the percentage of high-skilled and normal-skilled workers corresponds to 14% of the total workforce and majority of workforce around 86% is involve in low skilled and unskilled jobs (Figure 1).

It is reasonably obvious that India will be more prone to the effects of automation or industry 4.0 technologies because of the percentage of people engaged in low-skilled and routine work.

**Figure 1: Percentage of workers based on their skills**




Source: Report on Fifth Annual Employment– Unemployment Survey (2015–2016).

In precise, capital-intensive industrial sector like automobile sector is mainly implementing new technologies for labour-intensive and repetitive jobs such as painting, assembling, inspections and logistics functions, which are being automated and will replaced by robots. As a result the low skilled workers engaged in such jobs are prone to lose their jobs and the percentage of unemployed labour force will increase. A top textile enterprise Raymond has substituted its 10,000 labours with robots in the former two years (Economic Times, 2016).

## CONCLUSION

India is a country of 1.32 billion individuals and its assets are extended without a doubt. Nonetheless, India needs to modify the manner in which it has generally managed issues as its general surroundings are evolving. As we talked about before fourth industrial revolution is headed to involve the world and likely gives extensive chances. Through Industry 4.0 it is believable to make drawn out life system with qualified workers and to endure on India's edge in manufacturing and can organize to substantial scale customization. In spite of the fact that it is exceptionally hard to deal with the practice, if players in the framework apply right changes there will be strengthened impacts. Consequently it is simple to convey the thought that companies in government and corporate division will benefit most with activities of industry 4.0. On the other hand industry 4.0 will bring many advantages for India such as it will lead to advancement, bring effective globalization, optimum usage of assets, smooth human and robots interaction, efficient vitality utilization, autonomous controlling, greater adaptability etc. However, the consequences will be seen in labour market utilisation, loss of low-skilled jobs, automation will shrink job market; unskilled workforce will be unemployed etc. So, by embracing Industry 4.0, we will have a noteworthy upper hand over worldwide competitors in economy. Above all and first we should have the pattern of rapidity with the end goal to catch this chance and to accomplish our objective.

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# GRANTING INVESTMENT AID TO BUSINESS SERVICE CENTERS IN SLOVAKIA

***Daniela NOVÁČKOVÁ*[90]**
***Darina SAXUNOVÁ*[91]**

**Abstract:** *As a result of the globalization process and the development of the digital industry, Business Services Centres are being created in Slovakia, which have employed more than 30,000 employees so far. Business Services Centres can get economic support in the form of investment aid. Business services centres are established primarily to optimize the market performance of businesses, increase business flexibility and efficiency. This scientific article analyses the legal conditions for granting investment aid to business services centres in Slovakia. The contribution of this scientific article is theoretical thresholds compilation and the analysis of the operation of Business services centres in Slovakia from the perspective of employment and their performance. The competitiveness of these centres depends on the quality of their management and on an effective strategy to ensure the long-term prosperity of the centre, referring to the secondary data analysis, we have also identified the business and service areas provided by these centres.*

**Key words:** *Business Services Centres, investment aid, employment, Industry 4.0*

**JEL Classification*:*** *E02, E60, E62*

## 1. INTRODUCTION

A major issue in awarding state aid is the political economy of state aid, the distortion of markets, and state aid impacts contradicting other policy goals such as environmental and social objectives (e.g. de Moor and Calamai, 1997; Myers, 1998). The Court of Justice of the European Union has repeatedly stated that one of the important and defining characteristics of a State aid is the 'condition of specificity': in order to amount to aid, the measure must confer assistance or advantage to specific undertakings. A propensity to influence trade between Member States is the standard by reference to which the compatibility of aid with the common market is to be evaluated. In general, recent litigation has drawn attention to several important difficulties in the definition of State aid. (Plender, 2012).

How to manage allocation of the financial resources to companies applying for the subsidy requires knowledge on businesses themselves, their environment, conservative approach of interpreting accounting information and fair evaluation of their needs (Vojtovic & Kralova, 2014; Hwang, Kim, 2018). Prof. Anabela Santos (2019, p.1) stresses, based on the research of innovation subsidies in Portugal, "that firms with the best proposals and with higher performance in the pre-intervention period are more likely to receive the subsidy. When the businessman invests in a fixed asset or technological progress a positive and sustainable effect of the state aid, up to 5 years, is evident, however, it seems it has an impact on the size of investment and not on the decision to invest. Prof. Santos argues that subsidized firms also perform worse than similar companies that are non-subsidized ones, owing to their lower effectivity "in achieving the planned goals concerning labour productivity and value creation." Studies about the impact of public support in Portugal show that subsidies can influence positively R&D expenditure (Marquesand Monteiro-Barata, 2006), sales growth (Serrasqueiro and Nunes, 2016) and employment level (Silva, 2011; Mamede et al., 2015;

[90] prof. JUDr., PhD., Comenius University Bratislava, Faculty of Management, Department of Economics and Finance, Odbojárov 10, P.O. BOX 95,820 05 Bratislava 25, Slovakia
[91] doc. RNDr., PhD., Comenius University Bratislava, Faculty of Management, Department of Economics and Finance, Odbojárov 10, P.O. BOX 95,820 05 Bratislava 25, Slovakia

Lavery et al.,2019). However, there is some doubt about the influence on productivity on alleviating firms' financing constraints (Silva and Carreira, 2012, 2017; Barbosa and Silva, 2018). Research made in other EU countries and in the US also reveal some divergence concerning the capacity of public support to leverage private investment and increase firm performance. Assuming that a public subsidy is provided to a company because the investment is expected to generate a specific return over a given period: Recommendations for the European Innovation Council (EC, 2016) emphasize that impact should be added as an evaluation criterion and closer interaction between applicants and evaluators is needed in the evaluation process. The case study under assessment (Portuguese Innovation Incentive System) already included impact as an evaluation criterion but the history showed the contradictory results as well, also the case of Slovak companies proving that the state aid is not a guarantee of the success (see analysed companies that were provided state aid), but it may help to it, if resources managed with cautiousness. To this extent, evaluating entities' efficiency and effectiveness to achieve objectives that have been planned, plays an important role from a policy creation because it can contribute to the design of more effective policy intervention, especially if non-subsidized firms outperform the same subsidized ones. We may conclude that it highlights the fact that public support has no added value and public money is not used effectively.

### *1.1 Shared Services – Basic Terminology and Theoretical Thresholds*

The recent rise of intelligent industrial robots and digitalisation fundamentally change the nature of industry and business in Slovakia. Innovation can be considered as one of the key areas for the economic growth and competitiveness of businesses, regions and, consequently, the state economy as a whole. Many enterprising entities are using digital technologies so as business services centres, which have also been adapting to this trend. There is no specific regulation on the term "business services centre" itself in the Commercial Code, but form of the ownership forms of majority of these entities are a limited liability company and mostly with foreign equity participation. The concept of the development of business service centres, sponsored by the Ministry of Economy of the Slovak Republic (2016), defines business service centres as branches of foreign or Slovak companies that perform in-house services for their headquarters and subsidiaries companies or outsourcing for third parties in accounting and finance, technology support, human resources, and others. Dohnal and Příklenk (2011) argue that shared service centres represent a combination of centralization and enhancement of processes and services, together with enhanced financial management and control of these services. Services possibly shared can come from all areas of the business. The main reasons for the creation and application of shared business centres are the efforts to reduce costs, the need for process standardization and harmonization, the augmentation of products and services, which is achieved by concentrating expertise professionals in one place. Shared Business centres are characterized by extensive cost savings, efficiency and flexibility (Tarisková and Skorková, 2017), (Beno, Saxunova, 2017), and this process also resulted in increased number of bankrupting or liquidating companies that lose their competitive power. (Novackova, Saxunova, 2014).

At present, two forms of business service centres operate in Slovakia. The first form are businesses called *Shared service centres,* which perform specific in-house processes, supporting key activities of headquarters and subsidiaries. The aim of shared service centres is to reduce total costs, since the geographical scope of these entities is relatively wide. These activities are also called "business service-insourcing", such as accounting, cash, credit and inventory management, marketing or information technology support services. Obviously, activities previously carried out by for instance, finance or other related departments in individual companies located in different countries will be concentrated into one or more specialized centres, that will perform these services for all branches and affiliates. The

second form of business service centres is *Business process outsourcing* providing business process services to other external entities. Entities of this kind can withstand strong competitive pressures and the outlook of their products and services reaches an international dimension. The Slovak legislation dealing with the financial assistance for a business service centre is being adapted to this emerging trend.

### *1.2 Legal Conditions for Investment aid for business service centres*

Providing investment aid in Slovakia to enterprises and non-profit organizations is linked to the state aid rules in connection with the European Union legislation. State aid issues are multidisciplinary in nature and are closely linked to public resources policy, business activity, employment policy, regional development and competition policy. The system of providing investment aid was introduced by Act No. 565/2001 Coll. on investment stimuli, which had been amended several times and eventually replaced by the Act on Regional Investment Aid in 2018. The name of the Act implies that this is investment aid that can be granted for the purpose of eliminating regional disparities. In principle, this is public aid to eligible entities.

The Court of Justice has consistently defined enterprising entities as entities engaged in an economic activity, regardless of their legal status and the way in which they are financed (Case C -180/98). It should be noted that the classification of an entity as an business entity always refers to its specific activity. The entity's performing both economic and non-economic activities, it is only considered an enterprising entity in relation to those particular ones of an economic nature. In this case, it is required for the enterprising entity to keep separate accounts, separately for economic activities and separately for non-economic activities.

By adopting Act No. 57/2018 Coll. on regional investment aid and on amendments to certain acts the special requirements for providing investment aid to business service centres have been created. When granting regional investment aid, State aid rules within the meaning of Article 107 (1) of the Treaty on the Functioning of the European Union (TFEU) shall apply. State aid was formally introduced into European Union statute law by the Treaty on establishing European economic community (Treaty of Rome) . Article 107 TFEU prohibits granting State aid which distorts competition and trade between Member States or when it is incompatible with the internal market. Article 107 (2) and (3) lays down the conditions for granting State aid. State aid may also be granted to remove regional disparities complying to the Article 107 (3a). This form of aid is also called regional aid, where the emphasis is on creating new jobs and region development in accordance with rules constituted in Act No. 336/2015 on support for the least developed districts. State aid is defined as an *advantage* in any form whatsoever conferred on a *selective basis to undertakings* by national public authorities. Therefore, subsidies granted to individuals or general measures open to all enterprises are not covered by this prohibition and do not constitute State aid (examples include general taxation measures or employment legislation. (European Commission, 2019). State resources include all public sector resources, including the resources obtained from national (decentralized, federal, regional or other) entities, moreover, under certain circumstances, also the resources from private entities. Public enterprise funds also constitute state resources in accordance with the Article 107 (1) of the TFEU, as the State can direct their use. The compatibility of State aid with the internal market can be acceptable in the sense of regional aid only if a balance is ensured between the resulting distortion of competition and the advantages deriving from the aid. The Slovak legal act on regional investment aid constitutes terms for granting direct or indirect state aid from public resources. The beneficiaries of the aid may be enterprises operating in industrial production and technology centres, and a combination of industrial production and technology centres, and business services centres. Business Service Centres are increasingly an important part of

foreign direct investments in Slovakia. Business Service Centres are affiliates or branches of foreign or Slovak companies that provide in-house services to their headquarters and subsidiaries or to third parties in the areas of finance, IT services, customer services, human resources support, purchasing, sales and others. (Ministry of Economy SR, 2019). An establishment providing centralised support services, in particular services in the area of company management, information technology, accounting, finance, legal services, control, procurement, marketing, and human resources, with the exception of labour outsourcing services. The number of centres of this kind is constantly increasing. In addition to the Regional Investment Aid Act other legislation is applied:

a) Regulation of the Government of the Slovak Republic No. 195/2018 Coll. laying down the conditions for granting investment aid, the maximum investment aid intensity and maximum investment aid amount in the regions of the Slovak Republic;

b) Decree of the Ministry of Economy of the Slovak Republic No. 187/2018 Coll. laying down the details of the application for investment aid, acceptance of investment aid offers, annual progress report on investment project implementation, report on investment project completion, annual investment utilisation reports, final evaluation reports and information boards;

c) Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, as amended;

d) Guidelines on regional State aid for 2014-2020 (2013/C 209/01).

## 2. PROBLEM FORMULATION AND METHODOLOGY

The Slovak legal act on regional investment aid constitutes terms for granting direct or indirect state aid from public resources. The beneficiaries of the aid may be enterprises operating in industrial production and technology centres, and a combination of industrial production and technology centres, and business services centres. Business Service Centres are increasingly an important part of foreign direct investments in Slovakia. Business Service Centres are affiliates or branches of foreign or Slovak companies that provide in-house services to their headquarters and subsidiaries or to third parties in the areas of finance, IT services, customer services, human resources support, purchasing, sales and others. (Ministry of Economy SR, 2019). An establishment providing centralised support services, in particular services in the area of company management, information technology, accounting, finance, legal services, control, procurement, marketing, and human resources, with the exception of labour outsourcing services.

The scientific study analyses the system of providing investment aid for business service centres in a broader context from the legislation perspective, as well as it presents data on the employment of workers in these centres and highlights the concentration of these centres in Bratislava. In the theoretical level the objective of the study is to analyse legislation that represents the base of rules, directives etc. that must be followed in the sector of the shared business services.. The secondary data obtained from the Finstat database on the companies that received the state aid are analysed focusing on selected financial results such as ROS, ROA and ROE and net income of selected companies that were recipients of the state aid in the past. In addition, it highlights a) the amount of taxes paid to the state´s budget, showing current income tax (that was paid) and b) deferred income tax (that will be paid to the state in the future (positive number designating deferred tax liability) or returned by the state in the future (negative number designating deferred tax asset) that means it is a proof to what extent

the entity´s fulfilling the public duty to contribute financial resources to the state budget. These resources may be utilised for the public services financing, thereby augmenting the cost of life in the regions what is the goal of providing state aid. The Business Services Centre may obtain investment aid in the form of a subsidy for acquiring tangible and intangible fixed assets, receiving income tax relief or a new job allowance, up to the amount representing a proportion of the investment aid value to the value of eligible costs. Classical methods such as comparison, synthesis and analysis, deduction are applied in this scientific study.

The systematic data analysis on providing the aid to eligible entities in the area of shared business services has revealed that it is a non-manufacturing industry with a higher added value, increasing the employment of qualified labour in regions. It is obvious that employees possess skills in using IT technologies and abilities to enhance their knowledge.

The minimum value of the acquired property is Eur 400,000 is an essential requirement, and 50 percent of the financial resources are covered by the equity financing. Moreover, the investment plan includes creating 40 new jobs, of which at least 60% of the total number of new employees are employees with a university degree. The must is that recipient of the state aid is to keep and support these newly created working positions for the period of minimum 5 years, since the date of the first job created. This is decisive. These conditions laid down in the law are directly linked to regional development policy and the elimination of unemployment. In this context, it can be stated that the principle of regional investment aid is derived from:

(a) the place where the centre is located,

(b) the number of new jobs created,

(c) the degree of sophistication and added value of the Centre's activities following regional development.

## 3. RESULTS AND DISCUSSION

Referring to the data in the Commercial Register of the Slovak Republic (2019) we found that the largest number of centres is in Bratislava. The Ministry of Economy of the Slovak Republic maintains the list of Business Service Centres. As of 1 August 2019, 39 centres of this type have been registered in Slovakia. Taking into account the primary activities occurring regularly stated when registering in the Commercial Register of the Slovak Republic in Slovakia, these centres can be divided into four categories (www.orsr.sk):

(a) 61% of them operate in the consulting, accounting, finance, IT and telecommunications services sectors;

(b) 31% shall be in industrial production;

(c) 27% high-tech; and

d) 15% of them work in the field of software development.

### *3.1 Provision of regional investment aid*

In the form of a resolution, the Government of the Slovak Republic approves regional investment aid (previously investment aid or investment stimuli). The table 1 illustrates the amounts of state aid granted, the year of provided state aid stating the number of new jobs created. Most often, the state aid is granted in the form of income tax relief, assistance of forming new jobs with higher added value for skilled university workers, or for general and specific education.

Subsidy recipients, which are the business centres, benefit from the obtained assistance by performing their entrepreneurial activities and many businesses come from less developed regions for example Kosice, Nitra. as seen in table 1. However, it cannot be unequivocally

**Table 1: The Investment aid allocation to Business service centres 2004-2016**

| Company | Total aid in EUR | New jobs | Date of state aid approval |
|---|---|---|---|
| LafargeHolcim European Business Services Ltd. Kosice | 652,000 | 80 | 5.11.2015 |
| Holcim Business Services ltd., Kosice | 719,800 | 61 | 26.06.2014 |
| IBM Slovakia Ltd., Košice , 2013 | 1,575,000 | 150 | 7.10.2013 |
| T-Systems Slovakia, Ltd., Kosice | 5,079,000 | 350 | 15.10.2013 |
| T-Systems Slovakia, Ltd. Kosice | 11,976,366 | 900 | 28.08.2008 |
| Embraco Slovakia Ltd., Kosice, 2014 | 900,000 | 21 | 25.04.2014 |
| DELL,Ltd., Bratislava 2004 | 1,955,122 | 274 | 15.04.2004 |
| DELL, Ltd., Bratislava 2006 | 6,546,650 | 851 | 20.12.2006 |
| Johnson Controls International,Ltd., Trenčín, 2006 | 7,700,989 | 520 | 20.12.2006 |
| OSRAM, Inc. Nitra 2015 | 1,230,000 | 205 | 19.01.2016 |

Source: Elaborated by the authors based on Ministry of Economy of the Slovak Republic, 2018)

stated that expectations were fulfilled as expected as the unemployment rate in this region achieves 7.71% according to data from the Statistical Office of the SR, which is the second largest unemployment rate in comparison with other regions in 2019. [92]Employees work directly on projects in an international environment and for customers around the world. Business service centres are also operating in other countries. For instance, in its reports, the Czech Business and Investment Promotion Agency reports that more than 200 companies were active in the business services sector in 2017. 80% of these companies perform services for their companies and 20% of companies outsource these services that are performed for them. Currently, the number of centres increased by 12% in 2018. Robotization centres have grown significantly. The largest share amounting to 31% belongs to the US companies and German companies' share is 12% (Velecký, 2019). One of the frequent conditions for granting financial assistance is also the new jobs creation. In terms of employment, the centres are among the largest employers in Slovakia. The following table illustrates the number of employees in selected business centres. Data were obtained from FinStat database.

**Table 2: Number of employees registered in selected business service centres in 2019**

| Company's name | Employment |
|---|---|
| **IBM International Services Centre -** Accounting and internal audit, bookkeeping and tax consulting | 4941 |
| **T-Systems Slovakia -** IT service and IT service management | 3000-3999 |
| **AT&T Global Network Services Slovakia -** Telecommunication activities | 3000 |
| **DELL Ltd. -**Consulting in the area of management and entrepreneurship | 2000 |
| **Accenture Technology Solutions, Slovakia -** Processing data, providing server's space in the internet and related services | 1000-1999 |

Source: Adapted by authors from Finstat (2019).

[92] to read on the reasons why this may happen, read the paper by Novackova and her research team (Novackova et al., 2018).

The facts on GDP growth suggest that GDP per capita in EUR / in 2017 by regions in the Presov and Kosice regions per year is EUR 11,127 which is the lowest value compared to other regions (Bratislava Region EUR 36,709), Trnava Region, Trencin, Nitra - EUR 14,426; Region Zilina, Banska Bystrica - EUR 12,437. (Ministry of Transport, SR, 2018). In 2015, the labour costs of the employees of the Slovak centres, income tax, together with social security contributions, amounting to EUR 325 million represented the income for the state budget. Out of which the amount, approximately EUR 140 million, belonged to Kosice's self-governing region. (VUC, Kosice, 2019). In this context, we are persuaded that the level of benefits obtained should also be measured when providing regional investment incentives to business service centres, in particular referring to the return on investment incentives provided. The methodology of calculating effects should also include the benefits of BSC operations in the region, including also monitoring macroeconomic indicators as well. Reports should stress the full return on investment aid granted or the incomplete return on investment aid granted.

It may be assumed that the regional investment aid granted is beneficial for the region. An essential prerequisite for the successful development of economic activity business service centres in addition to technology is also an educated workforce. In the new economy, education increases the return on investment that ensures sustainable economic growth and competitiveness. To work in BSC requires a higher level of foreign language skills, digital and soft skills, and ability to work in a team. BSC continuously invests in the training and continuous training of its employees, which are benefits that they will retain even after their employer changes. In terms of professional focus, these categories of professionals are position in the area of:

A. Accounting, Finance and Tax: Financial Analyst, Financial Advisor, Tax Assistant/Specialist, Accounting Specialist.

IT - Application Support Specialist, SAP Specialist, SQL Reporting Specialist, 1st Level Specialist, Network Architect & System Engineer , Application Architect & Developer or-System Administrator.

### *3.2 Results and Discussion to the Economic Results of the Selected Companies*

The following tables demonstrate the performance of the several business companies that received the state aid. The year of the state aid accepted is marked on the table, some companies received this even in earlier years (see table1).

**Table 3: Dell, Ltd. In Slovakia**

| | pM | Operating | Net Profit | Income Tax | | ROE | ROA |
|---|---|---|---|---|---|---|---|
| **DELL** | in % | Revenue* | | Current | Deferred | in % | in % |
| **2018** | 4,0 | 159 301 263 | 6 805 066 | 3 689 315 | - 1 525 018 | 14,3 | 8,0 |
| **2017** | 6,0 | 106 082 759 | 6 140 970 | 1 684 341 | 215 640 | 7,6 | 5,6 |
| **2016** | 6,0 | 84 341 101 | 4 986 374 | 2 073 300 | - 284 651 | 6,7 | 5,4 |
| **2015** | 6,0 | 78 071 416 | 4 648 597 | 2 031 342 | - 473 092 | 6,7 | 5,4 |
| **2014** | 6,0 | 77 393 959 | 4 601 845 | 1 519 892 | 37 176 | 7,1 | 5,7 |
| **2013** | 7,0 | 79 433 467 | 5 751 503 | 2 175 045 | - 147 323 | 9,5 | 7,6 |
| **2012** | 8,0 | 73 965 667 | 5 594 297 | 1 299 771 | 29 768 | 10,3 | 8,6 |
| **2011** | 8,0 | 78 662 723 | 6 094 362 | 1 795 546 | 41 435 | 12,5 | 9,7 |
| **2010** | | | 5 634 671 | 2 050 538 | - 519 868 | 12,4 | |
| Legenda: | *Operating revenue including the the sale of non-current assets & securities | | | | | | |

The Company Dell in Slovakia received the state aid in years 2004 and 2006 amounting approximately 8,5 mil EUR and its results are stable, the company is profitable and a stable job provider and a regular tax income contributor to the state budget.

**Table 4: Johnson Controls International Ltd. in Bratislava, Slovakia**

| J&C | pM in % | Operating Revenue* | Net Profit ( Net Loss) | Income Tax Current | ROE in % | ROA in % |
|---|---|---|---|---|---|---|
| **2018** | - 1,20 | 108 156 000 | - 1 266 000 | - | - 1,5 | - 0,4 |
| **2017** | - 1,70 | 80 921 701 | - 1 363 666 | 4 260 664 | - 1,6 | - 0,3 |
| **2016** | - 1,50 | 65 001 000 | - 948 000 | 728 000 | - 1,1 | - 0,4 |
| **2015** | 5,70 | 626 310 633 | 35 545 798 | 10 576 441 | 31,6 | 8,0 |
| **2014** | 2,70 | 633 366 388 | 17 116 897 | 5 056 373 | 14,7 | 3,6 |
| **2013** | 2,20 | 618 169 413 | 13 644 833 | 1 781 760 | 13,8 | 3,0 |
| **2012** | 2,70 | 670 510 395 | 17 166 568 | 1 878 840 | 20,3 | 4,6 |
| **2011** | - 0,50 | 508 579 250 | - 2 390 958 | 1 199 566 | - 3,5 | 0,7 |
| **2010** | 25,00 | 388 875 754 | 96 848 276 | 14 447 404 | 146,3 | 30,3 |
| **2009** | - 0,11 | 302 273 789 | - 32 004 391 | - | n/a | - 23,3 |
| **2008** | 1,10 | 480 924 459 | 5 471 048 | 4 303 | 60,8 | 3,9 |
| Legenda: | *Operating revenue including the the sale of non-current assets and securities | | | | | |

The Company Johnson Controls International in Trencin was liquidated in 2011, although it received the state aid in year 2006. There are branches in Bratislava and Lucenec, in Slovakia. The company is Bratislava in Slovakia in last three years is in red numbers achieving net loss, the ROE was higher between years 2010-2015 and before crisis, and because the company´s debt has been stable since 2009 achieving levels over 70% the results ROE and its positive numbers were also enhanced by utilising the financial leverage. The negative results are due to a big decrease in Operating revenues. But in the year 2018 there was a slight increase in revenues, also 2018 loss decreased compared to 2017 loss. The payment of taxes is very volatile, in 2014, the company had a large deferred tax asset, almost 4 mil, that could be due to the minimum tax licence introduced in the year 2014.

**Table 5: T-systems Slovakia, Ltd.**

| T -systems Slovakia | pM in % | Operating Revenue* | Net Profit | Income Tax Current | Deferred | ROE in % | ROA in % |
|---|---|---|---|---|---|---|---|
| **2018** | 5,5 | 150 883 040 | 8 304 912 | 2 370 516 | - 307 322 | 23,7 | 12,1 |
| **2017** | 4 | 142 382 808 | 5 707 692 | 1 815 927 | - 146 487 | 17,6 | 9,2 |
| **2016** | 6,1 | 135 850 508 | 8 315 913 | 2 652 912 | - 281 123 | 23,7 | 13,2 |
| **2015** | 5,9 | 123 390 070 | 7 238 497 | 2 853 720 | - 799 931 | 21,3 | 12,3 |
| **2014** | 8,3 | 105 897 157 | 8 774 160 | 3 417 272 | - 686 719 | 24,7 | 15,0 |
| **2013** | 3,6 | 94 278 785 | 3 353 262 | 1 407 829 | - 445 927 | 12,5 | 6,8 |
| **2012** | 4,6 | 80 703 590 | 3 712 974 | 471 186 | - 358 888 | 15,9 | 8,4 |
| **2011** | | 71 949 999 | | 644 286 | - 174 928 | | |
| **2010** | 11,8 | 60 355 871 | 7 143 117 | 986 467 | - 204 429 | 46,5 | 25,2 |
| Legenda: | *Operating revenue including the the sale of non-current assets & securities | | | | | | |

The Company T-systems Slovakia, Ltd. Slovakia received the state aid in the years 2013 and 2008, together approximately 17 mil Eur and created 1250 jobs. The company´s results are gradually growing and all monitored financial indicators are positive and the company is an income tax contributor showing that company discloses the deferred tax asset each year and the highest in the years 2014 and 2015 (minimum tax licence introduced) applying the tax optimisation, the volume of the debt is optimal (cca 45,5% since 2009).

**Table 6: IBM Slovakia, Ltd. Kosice**

| IBM | pM | Operating | Net Profit | Income Tax | | ROE | ROA |
|---|---|---|---|---|---|---|---|
| | in % | Revenue* | | Current | Deferred | in % | in % |
| **2018** | 4,3 | 241 442 000 | 13 583 000 | 2 967 000 | 220 000 | 73,5 | 22,4 |
| **2017** | 4,3 | 231 594 000 | 12 696 000 | 3 218 000 | -493 000 | 93,0 | 23,7 |
| **2016** | 3,1 | 209 659 000 | 9 229 000 | 2 565 000 | 235 000 | 91,2 | 16,9 |
| **2015** | 3,3 | 195 947 000 | 8 377 000 | 2 287 000 | -334 000 | 76,7 | 15,5 |
| **2014** | 3,2 | 186 605 164 | 7 933 278 | 2 502 069 | -622 060 | 59,6 | 13,6 |
| **2013** | 5,6 | 171 449 009 | 12 225 549 | 3 089 832 | -5 438 | 99,1 | 21,4 |
| **2012** | 2,8 | 149 097 506 | 5 341 833 | 1 134 596 | -241 455 | 72,2 | 8,9 |
| Legenda: | *Operating revenue including the the sale of non-current assets & securities | | | | | | |

The IBM in Slovakia received the state aid in year 2013 amounting approximately 1,6 mil EUR and new 150 jobs were created. The results of the company´s performance are excellent as far as ROE and ROA presented. The company is profitable with a growing net income, but the amount of profit earned could be a signal of higher tax revenue for the state budget, but taxes paid are very low. The high ROE is caused by high financial leverage (company utilises debt for financing from 70%-90% over years since 2012) based on financial statements disclosed.

**Table 7: LaFarge Holcim European Business Services, Ltd. Kosice**

| Lafarge | pM | Operating | Net Profit | Income Tax | | ROE | ROA |
|---|---|---|---|---|---|---|---|
| Holcim | in % | Revenue* | | Current | Deferred | in % | in % |
| **2018** | 1,0 | 13 592 654 | 137 453 | 322 521 | -107 841 | 20,00 | 2,09 |
| **2017** | 13,5 | 15 145 616 | 2 039 801 | 445 519 | -249 541 | 3,81 | 22,30 |
| **2016** | - 30,2 | 9 710 758 | - 2 931 614 | 83 748 | 148 098 | | -55,58 |
| **2015** | - 8,2 | 12 563 565 | - 1 035 830 | 6 522 | -112 913 | -116,5 | -14,11 |
| **2014** | - 1,0 | 1 771 761 | - 18 052 | 22 722 | -35 186 | | -0,04 |
| **2013** | n/a | | - 62 203 | | | | -72,53 |
| Legenda: | *Operating revenue including the the sale of non-current assets & securities | | | | | | |

Provided state aid to LafargeHolcim EBS in years 2014 and 2015 assisted in improving the performance results dramatically, as shown in table 7. The company's debt is very high and its impact on ROE will be stronger if the volume of debt will decrease (see year 2018 when the debt declined to 89,5%, in 2013 it was 166% of debt. ROA must be higher than Interest rate after tax to obtain a positive impact of debt on ROE. (Saxunova, 2014)

**Table 8: Embraco Slovakia, Ltd. In Spiska Nova Ves**

| Embraco | pM | Operating | Net Profit | Income Tax | | ROE | ROA |
|---|---|---|---|---|---|---|---|
| Slovakia | in % | Revenue* | | Current | Deferred | in % | in % |
| **2018** | 3,4 | 238 198 000 | 8 115 000 | 3 263 000 | - 595 000 | 14,2 | 6,2 |
| **2017** | 3,5 | 243 228 000 | 8 313 000 | 3 172 000 | - 574 000 | 16,1 | 6,2 |
| **2016** | 3,5 | 225 140 000 | 7 848 000 | 3 495 000 | - 938 000 | 8,9 | 4,8 |
| **2015** | 4,4 | 237 324 000 | 10 426 000 | 3 383 000 | - 1 271 000 | 13,6 | 6,7 |
| **2014** | 3,9 | 221 801 000 | 8 466 000 | 2 041 000 | 555 000 | 12,4 | 6,2 |
| **2013** | 3,5 | 223 877 000 | 7 743 000 | 2 293 000 | - 288 000 | 13,0 | 5,3 |
| **2012** | 2,9 | 222 716 000 | 6 468 000 | | | 12,4 | 4,4 |
| **2011** | 2,9 | 183 350 000 | 5 291 000 | | | 11,2 | 4,8 |
| **2010** | 1,3 | 173 845 000 | 2 325 000 | | | 3,9 | 1,7 |
| Legenda: | *Operating revenue including the the sale of non-current assets & securities | | | | | | |

The Company Embraco Slovakia, a state aid recipient in the year 2014, shows stable profitable results, a stable job provider and a regular tax income contributor to the state budget.

**Table 9: AT & T Global Network Services, Ltd. in Slovakia**

| AT&T | pM | Operating | Net Profit | Income Tax | | ROE | ROA |
|---|---|---|---|---|---|---|---|
| | in % | Revenue* | | Current | Deferred | in % | in % |
| **2018** | 4,4 | 189 706 065 | 8 438 342 | 2 773 031 | - 293 277 | 24,47 | 11,54 |
| **2017** | 2,7 | 147 744 656 | 4 013 840 | 1 892 444 | - 370 083 | 15,41 | 6,77 |
| **2016** | 2,4 | 130 167 196 | 3 168 077 | 1 622 963 | - 155 450 | 14,38 | 6,06 |
| **2015** | 1,4 | 119 134 957 | 1 618 228 | 1 412 812 | - 512 407 | 8,58 | 3,48 |
| **2014** | 3,1 | 113 098 797 | 3 535 823 | 1 443 289 | - 56 917 | 20,51 | 8,34 |
| **2013** | 1,2 | 104 362 165 | 1 238 458 | 1 077 946 | - 231 418 | 9,04 | 3,05 |
| **2012** | 1,5 | 89 696 075 | 1 338 696 | 832 026 | - 369 639 | 10,74 | 3,6 |
| **2011** | 3,5 | 71 535 698 | 2 497 579 | 881 316 | - 17 740 | 22,44 | 7,19 |
| **2010** | 1,6 | 50 519 270 | 831 562 | 370 937 | - 17 966 | 9,64 | 3,03 |
| **2009** | 4,3 | 41 080 068 | 1 751 858 | 429 217 | 153 412 | 22,46 | 7,15 |
| Legenda: | *Operating revenue including the the sale of non-current assets & securities | | | | | | |

Source: tables 3-9 : Processed by authors based on Finstat, 2019.

The AT&T is not a state aid recipient, in spite of it it shows stable profitable results, it is a stable job provider and a regular tax income contributor to the state budget.

## 4. CONCLUSION

Digital technologies have an impact on business and the emergence of new business models. Based on the facts, we pointed out that there is an increasing number of Business Services Centres in Slovakia, which are justified in terms of employment. It was found that most centres are foreign-owned based on business register in Slovakia. *The main factors that make the Slovak Republic an excellent location for Business Services Centres are:* government support- aid, telecommunication and data networks, talented workforce available at a lower price, location in the centre of Europe. From analysed companies we may conclude state aid in majority cases is a catalysator of the better performing company. The study contributes, on the theoretical level, with clarification of shared business services from Slovak perspective and in the empirical level its contribution is information on the state aid recipients. There is a room to explore the group of non-recipients and recipients of the state aid and other selected aspects of their performance. In conclusion, Business Service Centres are created as legally independent economic entities, with their own organizational structure supporting the objectives of the knowledge economy. They can be considered as new business entities, which have been operating for about 10 years on the Slovak market, creating new jobs with higher added value. They are established to improve quality (process optimization and service improvement), use of IT technology and to reduce operating costs (human resources and infrastructure costs).

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# STUDENT COACHING IN THE PHASE OF CHOOSING THEIR PROFESSION: GENERATION Z NEEDS ORIENTATION

***Nadja PADE*[93]**
***Rozalia SULIKOVA*[94]**
***Lubomira STRAZOVSKA*[95]**

***Abstract:*** *This article shows that a career-oriented counselling of Generation Z during the last school years or immediately after school simplifies the successful selection of a career path, leads to a fewer drop-outs and seems to provide the candidates with advantages in later working-life. In a world where opportunities are becoming more and more diverse, digitalization is advancing, new professional fields are emerging and others are dying out, it is not easy for the youngest generation to make choices regarding their future professional route. The increasing acceptance of coaching services means that specialized coaching programs can be established. In many large cities coaches already offer professional coaching guidance for students and stand out in approach, result but also in price from the stately vocational advices. The article is based on an empirical evidence and highlights the success of a special student coaching in the format of a self-responsible process.*

***Key words:*** *coaching, generation Z, orientation*

***JEL Classification:*** *D23, J24, M53*

## 1. INTRODUCTION

The article deals with the success of student coaching for vocational orientation. Student in this context means young people who are about or just finished their secondary school. At a time in life when young people do not know what to expect, but definitely want to and are able to shape their future (Daheim & Wintermann, 2016), many are often helpless. Between uncertainty and autonomy, they are more likely to make no decision than a wrong decision regarding orientation. Parental advice is often not desired at this stage (Thimm, 2013).

It does not help, that the progressive digitalization is erasing or transforming entire occupational profiles and is changing processes within organizations increasingly. Generation Z, which has different expectations of working live than generation Y before, and who strives for self-realization (Brademann & Piorr, 2019), offers fertile soil for coaching in this phase.

To take on and follow up a common thread means to take responsibility for oneself and live with consequences. Responsibility that not only the young person, but also often the parents or reference persons shy away from. Environment has a say and an opinion on the subject of career choice, but it is difficult, ultimately also due to the lack of knowledge about new career opportunities, to give a concrete direction.

Those who have taken a path often end up in doubt later, loose their motivation or drop out of their way. In 2016, for example, 25% of students at German universities and 32% of students at universities of Applied Sciences dropped out of their studies (Autorengruppe

[93] Comenius University in Bratislava, Faculty of Management, Odbojarov 10, Bratislava 820 05, Slovakia, nadja.pade@fm.uniba.sk
[94] Assoc. Prof. PhDr., PhD., Comenius University in Bratislava, Faculty of Management, Odbojarov 10, Bratislava, 820 05, Slovakia, rozalia.sulikova@fm.uniba.sk
[95] Assoc. Prof., PhD., Comenius University in Bratislava, Faculty of Management, Odbojarov 10, Bratislava 820 05, Slovakia, lubomira.strazovska@fm.uniba.sk

Bildungsberichterstattung, 2018). How can an offer of orientation before the vocational choice help to go a professional path highly motivated?

### *1.1 Generation Z*

Different authors and studies on the youngest generation Z vary in terms of definition of its birth years: e.g. a birth rate as 1995 – 2009 (McCrindle, 2014) or simply "after 1997" (Bresman & Rao, 2017) is mentioned - anyway it is the youngest generation to join the labour market (Lanier, 2017).

**Table 1: Five things Human Resources needs to know about generation Z**

- the first true digital and mobile native generation from birth
- diversity is an expectation
- driven by traditional opportunities for advancement and development improved economic security and better benefits
- is more entrepreneurial than Millennials
- wants frequent in-person feedback

Source: Lanier, 2017, and Millennial Branding and Randstad, 2014

Generation Z has thus pinned high expectations on its (future) working life with a multiplicity of possibilities, mainly due to the digital prerequisites. Generation Z, like most young people, strives for self-realization, that parents are strongly protective and controlling, hardly bothers. On the contrary, the generation accepts rules and even likes to relent responsibility. According to Csehné Papp, I., Szabó, K., Schwarczová, L. & Hajós, L. (2017) generation Z is characterized by the multitasking ability as well as collaborative learning and self-regulation.

It does not seek performance as much as its predecessors and generation of parents: it is the generation of heritage and does not have to develop its own prosperity. Freedom and security play a role nevertheless (Meier & Lebok, 2016). Generation Z is convinced that their education is the key factor in achieving their goals but makes little effort to gain access to universities (Chillakuri & Mahanandia, 2018).

### *1.2 Student Coaching*

The German coaching market is still on the move (Coaching Report, 2018). The 2016/2017 Coaching Market Analysis records trends with 62,9% of customers being non-corporate individuals (Stephan & Rötz, 2017). This trend is increasing and may be an indication that coaching is more and more being used by private individuals for professional events (Stephan, 2017). The specialization considered here, student coaching, has so far scarcely been illuminated in the scientific literature.

Starting from the American business consulting in the 1990s, career coaching established itself in Germany from the year 2000. Initially withheld high performers in well-paying companies, business coaching has become an offer that is also increasingly being taken up by private individuals (Stephan & Rötz, 2017).

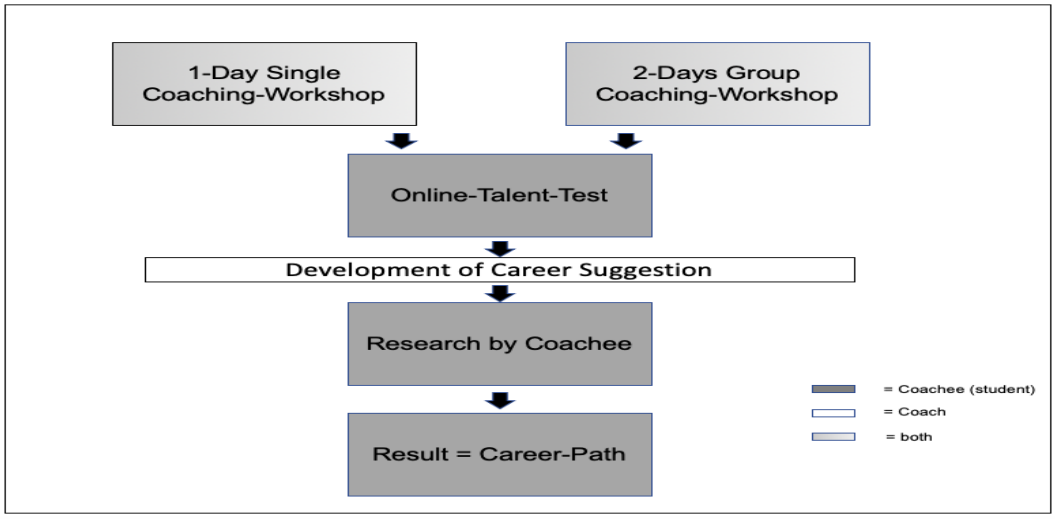
The word coaching, originally born in Hungary meaning "carriage", shows that it can help to make an own way to - vocational - destination (Fischer-Epe, 2018), helps to transfer knowledge, changes behaviors and attitudes. Career coaching is a combination of individual advice, in-person feedback and practice-oriented training for several professional topics, like role clarification and position determination or, like in this case, personal motivation and development of professional career or development (Fischer-Epe, 2018).

Literature does not indicate when first private student coachings were offered. Extracurricular measures for vocational preparation have been developed at the end of the 19th century/beginning of the 20th century as part of the women's movement (Meyer-Haupt, 1995). At what time parents started to prepare their children individually and not only through school for the choice of education can only be presumed and has probably been established since the beginning of 21st century.

Most German schools offer vocational guidance, which often includes "one-to-one" conversations with school experts or from governmental vocational information centres and usually just explains what is on the market – a match with talents and preferences of the student is rarely carried out or is only based on one's own self-assessment.

This article examines the success of student coaching and the possible positive consequences for the coachee's future career. It looks at a processual coaching, which is made up of various steps and not as a selective consideration. The result – the career path - is based on a workshop, in which strengths and development potentials are worked out with a coach and talent-based exercises are carried out, as well on the outcome of an online-test with queries in: self-assessment, cognitive skills and knowledge assessment and on the student's own research on the career suggestions developed by the coach.

**Table 2: Process of student coaching**




Own Source, 2019 (concept by von Bargen & Partner)

## 2. PROBLEM DESCRIPTION AND METHOD

The article focuses on the outcome of this student coaching in the years 2013 to 2019 and highlights the question whether it contributes to a more successful choice of training/career orientation. All participants, former student coachees, attended or had recently completed a secondary school at the time of the coaching. The survey focused on whether the professional proposal resulting from the coaching was accepted and followed up or has even been

completed and was conducted online. Each participant received an individual non-sharable link to answer the questions, embedded in a personalized email.

The questionnaire, specifically developed for this survey, was carried in February/March 2019. Full anonymity of the results was guaranteed – no personal data was queried. The main part included 18 questions on the experience of student coaching and the career path followed. It also asked whether the strived profession had already been absolved by a family member. Two questions dealt with the socio-demographic variables gender and age of the participants. The first part of the survey included questions such as when the coaching took place and the level of schooling at this time: still a pupil, already finished school or already dropped out of a training. It was also asked which career path the student coaching has resulted. The other questions concerned if the path was taken up, had already been completed or whether it was intended to be completed.

Participants who did not follow the resulted path were asked which training they had alternatively started/completed. The attitude to coaching/professional counselling was asked: whether further consultations were used and if coaching would be used as a future decision support. The following questions dealt with the subjective assessment of the respective participant, to what extent the coaching was perceived as supportive, which part of the steps had the most positive effects and what else the participants could take out of the process: e.g. experiences for self-image, better preparation for job interviews. Another question asked whether benefits for later working life are seen. The enquiries were carried out partly by closed questions, partly in semi-open questions (which career path was developed in the coaching). The questions included attitudes and opinions, behavioral questions and questions about characteristics. Differentiated questions for measuring personal attitudes were asked with 3- or 4-step Likert-scales.

The survey was sent to 139 participants (59 male, 80 female participants). 37% (51 respondents) answered the survey, of which 65% were female and 35% were male. The largest proportion, 51%, of the respondents were between 18 to 20 years old at the time of coaching, followed by the 16 to 17 years old (29%) and the 20 to 24 years old with 20%.

## 3. RESULTS AND DISCUSSION

The main group of participants consisted of pupils from a grammar school with 55%, while only 2% attended a different format of the secondary school. 33% had already graduated, 4% were trainees and 6% had already enrolled as students. At the time of coaching, 6% of the coachees had already dropped out of a training/study.

No pattern was discernible in the training courses or degree programmes that were developed. The most frequently represented career path was "Psychology" or "Business-Psychology". 16% of the participants worked to start a course of study in this direction. "Architecture" was the second most common result of coaching, with 8%. It is significant, however, that 92% of the participants aspired a degree at a university or a university of Applied Sciences, only 8% of the participants wanted to start an apprenticeship (here: the classical German training in the dual format: company/practical phases alternate with vocational school phases, either in contiguous blocks or one or two days a week, training usually lasts between 2 and 3,5 years). It is interesting to note that 84% of the participants continue to pursue or plan to pursue the proposal drawn up in student coaching. Of these 84%, 95% plan to complete or have already completed the route.

These figures are completely contrary to the drop-out rate in all bachelor's programmes at universities and universities of Applied Sciences in Germany, which was in total 28% in

2012, 29% in 2014 and 28% in 2016 (Autorengruppe Bildungsberichterstattung, 2018). It is interesting to note that in 2016 the courses "Psychology" (universities), "Social Sciences" (universities of Applied Sciences) and "Architecture" (both) are among the five courses with the lowest rates of drop-out in Germany.

Of the participants 69% did not use further coaching or career counselling, while the other 31% also took advantage of other offers. Of those 50% have taken advantage of the offer of vocational guidance from the governmental Employment Agency. However, only 41% said that participating in student coaching has led to them starting their training more quickly. It is worth noting that of the 16%, who did not follow up on the proposal drawn up in student coaching or do/did not plan to do so, 62% have taken advantage of further coaching or vocational training. So even this group still shows their need of coaching.

Basically, all participants were satisfied or very satisfied with the student coaching in terms of process design and meeting expectations. 98% felt encouraged and supported in their professional decision making, more than half of them even felt very supported. 67% of all participants would take up also in the future vocational consulting offers and/or business coaching. Only 4% ruled this out, whereas 29% were not yet sure whether to do so again.

71% saw the success of the coaching as being based on the process, which consists of several sessions/building blocks. More than half of the participants, 65%, also saw the success as being based on their own contribution (intensive research), so that a total of 76% of the participants felt that they could always make their own decisions and even considering the role of parents, 88% felt that their parents have always let them make their own decisions. Only 26% chose a direction that has already been completed by one of the family members.

## 4. CONCLUSION

This research shows that processual student coaching with integrated self-developed decisions is a helpful tool for generation Z. It presents that this generation can successfully accept orientation and support in this orientation phase and even assumes that this will be of advantage to them in future professional life. The fact that 84% of the participants have followed up the suggestion or plan to do so and that 95% of those have already completed their training or plan to do so, speaks for the security provided by coaching and counteracts the trend towards dropping out of university. Our suggestions therefore are that the use of a student coaching in the phase of orientation is purposeful and could even give advantages in future career steps. It should be stressed also that if communication with the young generation should be effective it is of great importance to develop and maintain appropriate communication channels. When formal communication channels are weak, the importance of informal communication channels is stronger and fills the gap of adequate channels for information flow (Bencsik, A., Juhasz, T., Mura, L. & Csanadi, A., 2019) - coaching is an alternative.

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# THE USE OF ICT IN ENTERPRISES OF THE SLOVAK REPUBLIC IN THE CONTEXT OF INDUSTRY 4.0

***Dagmar PETRUŠOVÁ***[96]
***Peter PETRUŠ***[97]

**Abstract:** *Industry 4.0 is a natural evolution that uses current technology as a tool to increase the competitiveness of businesses. However, by its scale, this change also exceeds the possibilities of an ordinary company. The ultimate goal is to implement a long-term strategy that will create the preconditions for successful business development. The implementation of the strategy should be intensive and extended to all areas of the company. It is based on the experience gained and the procedures should be permanently improved. Information and Communication Technologies (ICT) are now used by all business entities. Larger businesses have more opportunities to invest in and use ICT, which will affect the structure, quality and job creation.*

**Key words:** *company, Industry 4.0, Information and Communication Technologies, the competitiveness of businesses*

**JEL Classification:** *O30, O32, A19*

## INTRODUCTION

The development of information technology in recent decades, as well as the globalization of the world information space, is associated with an increase in the amount of recorded but also unrecorded information. For any business today, one of the key tasks is to effectively acquire, use and protect information from surrounding the environment as well as from the internal environment. Information systems take on the task of successfully navigating this extensive information space. Indeed, the issue of ICT to promote entrepreneurship, especially entrepreneurship in the range of SMEs (SMEs), is extremely vast. According to the Slovak Statistical Office, as well as EU statistics, approximately 90% of employment in Slovakia, in Europa, is provided globallyby small and medium-sized enterprises. Even small and medium-sized companies, in industry, commerce, services, need almost identical support services in the form of ICT for communication, ordering, storage systems, expedition, logistics, tax returns , as well as large corporations [8].

For SMEs, e-markets - or e-commerce systems - are already an interesting alternative to traditional markets. Deployment of resources can be optimized by adjusting the organizational structure and harmonize traditionally very close relations with customers and shipper may be using the information and support further improvements.

In the future, it can be expected that the often high costs of traditional business transactions will be reduced by integrating the participating businesses in the single electronic market, as the different phases of coordination can be realized through cost-effective and accessible communication networks.

Industry 4.0 does not mean getting the most out of what is technically feasible. Instead, businesses need to fully digitize production to survive the market. Optimizing processes and reducing costs therefore becomes a discipline superior to other areas. Intelligent connected systems also enable companies to produce smaller amounts at a profit that are tailored to the

[96] Ing. RNDr. Dagmar Petrušová, PhD., Fakulta sociálno-ekonomických vzťahov, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Študentská 3, 911 50 Trenčín, Slovenská republika, e-mail: dagmar.petrusova@tnuni.sk
[97] Ing. Peter Petruš., Fakulta špeciálnej techniky, Trenčianska univerzita Alexandra Dubčeka v Trenčíne, Pri parku 19, 911 06 Trenčín, Slovenská republika, e-mail: petrus.peter1404@gmail.com

individual requirements of customers at a profit. This gives them the opportunity to excel over cheap sellers pushing mass-produced products onto the market [2].

## RESULTS

In this section, based on data from the Statistical Office of the Slovak Republic, we monitored and evaluated the use of available ICT resources in enterprises in Slovakia. We evaluated the development in terms of branch breakdown for the period 2014 - 2018. Table 1 shows the percentage of enterprises with Internet access by selected economic activities and industries in the SR. We can say that more than 99% of businesses have Internet access. In the recycling of secondary raw materials sector; the generation and distribution of energy is 100 per cent internet access throughout the period under review. We see less reserves in the internet connection in administrative and support services.

**Table 1: Enterprises with Internet access (% of enterprises with PC) by selected economic activities and sectors in Slovakia in the years 2014-2018**

| sector | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **C** | 99,90 | 99,70 | 99,70 | 99,70 | 99,50 |
| **D-E** | 100,00 | 100,00 | 100,00 | 100,00 | 100,00 |
| **F** | 100,00 | 100,00 | 100,00 | 100,00 | 99,50 |
| **G** | 99,20 | 100,00 | 99,40 | 100,00 | 98,30 |
| **H** | 98,90 | 100,00 | 99,80 | 100,00 | 99,40 |
| **I** | 100,00 | 100,00 | 100,00 | 100,00 | 95,60 |
| **J** | 100,00 | 100,00 | 98,50 | 100,00 | 100,00 |
| **L** | 100,00 | 100,00 | 94,20 | 100,00 | 100,00 |
| **M** | 100,00 | 98,80 | 100,00 | 100,00 | 100,00 |
| **N** | 98,40 | 97,10 | 100,00 | 100,00 | 98,50 |
| **together** | 99,60 | 99,60 | 99,50 | 99,90 | 99,00 |

Source: ŠÚ SR, custom processing
Legend: C - industry; D-E - recycling of secondary raw materials; energy production and distribution; F - construction; G - trade; H - transportation; I - accommodation and catering; J - information and communication; L - real estate; M - professional, scientific and technical activities; N - administrative and support services.

From a technical point of view, businesses with Internet access use approximately 90% fixed broadband, using any of the following broadband access: xDSL, ADSL, SDSL, cable TV (cable modem), in other cases mobile broadband or other mobile connection, e.g. UMTS (mobile phone) and others (satellite, fixed wireless connection) [9].

Table 2 shows the development and overview of enterprises with their own website, expressed as a percentage of enterprises with Internet, by selected economic activities and industries in the SR. Since a website does not need rest, sleep, or work breaks, unlike humans, it can provide information about the company, its products, or the services it offers around the clock. The benefit is that we can update all information at any time, and the changes will take effect immediately. This cannot be achieved with printed leaflets. Individuals can link to a portfolio of work or referrals from satisfied clients on their site. The company offering products boasts customer ratings on its own website.

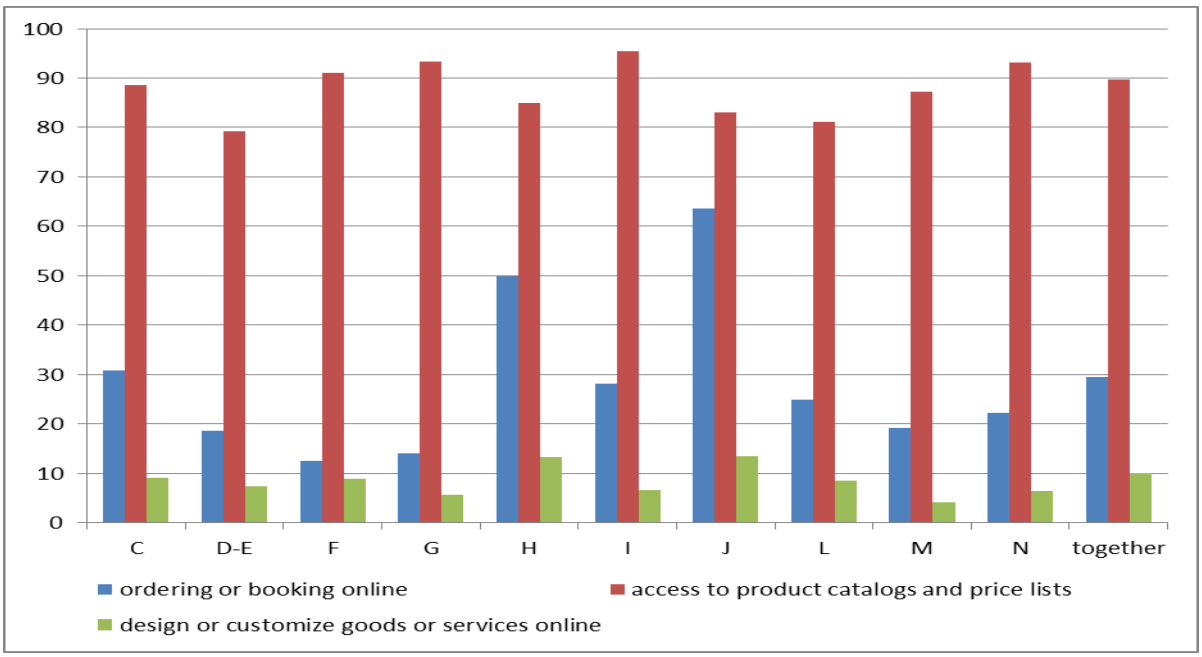
**Table 2: Enterprises with own web site (% of enterprises with Internet) by selected economic activities and sectors in the SR, 2014 – 2018**

| sector | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **C** | 73,50 | 81,90 | 79,10 | 81,50 | 79,30 |
| **D-E** | 91,00 | 86,60 | 88,50 | 90,70 | 83,90 |
| **F** | 74,30 | 75,50 | 80,60 | 79,40 | 74,20 |
| **G** | 80,20 | 83,00 | 80,70 | 84,70 | 84,90 |
| **H** | 68,40 | 75,10 | 76,00 | 63,40 | 59,70 |
| **I** | 79,80 | 85,30 | 73,50 | 74,90 | 81,70 |
| **J** | 87,70 | 96,90 | 92,10 | 94,70 | 93,90 |
| **L** | 63,30 | 63,40 | 84,70 | 88,90 | 73,40 |
| **M** | 79,50 | 89,20 | 89,10 | 80,90 | 85,00 |
| **N** | 76,90 | 74,70 | 75,40 | 72,10 | 69,70 |
| **together** | 76,60 | 81,20 | 80,60 | 80,40 | 78,80 |

Source: ŠÚ SR, custom processing
Legend: C - industry; D-E - recycling of secondary raw materials; energy production and distribution; F - construction; G - trade; H - transportation; I - accommodation and catering; J - information and communication; L - real estate; M - professional, scientific and technical activities; N - administrative and support services.

Interestingly, the transport sector (60-76%) as well as administrative and support services (70-75%) are the least used for this presentation. Of course, most (90-97%) of businesses with their own websites are in the information and communication sector. Overall, about 80% of businesses with Internet access use their websites to promote and communicate. When we compare online advertising with print, television, radio or outdoor, we find that online advertising is cheaper and more efficient. In addition to affordability, it also wins online in durability - newspaper information is limited in time, a website is a long-lasting medium.

**Figure 1: Possibilities of using enterprises website (in %) in 2018**




Source: ŠÚ SR, custom processing
Legend: C - industry; D-E - recycling of secondary raw materials; energy production and distribution; F - construction; G - trade; H - transportation; I - accommodation and catering; J - information and communication; L - real estate; M - professional, scientific and technical activities; N - administrative and support services.

Through website, we can find out detailed information about our visitors - who they are, what interests them most on your site, and how, and how they got to the site. We can use the insights to turn ordinary visitors into customers. You can also use your own website to get contacts with whom we can build business relationships.

In 2018, Slovak companies with their own website used this option mainly to access the catalogs and price lists of their products and least used the option of designing or adapting goods or services online (Figure 1). In the construction, trade, accommodation and catering sectors, administrative and support services, more than 90% of companies with their own websites have access to their product catalogs and price lists. Online ordering and bookings were used most in the information and communicationsector (almost 64%) and in the transport sector (50%). Overall, the latter two sectors use their ownwebsites best, according to available data, although there are still some reserves.

## CONCLUSION

The question of Industry 4.0 has been declined in Slovak companies for several years. Today we can say that it has reached a stage where companies are approaching its real implementation. The response of enterprises to the changes associated with Industry 4.0 in the past period was associated with the idea of high investment. It is confirmed that the discussion and "demolition" of myths have shifted companies to more realistic perspectives. Today, up to three quarters of businesses are convinced of investment manageability of change. There has also been an interest in applying Industry 4.0 from the perspective of the state of internal culture, which suggests that businesses are taking a more systematic and conceptual approach to preparing for change, and the debate on the topic within companies is also changing. It is positive to find that more than half of companies state that they have good conditions for the education of workers [10].

Although we are talking today about the first steps in implementing Industry 4.0 in businesses, it is already necessary to incorporate the issue of preparing a skilled workforce into global strategies. It is necessary to change the structure of education, otherwise technological development will reach unprepared companies. Today, the pressure is not so significant, but in a few years businesses will no longer have a choice. By hesitating, they lose the advantage of specialists' readiness, corporate culture, organizational models and not only investment, but also the lack of skilled labor will increase dramatically [1].

At present, setting up and running a business without ICT support is unthinkable. In the IT industry, we are observing in Slovakia as well as the global gradual sobering of companies in relation to business and industry from understanding and, in particular, identifying the position of ICT tools in planning, managing industrial manufacturing activities, supporting health, employment and corporate governance. It is slowly becoming established in the IT industry that ICT should serve to support the key behaviors and activities of the ECO system for which it develops, where it is implemented, and not to be the main objective and key activity of the enterprise. On the other hand, it is necessary to realize that ICT is essential for business, services as well as the use of ICT tools to support project activities. This is due to the technological change of the communication platform, the transition from paper communication to digital communication. The decisive factor for the introduction of ICT is the quality of integration of communication with other systems, with the environment, data exchange, data processing dynamics and output generation. Of course, the introduction of ICT technologies also affects business, management processes and the creation, respectively or termination of job positions [6]..

Accelerating pace of life, the possibility of distance communication, improving the quality of information and services, faster economic growth, raising awareness, competitiveness and, last but not least, the possibility of expanding education. These and many other facts only

prove that information and communication technologies are a means of improving the standard of living of all of us.

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# CHALLENGES OF TEACHING AND MANAGING GENERATION Z

***Svetlana POPOVA*[98]**

**Abstract:** *The world is changing rapidly. Further technological and industrial development is inevitable. Future generations will need to work with loads of information, know where to find it, to check it and to process, to get as much useful knowledge as possible. People have to change and evolve, as the dynamic rhythm of modern life makes everyone either fit the times or become an outsider. The article touches upon the aspect of socialization and self-realization of the modern youth in the dynamic world. It will observe some of the changes that have recently happened to the worldviews, moral standards and motivation. There is made an attempt to draw a portrait of the main consumer who will be creating the demand for further technological development of the world in the nearest future. The article analyzes the main characteristics of the coming generation (Generation Z), gives recommendations on how to interact with the representatives of the modern youth and which aspects of social and professional life should be given more attention to.*

**Key words:** *facilitating, generation Z, motivation, soft skills.*

**JEL Classification:** *O3, M5, I25, I28*

## 1. INTRODUCTION

Our society is a complex mechanism which generates a certain pattern of social and personal behavior. Being born in a particular country at a particular period of its historical, economic and political development every man should integrate into the network of their social and personal roles and be ready to follow the scenario of development which has been partly defined by their predecessors and partly depends on them and their active social position.

Modern life is full of events and dramatic developments. Thousands of major and minor phenomena get into local and international network of mass media. Terabytes of information are flowing around. Some events find immediate resonance and others dissolve in the information space.

Society consists of people belonging to different generations. According to official statistics about one third of the whole population of the Russian Federation comprises young men and women who were born during the intensive technological development. [3] Personal computers, mobile phones, smart phones, global internet connection – step by step were changing the way of getting and processing information.

The youth is penetrating the rows of the labor force. Their bosses will be minimum one generation older, the gap will comprise about 18-20 years. These people will have slightly different approaches to time management, to mechanisms of motivation, to models of social behavior. It means that there will be situations of misunderstanding, conflicts and, as a result, less efficient business performance. In order to annihilate possible obstacles in communication it is necessary to analyze and characterize the peculiarities of the youth and provide the management with the information about the potential labor force of the future.

More importantly, the youth of the present will reinforce their position as the active consumer of services and commodities. That is why it would be reasonable to learn their needs, habits, hobbies and customs in order to be able to manage the demand, to provide an up-to-date supply and to avoid market volatility.

[98] PhD, senior lecturer. Peoples' friendship university of Russia, 117198, Moscow, Mikluho-Maklaya str.,6; SEI "school № 2114" , 117216, Moscow, Bul'var Dmitriya Donskogo, 14A. e-mail: vetka-aktev@yandex.ru

## 2. PROBLEM FORMULATION AND METHODOLOGY

Having been working as a teacher at a secondary and high school in Moscow (Russia) and as a lecturer at the university for 16 years I have been observing the changes of motivational mechanisms and the changes in student-student, student-teacher interactions. For about 5 years I have been trying to find the ideal mechanisms of motivation for learning and for self-development. When I tried to claim to famous theories of motivation and management by Douglas McGregor and Abraham Maslow, I realized that the mechanisms described do not work as smoothly and ideally as they used to earlier, with the previous generations. It has become obvious that there should be introduced some modifications to the theories in order to make them more timely and efficient.

The results provided in the article are based on the method of scientific observation, experiment and description applied to school and university students of 12-19 years old. The subjects of the experiment and observation were performing naturally in the process of studying and researching as they were not informed about the experiment. The data have been gathered for the period of five years. The author then tried to systematize the results according to the Theories of Socialization by Abraham Maslow and George Herbert Mead. The data then were analyzed on the basis of the modern Strauss-Howe generational theory [2] and its Russian adaptation proposed by Shamis and Nikonov. [5]

## 3. PROBLEM DISCUSSION

### *3.1 Psychological and demographic characteristics.*

From the first minutes of life modern children are exposed to a continuous flow of information. Television, computers, laptops, tablets, mobile phones, games consoles - all this is available to most toddlers in their early childhood already. Usually their moms and dads quickly get tired of communicating with children who, in their turn, are characterized by restlessness, ability to switch from one activity to another and lose interest to monotonous and routine work which requires long concentration.

The increase in misunderstanding among adolescents and their parents that we are observing at present has a number of serious reasons:

1) Firstly, it is the difference in the speed of the world cognition. In case with the younger generation, it significantly exceeds the similar indicators of their parents.

2) Secondly, grandparents do not help their children much with the process of raising their babies.

3) Due to the tense economic situation in the country, parents spend more and more time at work, trying to earn money.

4) Developed commodity-market relations contributed to an increase in the material demands of society, which also forces the modern generation of mothers and fathers to work longer and spend less time with their children.

5) According to statistics, parents of many modern youth are divorced. Therefore, in most cases, they are busy solving material issues, and children spend most of their free time at the computer, in social networks.

As a result, modern children are often left to their own devices in finding the right information and forming their own views, their worldview. Moreover, since today there are practically no “filters” of information flows, the child’s body and brain learn to defend themselves by developing a reaction of indifference and abstracting from constant “information noise.”

Therefore, a modern teacher or employer should not be surprised that students and young staff don't hear them, don't understand the instructions on the first try, and master the material slowly.

Representatives of the modern youth have hundreds of "friends" online, they are used to communicating in short messages, in which emotions and figures of speech are replaced by "emoji" and "memes". [7] A new generation of children is not used to correcting mistakes, redoing. They had better throw the broken thing away and buy a new one, abandon the project and start from scratch. Children of Generation Z easily change directions, looking for exactly what they will do well. Thanks to Internet technology, the world of the children of Generation Z is wider. They are called lazy and selfish. But you need to work with them and you can train them. These people are talented and better oriented in the world. They quickly analyze large volumes of information, issue new original solutions, and easily cope with several tasks simultaneously (multitaskers). Social networks keep them up to date with current trends. They are a treasure for the teacher and employer. But to get this "treasure", we need to change the strategy of setting goals.

Modern children are not used to solving complex problems themselves. They grew up in a fairly prosperous environment. In childhood, loving parents decided to which kindergarten, school they will go. The choice of university and specialty of training was also made only partially independently. These children are used to trusting adults in making important decisions.

In this regard, teachers and leaders should be flexible and understanding. If a student loses interest to a project, they should let him look at the problem from a new perspective and postpone the deadline, granting him an opportunity to take the second chance. Students of generation Z need an incentive, motivation. At the same time, the teacher fulfills the duties of a leader who should consider the potentially interesting and promising facets of the personality of such a student, notice what he is keen on and is interested in. The student of Generation Z will successfully complete the task only if the topic coincides with his personal interests.

### *3.2 Attention span.*

Recently many teachers, professors, parents and employers have noticed the differences in the attention span of people belonging to different age groups. Their primary concern is about a short period of concentration on a particular activity or task that has been demonstrated by the youngsters and adolescents. They claim that adults are really good at paying attention but children are often distracted. The situation is being considered as inevitable where everybody should reconcile to the circumstances and take things as they are. But we suggest looking at the problem from another perspective.

A lot of parents will recognize the tendency of children to notice everything, even when they wish them not to. Meanwhile, adults are really good at paying attention but only to what you tell them to, whereas children do not ignore anything.

There was held an experiment, where the researchers studied 34 adults and 36 4-year-old children. The probationers were presented with colorful images of "alien" creatures on a computer screen that had seven identifiable features, including antennae, head and tail. The participants were given an instruction to divide the "aliens" into two types according to a unique feature: for example, orange tales for the first kind of aliens and pink antennae for the second. There also were some "irrelevant features" about the two types of creatures but they were of no importance and were not mentioned in the instructions.

Halfway through the experiment, the researchers made an unannounced switch: the irrelevant feature became the feature of distinction. The earlier algorithm was cancelled. This feature, which had been the same for both creatures before the switch, was now different.

The experiment revealed that after the shift adults needed more time than children to realize the change and to switch to another pattern of actions. It happened because they suffered from "learned inattention". They didn't pay attention to the formerly irrelevant feature because they believed it wouldn't be important. The results show that children tend to distribute their attention broadly, while adults use selective attention to focus on information they believe is most important. [6]

The experiment proves that younger generation will potentially do better at a stressful situation where the participants have to take quick and risky decisions. The youth would show more efficiency if they were given more freedom and creativity at studies and at work as it would give an opportunity to look at things from unusual perspectives, let them unleash their imagination and creative thinking.

### *3.3 Motivation shift*

It is becoming more and more obvious that the future generations of students and employees will focus on the creative component of their position. Consequently, there should be a different mechanism of motivating them to better performance. It has been proved experimentally that modern employees all over the world will react to a traditional incitement such as money reward only when the task requires a narrow focus, mechanical operations. Traditional stimuli works in many cases, when the problem demands concentrating the mind on a typical task. The mechanism here is built around extrinsic motivators, around carrots and sticks. However, when employees need to look around solving a problem, to use their creativity, that financial reward narrows their focus and restricts abilities.

We are living in a highly developed society. A lot of routine, rule-based, left-brain work -- certain kinds of accounting, financial analysis, computer programming -- has become easy to outsource, easy to automate. Software can do it faster. Low-cost providers can do it cheaper. What really matters are the more right-brained creative, conceptual kinds of abilities. People nowadays are facing a lot of problems where the solution is not obvious and the rules are obscure. The modern reality needs more of our creative involvement, non-standard thinking, and fresh perspective at traditional aspects. For this there should also be a new approach to motivation.

We should build incentives around intrinsic motivation. Employees will work better and students will study harder if the process is interesting for them, if they realize that the task they are doing right now is a part of something more important, if it matters for their self-development and self-realization. Daniel H. Pink, an American author, journalist, and television host names the feature "autonomy, the urge to direct our own lives". [1] In one of his public speeches he mentioned the experience of some companies that have already realized the necessity to grant their employees more time for themselves. For example the Australian software company Atlassian lets their engineers work on anything they want for twenty-four hours several times a year. After such a day, when the engineers' minds can wander and take any direction they like, employees come up with fresh and unusual ideas that sometimes become a subject of a new business project. As a result the efficiency and creativity boost, the employees are happy doing what they like, and the bosses are proud of reducing costs on financial incentives and getting more profit thanks to implementing new business ideas of the stuff.

It is possible to apply the same approach at schools and universities. We are sure that creativity of projects and essays will ramp up if teachers give students an opportunity to choose the topic themselves and promise not to reduce the mark if they do not follow the

structure in their works. We should give the youth more opportunities to take decisions concerning their career, future life, interests. The sooner schools introduce this scheme of conscious attitude to studies and taking control over their lives, the more likely the youngsters will grow into a more creative employee. It is more probable that they will take an active life position towards everything they will do.

### 3.4 *Skills Mismatch*

The world is developing rapidly. A lot of spheres of our lives are automatized. Some industries, that used to involve thousands of specialists, are evolving, introducing robots at different stages of production. Some specialists are not able to adapt to this changing matrix and fall out of the system being made redundant. There are those who try to resist the situation and start immediate requalification. But the majority joins the rows of unemployed being unable to catch up with the changing requirements. Meanwhile, the market of new jobs is created. It needs high-skilled specialists, real talents who will be able to create and serve the new technologies. As a result, there is a crowd of unemployed people on the one hand, and a deficit of skilled specialists on the other. Without sufficient labour-force migration and mobility there is going to be a great gap between staff demand and supply. [4]

Today it is important to cultivate the model of lifelong education in order to bring up a generation of employees with the active life position, who will be stress resistant, initiative and optimistic. In order to ensure a positive result in the future, schools, universities and enterprises should develop programs of extracurricular activities; employers should promote skills-upgrading trainings [8]. It will increase the feeling of job-safety and develop job-satisfaction. Employees will get more opportunities for self-realization and the whole system of education, socialization and employment will function as a unique organism.

It is essential to establish and maintain more ties between educational and business enterprises. Organize cooperative venues for further collaboration, penetration and development. In theory, all the parties have common strategies, aims and approaches. Virtually, everybody are not seeing eye to eye due to the fact that they are pursuing own interests and got used to a long established conservative individualistic approach. [9]

Now, what are the job preferences of the modern workforce? What are they looking for? Out of a list of 26 topics, salary has already become only number eight. The priority is given to corporate culture and personal relations. Number four is having a great relationship with the boss; three, enjoying a great work-life balance; two, having a great relationship with colleagues; and the top priority worldwide is being appreciated for your work. [4] People are expecting to get a thank you. They are not looking forward to the annual bonus payment only, but reckon to receive a sort of recognition for what they are doing every day. It has become clear that the global workforce crisis is becoming very personal.

## 4. CONCLUSION

Adults need to be ready to deal with a new generation of young specialists who will have a fresh perspective to everything around. They will be able to notice and develop spheres that were earlier considered as underdeveloped and hopeless. In order to make the youth more efficient at their activities, grown-ups should try to give them fewer instructions, not to guide them and let their creativity change the conservative approach to studies and to doing business.

The coming generation of employees will grow out of modern students, representatives of Generation Z who will have more developed soft skills compared to their professional

competences. Though they will need some support from the technical point of view they will be keener on creativity, innovation and fashion. As there is going to be a change in demand, employees and manufacturers of today should think over a relevant supply in order to be on the ball in a decade time and not to miss a profitable opportunity.

In the near future the world will face a global workforce crisis which consists of an overall labor shortage, a huge skill mismatch, and a big cultural challenge. This global workforce crisis is approaching very fast. We are at the turning point right now. To improve the situation every company needs a people strategy. Firstly, there should be a plan for how to forecast supply and demand for different jobs and different skills. There is no doubt that workforce planning will become more important than financial planning. Secondly, there should be a strategy of attracting highly-qualified people. Thirdly, the modern world needs a plan for how to educate and develop them. And finally, it is important to work out a strategy of retaining the best people, realize an appreciation and relationship culture.

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# THE FINTECH SECTOR AS A DRIVER OF PRIVATE ENTREPRENEURSHIP DEVELOPMENT IN TIME OF INDUSTRY 4.0

***Pavlo RUBANOV*[99]**
***Serhiy LYEONOV*[100]**
***Yuriy BILAN*[101]**
***Oleksii LYULYOV*[102]**

**Abstract:** *The Fourth Industrial Revolution is making changes to the structure and nature of employment, which is evident in several multi-vector trends. On the one hand, large corporations and industrial enterprises are experiencing declining demand for labor due to the digitization of business processes, the use of artificial intelligence, Big Data, and more. On the other hand, Industry 4.0 creates new opportunities for SMEs to grow, such as alternative business financing models through online platforms. Online financing models include peer-to-peer business loans, equity crowdfunding, profit-sharing crowdfunding, reward-based crowdfunding, and others. The purpose of the article is to explore the possibilities of meeting the needs of SMEs in online financing by the criteria of the volume, value and period of borrowing and to identify the factors that affect the effectiveness of online financing tools. The study used the methods of comparative analysis and expert evaluations. The results of the study show that the success of SMEs financing through crowdfunding and peer-to-peer platforms depends on a set of factors: objective (business project theme, projected profitability rates, loan repayment and interest payment terms) and subjective (investor personal preferences; attractiveness of information posted on crowdfunding platforms). Summarizing the impact of these factors, the authors provide recommendations for SMEs to increase the likelihood of obtaining full funding through online platforms.*

**Key words:** *FinTech, crowdfunding, online financing, SMEs, Industry 4.0.*

**JEL Classification:** *E22, G32, O16, O33.*

## 1. INTRODUCTION

The Fourth Industrial Revolution is making changes to the structure and nature of employment, which is evident in several multi-vector trends (Tatarczak & Boichuk, 2018; Rollnik-Sadowska & Dąbrowska, 2018; Dmytrów & Bieszk-Stolorz, 2019). On the one hand, large corporations and industrial enterprises are experiencing declining demand for labor due to the digitization of business processes, the use of artificial intelligence, Big Data, and more (Kohnová et al., 2015; Limba et al., 2019). On the other hand, Industry 4.0 creates new opportunities for SMEs to grow. This is facilitated by: increasing consumer demand for new products and services that can improve the quality of life; reducing the cost of organizing business through the transformation of core business processes into the digital environment (e-commerce, the use of social networks to promote goods, freelance and remote employment), rapid commercialization of innovation and business ideas through startups (Afonasova et al., 2019; Hu et al., 2019).

[99] PhD, Department of Finance and Entrepreneurship, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, p.rubanov@finance.sumdu.edu.ua
[100] D.Sc., Professor, Economic Cybernetics Department, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, s.lieonov@uabs.sumdu.edu.ua
[101] dr. hab. Alexander Dubcek University, Študentská 1639/2, 911 01 Trenčín, Slovakia, yuriy_bilan@yahoo.co.uk
[102] D.Sc., Department of Marketing, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, alex_lyulev@econ.sumdu.edu.ua

One of the implications of the Industry 4.0 is the growing role of digital technology in enterprise manufacturing and all the processes that accompany and serve the core business (Krykavskyy Pokhylchenko & Hayvanovych, 2019). In particular, the emergence of FinTech companies, which combine the traditional functions of financial intermediaries (such as lending, savings (reserves) and settlement) and modern technologies, is a specific phenomenon of Industry 4.0 (Druhov et al., 2019). FinTech companies allow individuals and business entities to use the Internet, mobile phones, computers, etc. to simplify access to financial services and improve the technical basics of using these services (Wierzbicka, 2018).

From the point of view of SMEs, FinTech companies allow to increase financial inclusion – include SMEs to those financial services that were previously unavailable to them due to a number of conditions (lack of credit history, high rates for banking, etc.) (Bilan et al., 2019). Since SMEs tend to be scarce in their resources and require external financing, financial technologies such as online financing through crowdfunding and p2p / p2b platforms can be a good alternative to traditional loans (Paskevicius & Keliuotyte-Staniuleniene, 2018) and become a driver for the entrepreneurial sector, increasing the number of startups and volume of SMEs funding in general.

## 2. PROBLEM FORMULATION AND METHODOLOGY

There are differing opinions as to whether it is appropriate to use online financing in business activities. Thus, Jaziri and Miralam (2019) draw attention to the potential risks of launching a project proposal for innovative businesses and start-ups (eg plagiarism risk). In addition, despite the benefits of online financing for borrowers and the technological simplification of the funding approach, practice shows that projects hosted on a crowdfunding or peer-to-peer platform have not always received funding at all or have not been sufficiently funded to actually implement this project (Xin et al., 2019).

The issues surrounding the success of a project in obtaining funding through crowdfunding or peer-to-peer platforms are widely researched. However, the vast majority of researchers focus on the impact of isolated factors or a particular method of online funding. In particular, the following studies address the importance of the specific factors in choosing a project lender for financing. Chen, Zhou, & Wan found that the borrower's general group social capital and relational social capital yielded inconsistent effects, and the borrower's structural social capital had a negative impact on the funding (Chen et al., 2016). Han et al. investigated the factor of voluntary information in peer to peer lending (Han et al., 2018). Lin & Viswanathan found evidence that transactions in online financing are more likely to occur between parties in the same geographical area (Lin & Viswanathan, 2016). Malekipirbazari and Aksakalli proposed the RF-based method to assess the credit risk and predict borrower's status (Malekipirbazari & Aksakalli, 2015).

In contrast to most studies, in which the success of the project is considered from the perspective of the factors influencing the choice of lenders, in the studies (Feng et a., 2015) and (Jaziri & Miralam, 2019) the authors analyzed the behavior, strategies and decision-making by the borrowers. Among the studies that provide a comprehensive assessment of the impact on online funding success, it should be noted the study by Moreno-Moreno, Berenguer & Sanchís-Pedregosa (2018). The authors established a crowdlending success factor model, which includes borrowe's factors (info offered, expertise, trustworthy appearance), platform's

factors (trust, loan characteristics, credit score), lender's factors (trust, herd behavior, demographic and social info, same geographical area). Another authors, Song and Boeschoten, designed the website for founders and funders to observe crowdfunding behaviors (Song and Boeschoten, 2015).

Gavurova et al. used the method of the multinomial logistic regression model, which included 48 factors, to describe the importance of borrowers' decisions in peer-to-peer market and their effects on funding results. They found that the debt to income rate is the most significant variable and the highest negative impact is reached by the home ownership type variable (Gavurova et al., 2018).

Therefore, most researchers pay attention to the success factors of the project as a whole. At the same time, there is virtually no research on the analysis of success factors for attracting financing through online platforms by SMEs. Small and medium-sized businesses, as well as start-ups, have their own specifics regarding the choice of online financing methods and their attitude towards lenders. Therefore, this issue requires a separate study.

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

The main methods of attracting online financing are crowdfunding and peer-to-peer (peer-to-business) loans. The crowdfunding is primarily aimed at financing start-ups, businesses and ideas in the early stages of project development. Depending on the remuneration the investor receives from the project, there are following types of crowdfunding: crowdfunding with financial rewards (equity-based crowdfunding, profit sharing crowdfunding), reward-based crowdfunding and donation-based crowdfunding (Wardrop R. et al., 2016). The most common model by the number of platforms created is reward-based crowdfunding. For SMEs, each of these types of crowdfunding and peer-to-peer (peer-to-business) loans has its advantages and disadvantages (Table 1).

**Table 1: Comparative analysis of online financing options for SMEs**

| Criteria | Online financing options | | | | |
|---|---|---|---|---|---|
| | Donation-based crowdfunding | Reward-based crowdfunding | Equity-based crowdfunding | Profit sharing crowdfunding | Peer-to-peer, peer-to-business lending |
| Essence | The recipients of the funding have no obligations to the donors | Money providers receive non-financial rewards, such as participating in pre-ordering goods, receiving goods at a lower price | Investors provide funds in exchange for company shares, dividends or voting rights at a general meeting of shareholders | Investors receive a share of the proceeds or profits of the project in the form of dividends, royalties or other payments | Obtaining a loan directly from individuals and institutional investors without the involvement of a traditional financial intermediary |
| Pros | No additional costs | It gives an opportunity to estimate the demand for | It is possible to raise funds in any business, does not | It is possible to raise funds in any business, allows the | It is possible to raise funds in any business; it can be used at |

| | | | | | |
|---|---|---|---|---|---|
| | | products and to find potential consumers | depend on the characteristics of the product | recipient of funding to retain control of the business | any stage of project realization |
| **Cons** | Used in the early stages of project development | | | | The terms of the loan do not always match the needs of the business and the production cycle |
| | Suitable for creative projects, the likelihood of obtaining funding by SMEs is poor | It is necessary to have a prototype of products; the product must be innovative; the idea can be used by competitors | Loss of sole control and management of business (project) | Less common than other types of crowdfunding | |

Source: based on (Segal, 2016), Zhang B. et al. (2016).

Profit sharing crowdfunding, equity-based crowdfunding and under certain conditions reward-based crowdfunding are best suited for SMEs. Since most of SMEs cannot offer a creative product, they are not a charity, SME entities are raising money for projects for profit, so they cannot claim free funding. Besides, if a SME entity does not carry out any innovative activities, does not create a product that is different from the existing ones, then it will not be able to raise funds on conditions other than equity-based crowdfunding, profit sharing crowdfunding or peer-to-business lending.

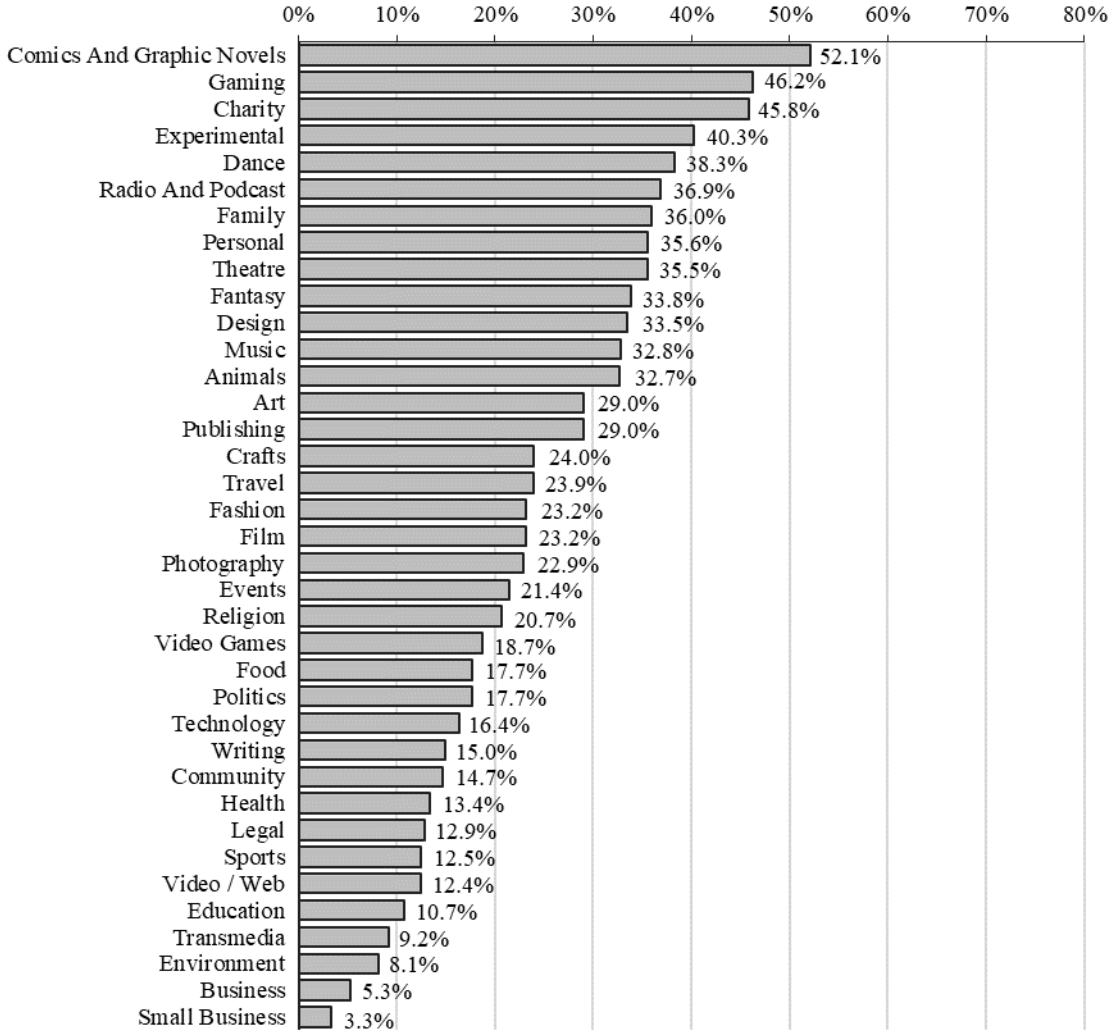
The fact that not all types of crowdfunding are suitable for small business causes the smallest share of receiving full funding by small and medium-sized business entities in comparison to other targeted financing areas (Figure 1).

Figure 1 summarizes data on the crowdfunding platforms such as Fundrazr, Crowdfunder.co.uk, Indiegogo, Kickstarter, Rockethub. The platforms differ significantly in the target areas of the funded projects. In particular, according to TheCrowdfundingCentre the world's largest crowdfunding platforms have the following specialization for the last 5 years:

- Kickstarter: music, film, design, publishing, games, art;
- Indiegogo: cinema, music, community;
- Fundrazr: charity, animals;
- Crowdfunder.co.uk: community;
- Rockethub: art, community, business.

Regarding the financing of small business projects on the listed platforms, in 96.5% of cases full funding was received on Indiegogo (732 out of 758 fully funded projects), the rest (26 projects) were funded on Fundrazr. In addition, Indiegogo is characterized by the largest amounts raised on projects – about $47,000 on average (TheCrowdfundingCentre). This platform offers services of experts and partners at separate stages of development and sale of a new product (fulfillment, marketing, prototyping, production, retail), as well as support of a business project at all stages. Indiegogo is used by entrepreneurs who create innovative products and use reward-based crowdfunding, offering as a reward the purchase of goods at a significant discount.

**Figure 1: Share of successful (fully funded projects) on crowdfunding platforms depending on their targeting for the period from January 1, 2014 to September 30, 2019**

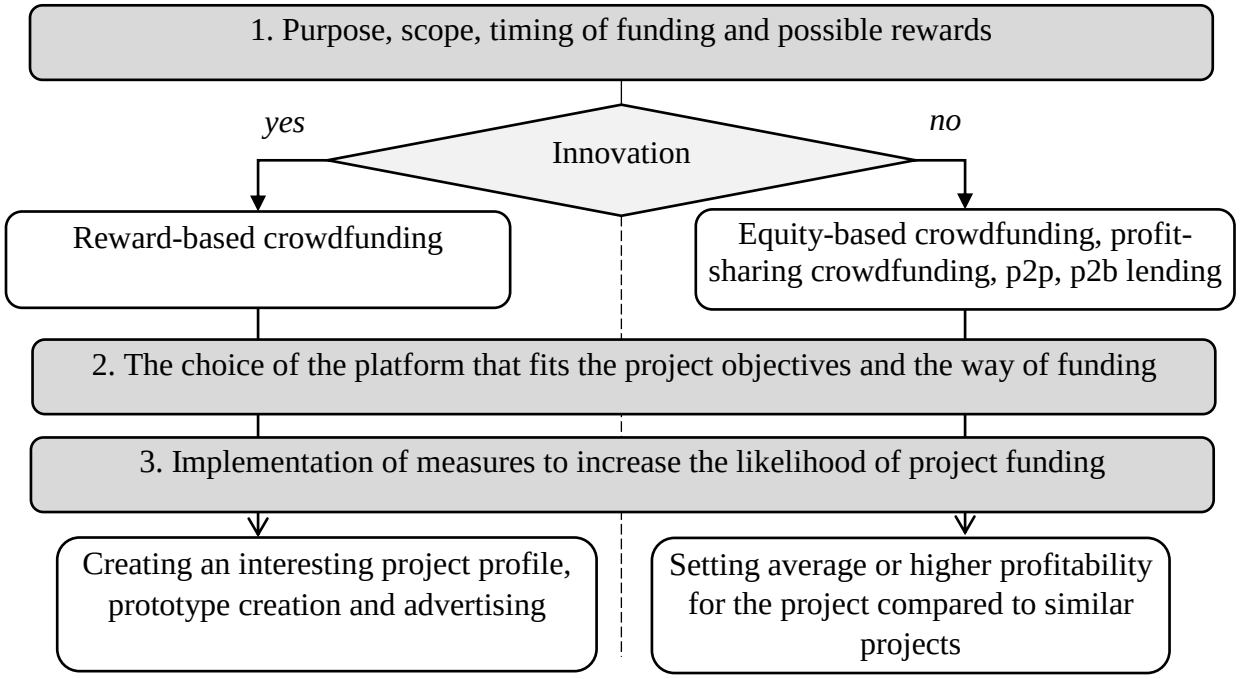



Source: (TheCrowdfundingCentre)

The crowdfunding platform can be considered as a trading platform, a certain local market in which supply, demand and price of borrowed funds are formed. Accordingly, if there are similar projects on the platform that offer higher returns or has other conditions that are more favorable to the investor, then the SME entity that raises funds through this platform has a worse competitive position than other market players. In order to reach the goals of attracting the necessary funding, SME entities need to explore the online platform on which it plans to post a project profile.

Given the above, it is necessary to develop a basic algorithm of actions for the company to raise funds through an online platform. First of all, the SME entity should determine the eligibility conditions of the loan, that is, required amount of funding, period of raising funds, return rate limits (maximum, minimum), other possible types of reward (Figure 2).

**Figure 2: Measures to increase the likelihood of full funding the project in crowdfunding**




Source: author's development.

Online platforms specialize in certain types of crowdfunding. Therefore, the second step is to select the platform that suits the goals of funding and study the current state of the local market on the chosen platform. In particular, consideration should be given to what similar projects are currently available on the platform, what loan conditions are in place. If the SME entity can set a rate of return equal or above the average market rate, this will create a competitive position and help attract funding.

The criteria for evaluating the success of a project depend on the evaluating entity – borrower, lender, platform runners, or other outsiders. For the borrower, the criteria for evaluating success of the project funding are (Astrauskaitė & Paškevičius 2018):

- Fundraising speed (time to get full funding);
- Receiving the required amount (full or partial funding);
- Lending period (attracting funds for the required period);
- Number of creditors (reflects the level of interest in the offer, indirectly determines the interest in the products of the company, the level of demand).

The main criterion for the success of the project offer, which fully reflects the purpose of the SME entity is obtaining the necessary amount of funding. Achieving full funding depends on many factors that can be summarized in three groups (Paskevicius & Keliuotyte-Staniuleniene 2018):

- Platform-dependent factors;
- Factors that depend on the lender;
- Factors that depend on the borrower.

On the other hand, these factors can be divided into objective and subjective. SMEs can partially manage the platform's factors (at the stage of selecting the platform that will provide

the highest likelihood of obtaining financing based on product features and acceptable loan conditions). SMB determines whether it is competitive on this platform. Factors that depend on the lender are subjective and will be minimally influenced by the borrower: investor personal preferences; attractiveness of information posted on crowdfunding platforms for the investor. The third group of factors SMEs can and should manage to increase the likelihood of obtaining full funding: business project theme, projected profitability rates, loan repayment and interest payment terms, project profile, advertising.

For reward-based crowdfunding lender's demand will depend on the characteristics of the product being offered and the consumer's interest in it (reward-based crowdfunding finances the production of innovative products that have no analogues or products that have significant improvements over existing products, so competition under the financial terms of the loan is not significant). For loans attracted under equity and profit-sharing crowdfunding, the funding depends on the return rate and other financial terms of the loan.

## 4. CONCLUSION

Industry 4.0 creates new opportunities for SMEs to grow, such as alternative business financing models through online platforms. Online financing models include peer-to-peer business loans, equity crowdfunding, profit-sharing crowdfunding, reward-based crowdfunding, and others. Online financing models best suited for SMEs are profit sharing-crowdfunding, equity-based crowdfunding and under certain conditions reward-based crowdfunding. Achieving full funding through online platform depends on many factors that can be summarized in three groups: platform-dependent factors, factors that depend on the borrower and factors that depend on the lender. Factors that depend on the borrower (business project theme, projected profitability rates, loan repayment and interest payment terms, project profile, advertising) can and should be managed by SMEs to increase the likelihood of obtaining full funding. Measures to increase the likelihood of obtaining funding for innovative projects are placing a project offer on a reward-based crowdfunding platform, developing a product prototype, creating an interesting project profile on the platform, applying marketing tools to promote an innovative product. When placing a project offer for traditional types of goods / services, the measures to increase the likelihood of obtaining funding are to use equity-based or profit-sharing crowdfunding, to study the current state of demand and supply on the chosen platform and to set average or higher profitability for the project compared to similar projects on the platform.

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# HUMAN RESOURCE MANAGEMENT CHALLENGES OF THE FOURTH INDUSTRIAL REVOLUTION FOR CZECH SMEs

***Jana Marie ŠAFRÁNKOVÁ***[103]
***Martin ŠIKÝŘ***[104]

**Abstract:** *The revolutionary technological advancement associated with the fourth industrial revolution (4IR) naturally affect all businesses, including small and medium-sized enterprises (SMEs) that play an important role in economic and social development of the society. To master the challenges of the 4IR, SMEs should apply suitable strategies, policies and practices on human resource management to attract enough talented and motivated people and ensure development of their potential. The goal of the paper is to present the main findings of the authors' questionnaire survey on human resource management practices in six Czech profit SMEs and define the current human resource management challenges of the 4IR for Czech SMEs. The survey was conducted from March to April 2018. The relevant data were obtained from 258 respondents. The results show that surveyed SMEs are able to effectively and efficiently master the human resource management challenges of the 4IR, however they should focus more on creating and maintaining employment opportunities and working conditions with regard to the natural diversity of people.*

**Key words:** *Czech Republic, fourth industrial revolution, human resource management, small and medium-sized enterprises*

**JEL Classification:** *M10, M12*

## 1. INTRODUCTION

The fourth industrial revolution (also called the 4IR or Industry 4.0) is the environment in which progressive information and communication technologies are affecting and changing the way people live and work (Dean & Spoehr, 2018). The 4IR is based on the digitalization of manufacturing processes, gathering and analyzing data across machines and transformation of businesses into smart and sustainable ones and this manufacturing revolution will bring along significant changes in labor markets (Habanik, Grencikova, & Krajco, 2019). In this context, the 4IR is characterized by the devaluation of labor as such, including mental work, and the value of technological platforms is hidden in strengthening the role of trade in comparison with the role of production (Balatsky, 2019). Through the digitalization of manufacturing processes, the processes are getting evolved and accurate results are being produced which in turn helps increasing the productivity (Sanghavi, Parikh, & Raj, 2019). The revolutionary technological advancement associated with the 4IR naturally affect all disciplines, industries and businesses (Postelnicu & Calea, 2019), including small and medium-sized enterprises (SMEs) that play an important role in economic and social development of the society.

SMEs contribute to the economic and social development by creating new jobs, providing investment opportunities and forming the economic capital and potential required for sustainable economic and social growth (Belas, Bilan, Demjan, & Sipko, 2015). SMEs, as well as many other enterprises, consider experienced people to be the most important source and require people with necessary knowledge, skills and abilities to help them to achieve expected goals (Armstrong et al., 2010). To effectively master the challenges of the 4IR,

[103] Associate Professor, CSc., College of Regional Development and Banking Institute – AMBIS, Narozni 2600/9, 158 00 Praha 5, Czech Republic, e-mail: jana.safrankova@ambis.cz
[104] Assistant Professor, PhD., College of Regional Development and Banking Institute – AMBIS, Narozni 2600/9, 158 00 Praha 5, Czech Republic, e-mail: martin.sikyr@ambis.cz

SMEs should apply efficient strategies, policies and practices on human resource management to attract enough talented and motivated people and ensure development of their potential. In this context, the SMEs should create appropriate and attractive job opportunities and working conditions for different generations of people and especially create age-old, diverse workgroups, bringing together young and older people (Nemec & Surynek, 2015).

The goal of the paper is to present the main findings of the authors' questionnaire survey on human resource management practices in six Czech profit SMEs and define the current human resource management challenges of the 4IR for Czech SMEs.

The paper is divided into three parts, including methodology, results, and conclusion. The first part (methodology) provides description of the authors' questionnaire survey on human resource management practices in six Czech profit SMEs. The second part (results) presents and discusses the authors' findings on human resource management practices in six Czech profit SMEs and compares them to findings of other researchers. The third part (conclusion) includes the general summary of the paper, implications and recommendations for practice, research limitations, and suggestions for the future research.

## 2. METHODOLOGY

Achieving the goal of the paper is based on the results of the authors' questionnaire survey on human resource management practices in six Czech profit SMEs. The survey was conducted from March to April 2018. The questionnaire included 112 multiple choice questions focused on human resource management practices.

The relevant data were obtained from 258 respondents. The respondents were characterized by the type of business (5% accounting, 24% wellness, 20% education, 20% recruitment agency 1, 19% recruitment agency 2, 12% food), the gender (46% male, 54% female), the age (37% 25 years or less, 54% between 26 and 54 years, 9% 55 years or more), and the nationality (93% Czechs and Slovaks, 7% other nationalities).

The data analysis was based on the calculation of relative frequencies (as a share from the total number of respondents) and the evaluation of the dependence of responses on gender (male and female respondents) using contingency tables and chi-square tests of independence.

## 3. RESULTS AND DISCUSSION

This part presents and discusses the authors' findings on human resource management practices in six Czech profit SMEs and compares them to findings of other researchers. The analysis of people and diversity management policies and practices is focused on employee selection, employee compensation, employee training, and employment discrimination.

### *3.1 Employee selection*

In terms of employee selection, the surveyed SMEs use different methods of employee selection to decide which candidates should be hired. The goal of employee selection is to hire a sufficient number of people with the right qualifications in a relatively short time and at minimum cost. The most used method of employee selection is a selection interview. 82% of respondents stated that they were interviewed before taking up employment. Most of interviewed respondents said that the interview was pleasant and friendly. Only 6% of interviewed respondents perceived the interview as discriminatory in terms of gender or age. Other interviewed respondents perceived their interviews as neutral or objective. The data analysis showed no significant difference between male and female respondents ($p < 0.05$). Firstly, we tested the null hypothesis that there is no difference between male and female

respondents regarding their perception of gender discrimination during the interview (see Table 1). Since the test statistics was lower than the critical value, we failed to reject the null hypothesis in favor of the alternative hypothesis. In other words, there was no difference between male and female respondents regarding their perception of gender discrimination during the interview.

**Table 1: Respondents' perception of gender discrimination during the interview**

| | Objective | Neutral | Discriminatory | ∑ |
|---|---|---|---|---|
| Male respondents | 55* (57.70)** | 28 (24.91) | 5 (5.40) | **88** |
| Female respondents | 84 (81.30) | 32 (35.09) | 8 (7.60) | **124** |
| ∑ | **139** | **60** | **13** | **212** |

*observed frequencies (O), ** expected frequencies (E)

$H_0$: There is no difference between male and female respondents regarding their perception of gender discrimination during the interview. $H_A$: There is a difference between male and female respondents regarding their perception of gender discrimination during the interview.

Level of significance α = 0.05

Chi square statistic $\chi^2 = \sum\left[\frac{(P_{r,c} - E_{r,c})^2}{E_{r,c}}\right] = 0.923$

Degrees of freedom (f): $(r-1)\times(c-1) = 2$

Critical chi-square value $\chi^2_{0,05}(2) = 5.991$

r – the number of rows in the contingency table, c – the number of columns in the contingency table

Source: authors

Secondly, we tested the null hypothesis that there is no difference between male and female respondents regarding their perception of age discrimination during the interview (see Table 2). Since the test statistics was lower than the critical value, we failed to reject the null hypothesis in favor of the alternative hypothesis. In other words, there was no difference between male and female respondents regarding their perception of gender discrimination during the interview.

**Table 2: Respondents' perception of age discrimination during the interview**

| | Objective | Neutral | Discriminatory | ∑ |
|---|---|---|---|---|
| Male respondents | 59* (64.58)** | 17 (14.26) | 8 (5.15) | **84** |
| Female respondents | 104 (98.42) | 19 (21.74) | 5 (7.85) | **128** |
| ∑ | **163** | **36** | **13** | **212** |

*observed frequencies (O), ** expected frequencies (E)

$H_0$: There is no difference between male and female respondents regarding their perception of gender discrimination during the interview. $H_A$: There is a difference between male and female respondents regarding their perception of gender discrimination during the interview.

Level of significance α = 0.05

Chi square statistic $\chi^2 = \sum\left[\frac{(P_{r,c} - E_{r,c})^2}{E_{r,c}}\right] = 4.279$

Degrees of freedom (f): $(r-1)\times(c-1) = 2$

Critical chi-square value $\chi^2_{0,05}(2) = 5.991$

r – the number of rows in the contingency table, c – the number of columns in the contingency table

Source: authors

### *3.2 Employee compensation*

In terms of employee compensation, 24% of respondents stated that they are dissatisfied with their wages, 17% of respondents stated that they do not think their wage is comparable to that of their colleagues in a similar position, and 10% of respondents stated that they feel wage discrimination because they were male or female. The data analysis showed a significant difference between male and female respondents ($p < 0.05$). We tested the null hypothesis that there is no difference between male and female respondents regarding their feeling of wage discrimination (see Table 3). Since the test statistics was higher than the critical value, we rejected the null hypothesis in favour of the alternative hypothesis. In other words, there was a difference between male and female respondents regarding their feeling of wage discrimination.

**Table 3: Respondents' perception of wage discrimination**

| | Yes | Neither yes nor no | No | ∑ |
|---|---|---|---|---|
| Male respondents | 10* (11.43)** | 15 (9.60) | 93 (96.96) | **118** |
| Female respondents | 15 (13.57) | 6 (11.40) | 119 (115.04) | **140** |
| ∑ | **25** | **21** | **212** | **258** |

*observed frequencies (O), ** expected frequencies (E)

$H_0$: There is no difference between male and female respondents regarding their perception of gender discrimination during the interview. $H_A$: There is a difference between male and female respondents regarding their perception of gender discrimination during the interview.

Level of significance $\alpha = 0.05$

Chi square statistic $\chi^2 = \sum\left[\frac{(P_{r,c} - E_{r,c})^2}{E_{r,c}}\right] = 6.215$

Degrees of freedom (f): $(r-1)\times(c-1) = 2$

Critical chi-square value $\chi^2_{0,05}(2) = 5.991$

r – the number of rows in the contingency table, c – the number of columns in the contingency table

Source: authors

### *3.3 Employee training*

In terms of employee training, the surveyed SMEs provide employees with the initial and additional training to ensure that employees acquire the knowledge, skills and abilities they need to perform their work. The goal of employee training is to meet the learning gap, it means the discrepancy between actual and required knowledge, skills and abilities. The commonly applied methods of employee training include both on-the-job training methods (e.g. job instruction, assistance, coaching, mentoring, or job rotation) and off-the-job training methods (e.g. classroom lectures, case studies, business games, or outdoor training). 31% of respondents stated that the employer provides them with the initial training and 68% of respondents stated that the employer provides them with the additional training in the last year. More than a third of respondents stated that they would welcome more training focused on the development of foreign languages and soft skills. The data analysis showed no significant difference between male and female respondents ($p < 0.05$). We tested the null hypothesis that there is no difference between male and female respondents regarding their satisfaction with the employer's approach to employee training (see Table 4). Since the test statistics was lower than the critical value, we failed to reject the null hypothesis in favour of the alternative hypothesis. In other words, there was no difference between male and female respondents regarding their satisfaction with the employer's approach to employee training.

**Table 4: Respondents' satisfaction with the employer's approach to employee training**

| | Yes | Neither yes nor no | No | ∑ |
|---|---|---|---|---|
| Male respondents | 38* (37.99)** | 52 (52.53) | 31 (30.48) | **121** |
| Female respondents | 43 (43.01) | 60 (59.47) | 34 (34.52) | **137** |
| ∑ | **81** | **112** | **65** | **258** |

*observed frequencies (O), ** expected frequencies (E)

$H_0$: There is no difference between male and female respondents regarding their satisfaction with the employer's approach to employee training. $H_A$: There is a difference between male and female respondents regarding their satisfaction with the employer's approach to employee training.

Level of significance $\alpha = 0.05$

Chi square statistic $\chi^2 = \sum\left[\frac{(P_{r,c} - E_{r,c})^2}{E_{r,c}}\right] = 0.026$

Degrees of freedom (f): $(r-1)\times(c-1) = 2$

Critical chi-square value $\chi^2_{0,05}(2) = 5.991$

r – the number of rows in the contingency table, c – the number of columns in the contingency table

Source: authors

### *3.4 Employment discrimination*

In terms of employment discrimination, only 6% of respondents stated that they experienced discrimination in the workplace. 70% of respondents stated that they know how to deal with discrimination in the workplace. 49% of respondents stated that they are satisfied with the employer's approach to discrimination in the workplace. The data analysis showed no significant difference between male and female respondents ($p < 0.05$). We tested the null hypothesis that there is no difference between male and female respondents regarding their satisfaction with the employer's approach to discrimination in the workplace (see Table 5).

**Table 5: Respondents' satisfaction with the employer's approach to discrimination**

| | Yes | Neither yes nor no | No | ∑ |
|---|---|---|---|---|
| Male respondents | 66* (57.63)** | 46 (53.97) | 6 (6.40) | **118** |
| Female respondents | 60 (68.37) | 72 (64.03) | 8 (7.06) | **140** |
| ∑ | **126** | **118** | **14** | **258** |

*observed frequencies (O), ** expected frequencies (E)

$H_0$: There is no difference between male and female respondents regarding their satisfaction with the employer's approach to discrimination in the workplace. $H_A$: There is a difference between male and female respondents regarding their satisfaction with the employer's approach to discrimination in the workplace.

Level of significance $\alpha = 0.05$

Chi square statistic $\chi^2 = \sum\left[\frac{(P_{r,c} - E_{r,c})^2}{E_{r,c}}\right] = 4.457$

Degrees of freedom (f): $(r-1)\times(c-1) = 2$

Critical chi-square value $\chi^2_{0,05}(2) = 5.991$

r – the number of rows in the contingency table, c – the number of columns in the contingency table

Source: authors

Since the test statistics was lower than the critical value, we failed to reject the null hypothesis in favour of the alternative hypothesis. In other words, there was no difference between male

and female respondents regarding their satisfaction with the employer's approach to discrimination in the workplace.

### *3.4 Discussion*

Based on the authors' findings and findings of other researchers in terms of the approach to human resource management in SMEs, to master the challenges of the 4IR, human resource management practices in Czech SMEs should be focused on creating and maintaining employment opportunities and working conditions with regard to the natural talent and diversity of people and on preventing gender and age discrimination of employees (Eger & Indruchova, 2014). From the perspective of the gender and age of people, the aim of human resource management should be to gain a competitive advantage by employing men and women of all ages (Madara, Dawson, & Neal, 2018). But this requires changing some stereotypes associated with the employment of men and women as well as young and older people.

In terms of age, young people usually do not meet the employers' requirements for professional skills and experience, as well as social behaviour and professional motivation. Older people (aged 50 and over) are usually seen as loyal and hardworking, but inflexible, ineffective and unpromising (Nemec & Surynek, 2015). This leads to the fact that employers are not willing to invest in them. In addition, many young and older people believe that the age alone is a barrier for getting a job, but the fact is that employers can really benefit from an age diverse workforce, mixing the new ideas of young people with the life experience of older people.

Gender and age diverse groups of people have various knowledge, skills and abilities that add value to the workplace and play a key role in achieving success of the organization. Gender and age diverse groups of people are more experienced, have lower absenteeism, and are more flexible and often more productive than male or female as well as younger or elder groups of workers. In addition, gender and age diverse groups of people have a chance to interact with different co-workers, which improves their relationships and understanding, as well as their morale and motivation, and makes the organization more attractive to workers and other stakeholders (Howarth & Andreouli, 2016).

## 4. CONCLUSION

The results of the authors' survey on human resource management practices in six Czech profit SMEs show that surveyed SMEs are able to effectively and efficiently employ people and prevent gender and age discrimination, however they should focus more on creating and maintaining employment opportunities and working conditions with regard to the natural talent and diversity of people. It is obvious that also SMEs can gain a competitive advantage by employing men and women of all ages.

To master the challenges of the 4IR, human resource management practices in SMEs should be focused on diverse employee selection, evaluation, compensation, and development. These activities may enable SMEs to attract, employ and develop gender and age diverse groups of people with different knowledge, skills and abilities that may help SMEs to achieve expected organizational results through achieving desired employee results.

The authors' survey is quite unique by its focus on human resource management practices and prevention of gender and age discrimination in Czech SMEs. Similar surveys are quite rare. The specific focus on Czech SMEs as well as the relatively low number of respondents does not allow authors to draw general conclusions. However, the current authors' survey results

are worth attention from managers of SMEs who are responsible for employing people. The current authors' survey results open up new possibilities for further research in the field of human resource management and dealing with gender and age discrimination of employees.

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# POTENCIÁL STRIEBORNEJ EKONOMIKY PRE TRH PRÁCE A INDUSTRY 4.0

## SILVER ECONOMY POTENTIAL FOR THE LABOR MARKET AND INDUSTRY 4.0

***Peter SIKA***[105]

**Abstrakt:** *Ekonomické správanie, potreby a preferencie ľudí sa líšia v jednotlivých fázach života, posuny vo vekovej štruktúre preto môžu mať významné makroekonomické účinky. Aj keď starnúca pracovná sila a seniori v Slovenskej republike zatiaľ nepredstavujú silný dopyt po trhových statkoch, ich ekonomický potenciál nemusí byť zanedbateľný. Starnutie obyvateľstva predstavuje okrem iného aj ekonomický potenciál, ktorý je možné využiť v prospech inovácií a zlepšení. Napriek nie vysokej úrovni dôchodkov disponujú seniori nezanedbateľnou kúpnou silou, čo bude generovať rastúci dopyt po špecifických tovaroch a službách, čo je príležitosťou pre trh práce a industry 4.0. V príspevku sa snažíme priblížiť vybrané oblasti, v ktorých by sa mala strieborná ekonomika, a samotné starnutie populácie brať ako výzva na nové podnikateľské príležitosti.*

**Kľúčové slová:** *strieborná ekonomika, starnutie, ekonomika, trh práce, oblasti rozvoja*

**Abstract:** *Economic behaviors, people's needs and preferences vary from stage to stage, so shifts in age structure can have significant macroeconomic effects. Although the aging workforce and seniors in the Slovak Republic do not yet represent a strong demand for market goods, their economic potential may not be negligible. Among other things, the aging population is an economic potential that can be exploited for innovation and improvement. Despite the high level of pensions, seniors have considerable purchasing power, which will generate increasing demand for specific goods and services, which is an opportunity for the labor market and industry 4.0. In this paper we try to describe the areas where the silver economy should be and the aging of the population itself as a challenge to new business opportunities.*

**Key words:** *silver economy, aging, economy, labour market, development areas*

**JEL Classification:** *E24, I38, J11*

## 1. ÚVOD

V posledných desaťročiach sa v krajinách Európskej únie prejavuje intenzívne starnutie populácie, ktoré je spôsobené najmä zvyšujúcou sa dĺžkou dožitia a zároveň nízkou mierou pôrodnosti. Za posledných 50 rokov sa v krajinách Európskej únii očakávaná dĺžka života pri narodení zvýšila v priemere o 10 rokov a miera pôrodnosti sa znížila, pričom sa odhaduje, že do roku 2050 sa podiel obyvateľstva Európy na celkovej populácii zníži na 5 %. Predlžovanie ľudského života môžeme označiť za úspech 20. a 21. storočia, avšak zároveň sa stáva vážnou hrozbou pre udžateľnosť verejných výdavkov v oblasti dôchodkového systému, zdravotníctva ako aj sociálnych služieb. Zvyšujúci sa počet starších ľudí vynára množstvo nových výziev, ktorých potenciál a riešenia sa hľadajú iba postupne. Starnutie je považované za jednu z hlavných európskych výziev v nadchádzajúcich rokov, nakoľko ovplyvní konkurencieschopnosť, ekonomický rast a zamestnanosť. Vplyv starnutia sa bude postupne premietať do národného hospodárstva, a to v kontexte zmien v ponuke a dopyte po službách,

[105] doc. Ing. PhD., Ekonomická univerzita v Bratislave, Dolnozemská cesta 1, Bratislava, 852 35, Slovenská republika, e-mail: peter.sika@euba.sk

výrobkoch, pracovnej sile, na čo bude musieť ekonomika a podnikateľské subjekty reagovať svojimi riešeniami. Práve vďaka starnúcim spoluobčanom sa na trhu vytvára priestor, ktorý pri správnom prístupe mnohých spoločností môže viesť k rýchlemu uspokojeniu zvyšujúceho sa dopytu strieborných spotrebiteľov (Páleník, 2015, s. 70). Zmena spotrebiteľského správania bude vyvolaná aj zmenou disponibilných príjmov, ako aj zmenou ekonomického rastu, vývojom úspor a samozrejme aj vývojom kúpnej sily obyvateľstva. Je nevyhnutné si uvedomiť, že strieborná generácia má odlišné nároky na uspokojovanie svojich potrieb v porovnaní s mladšou generáciou.

Podľa Bonnskej deklarácie (2005) strieborná ekonomika predstavuje potenciál nových a inovatívnych produktov a služieb pre vyššiu kvalitu života v starobe. Európska komisia (2015) definuje striebornú ekonomiku ako ekonomiku príležitostí vyplývajúcich z verejných a spotrebiteľských výdavkov spojených so starnutím populácie a so špecifickými potrebami populácie staršej ako 50 rokov. Podľa Eurostatu predstavuje strieborná ekonomika vývoj a marketing inovatívnych produktov (tovarov a služieb) určených pre staršie osoby. Deutsche Welle (2005) ju vymedzuje ako adaptácia ekonomiky na budúce potreby rastúceho počtu starších ľudí, čím tento fenomén vytvára nové trhové príležitosti.

V súvislosti so striebornou ekonomikou nazývame striebornou populáciou skupinu spotrebiteľov v poprodukčnom veku (viac ako 50 rokov). Seniormi nazývame ľudí starších ako 65 rokov. Staršiu populáciu rozdeľuje Páleník (2012) na Slovensku do troch vekových skupín:

- 50 – 64 rokov – starnúci (young-old),
- 65 – 79 rokov – starí (middle old, seniors),
- nad 80 rokov – najstarší (very old).

Cieľom príspevku je poukázať na potenciál striebornej ekonomiky pre trh práce a priemysel 4.0 v Slovenskej republike ako aj nutnosť spoločnosti urýchlene reagovať na nové socio-ekonomické javy v spoločnosti. Zvyšujúci sa dopyt seniorov po tovaroch a službách vytvára neustále sa zvyšujúci tlak na tvorbu nových pracovných miest.

## 2. STRIEBORNÁ EKONOMIKA V KONTEXTE STARNUTIA

Očakávaná dĺžka života sa u nás za ostatné desaťročie predĺžila o 2,3 roka v prípade žien a o 3,4 roka v prípade mužov. Zaraďujeme sa medzi top 10 krajín európskej únie, v ktorých došlo za obdobie 2006 až 2016 k najvýraznejšiemu predĺženiu života. Všeobecne platí, že muži žijú kratšie ako ženy. V prípade slovenských mužov je to približne o 7 rokov menej ako sa dožívajú slovenské ženy. Priemerný rozdiel medzi oboma pohlaviami v Európskej únii je 5,4 roka. Očakávaná dĺžka života žien pri narodení je u nás necelých 81 rokov a u mužov je to necelých 74 rokov.

**Tabuľka 1: Očakávaná dĺžka života vo vybraných krajinách Európskej únie**

| Krajina EÚ | Očakávaná dĺžka života - ženy | | | Očakávaná dĺžka života - muži | | |
|---|---|---|---|---|---|---|
| | 2006 | 2016 | 2016 vs 2006 | 2006 | 2016 | 2016 vs 2006 |
| Francúzsko | 84,5 | 85,7 | 1,2 | 77,3 | 79,5 | 2,2 |
| Taliansko | 84,2 | 85,6 | 1,4 | 78,5 | 81,0 | 2,5 |
| Fínsko | 83,1 | 84,4 | 1,3 | 75,9 | 78,6 | 2,7 |
| Švédsko | 83,1 | 84,1 | 1,0 | 78,8 | 80,6 | 1,8 |
| Rakúsko | 82,8 | 84,1 | 1,3 | 77,1 | 79,3 | 2,2 |
| Grécko | 81,9 | 84,0 | 2,1 | 77,2 | 78,9 | 1,7 |
| **EÚ** | **-** | **83,6** | **-** | **-** | **78,2** | **-** |
| Nemecko | 82,4 | 83,5 | 1,1 | 77,2 | 78,6 | 1,4 |
| V. Británia | 81,7 | 83,0 | 1,3 | 77,3 | 79,4 | 2,1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ČR | 79,9 | 82,1 | 2,2 | 73,5 | 76,1 | 2,6 |
| Poľsko | 79,7 | 82,0 | 2,3 | 70,9 | 73,9 | 3,0 |
| **Slovensko** | **78,4** | **80,7** | **2,3** | **70,4** | **73,8** | **3,4** |
| Maďarsko | 77,8 | 79,7 | 1,9 | 69,2 | 72,6 | 3,4 |

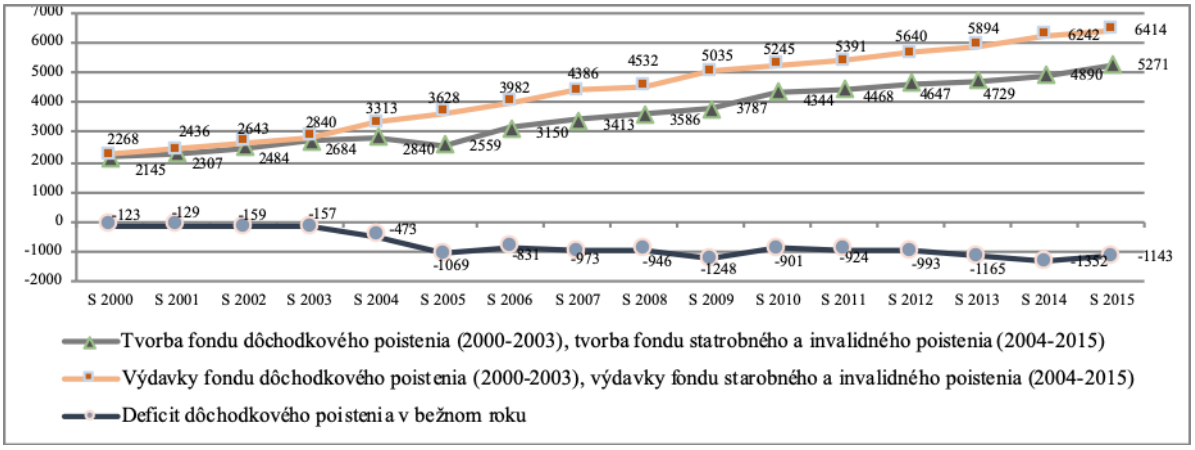
Zdroj: Poštová banka podľa údajov Eurostatu

Podľa Vladimíra Baláža (2011) v roku 2035 podiel mládeže bude činiť len 18,2 %, kým podiel ľudí nad 65 rokov stúpne na 21,1 %. Starnutie bude pokračovať veľmi rýchlym tempom a v roku 2050 stúpne podiel seniorov na 28,4 %.

Na prebiehajúcu demografickú zmenu sa môžeme pozerať z niekoľkých pohľadov. Prvý považuje staršiu generáciu za príťaž pre spoločnosť, nakoľko neustále rastú nároky na dôchodkový systém ako aj na zdravotný systém.

Výdavky na dôchodkové dávky sa za ostatných 15 rokov viac ako strojnásobili, čo má zásadný vplyv na udržateľnosť dôchodkového systému.

**Obrázok 1: Deficit dôchodkového poistenia v bežnom roku za obdobie rokov 2000 až 2015 (v mil. €)**




Zdroj: Vlastné spracovanie na základe údajov Sociálnej poisťovne.

Celkové výdavky na zdravotníctvo taktiež prudko rastú, v roku 2019 dosiahnu výdavky na zdravotníctvo 5,2 mld. €, čo predstavuje 5,8 % HDP.

Tento pohľad vytvára pnutie medzi generáciami a zvyšuje sa tlak na zníženie solidarity v poistných systémoch. Z toho dôvodu neustále rastú požiadavky na zvýšenie odvodového zaťaženia obyvateľstva ako aj na posilnenie subsidiarity.

Druhý pohľad sa zameriava na striebornú ekonomiku ako na významný potenciál budúceho ekonomického rastu. Prejavovať sa to bude najmä vo zvýšenej potrebe produktov a služieb rôzneho druhu špeciálne zameraných na seniorskú generáciu, ako aj participáciou starších na pracovnom trhu. Ich uplatniteľnosť na trhu práce však bude vytvárať tlak na prispôsobovanie pracovných podmienok ich špecifickým podmienkam a zdravotnému stavu ako aj pozornosť na úpravu daňovo-odvodových bariér ich pracovnej činnosti. Starší pracovníci môžu byť v porovnaní s mladšou generáciou pre zamestnávateľov prínosom v dôsledku dlhoročných pracovných skúseností, zrelosti a nižšej fluktuácii (Páleník a kol., 2012, s. 34). K celkovému výkonu ekonomiky významnou mierou prispievajú seniori i v rámci neplatenej práce, ktorej však objem nie je zachytený v makroekonomickom ukazovateli HDP. Zahŕňa okruh činností mimo oficiálneho trhu práce, ktoré nie sú finančne odmeňované a predstavuje akúkoľvek

činnosť využívajúcu ekonomické zdroje na uspokojenie potrieb – prácu v domácnosti, starostlivosť o dieťa a iné závislé osoby, prácu v dobrovoľných organizácicách, pomoc v rodinnom podniku a pod. (Kaščáková, Kubišová, 2016). Tieto činnosti prispievajú k udržaniu primeranej životnej úrovne a zdravia seniorov, ale aj k súdržnosti rodín a komunít, čo má vysokú spoločenskú hodnotu, aj keď finančne ťažko vyčísliteľnú.

## 3. VYBRANÉ OBLASTI ROZVOJA PRE POTREBY STRIEBORNEJ EKONOMIKY

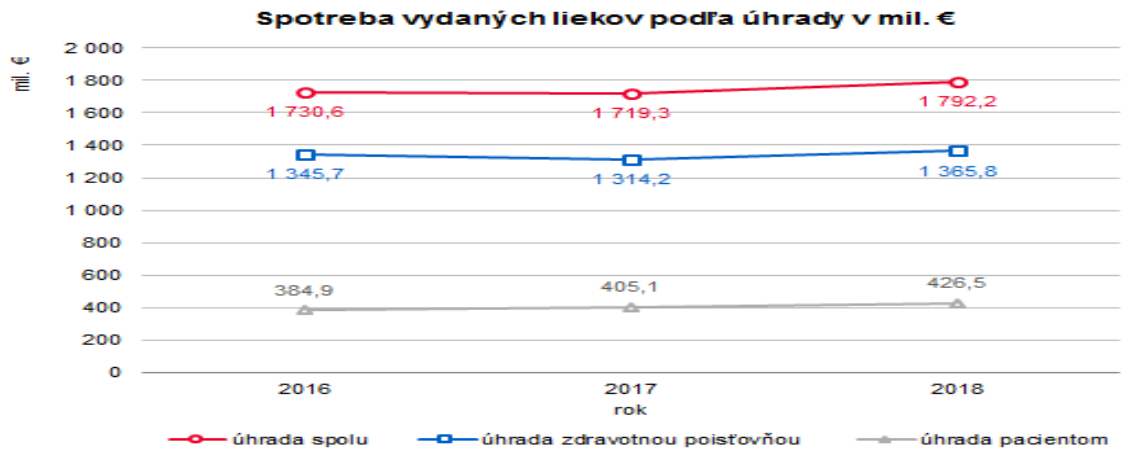
Súčasná generácia od 50 rokov je už v súčasnosti vzdelanejšia, modernejšia, zdravšia a preferuje iné hodnoty v živote ako generácie pred niekoľkými rokmi (Setnická, Szüdi, 2016, s. 58). Na túto skutočnosť musia reagovať ekonomiky jednotlivých štátov ako aj podnikateľské subjekty. Z toho dôvodu upriamime pozornosť na vybrané oblasti rozvoja, ktoré by mali reagovať na starnutie obyvateľstva.

### *3.1 Farmaceutický priemysel*

Na Slovensku sa medzi najbežnejšie príčiny smrti pričinili choroby obehovej sústavy, nádory, úrazy ako aj ochorenia dýchacej sústavy a tráviacej sústavy. Za predlžujúcu sa dĺžkou života obyvateľov môžeme jednoznačne označiť farmaceutický priemysel ako aj lekárne a zariadenia, ktoré predávajú lieky. V súvislosti s pokračovaním trendu starnutia obyvateľstva bude farmaceutický priemysle zohrávať významnú úlohu v tvorbe pracovných príležitostí ako aj ekonomických benefitov.

Celková spotreba humánnych liekov v Slovenskej republike za rok 2018 sa z pohľadu finančnej úhrady za vydané lieky zvýšila oproti roku 2017 o 4,2 % na 1 792,2 milióna €. V tom úhrada zdravotnej poisťovne činila 1 365,8 mil. €, čo predstavuje nárast o 3,9 % oproti roku 2017. Rovnako došlo aj k navýšeniu úhrady pacientom za lieky. Tá v roku 2018 predstavovala 426,5 mil. €, teda o 5,3 % viac ako v predchádzajúcom roku (www.nczisk.sk).

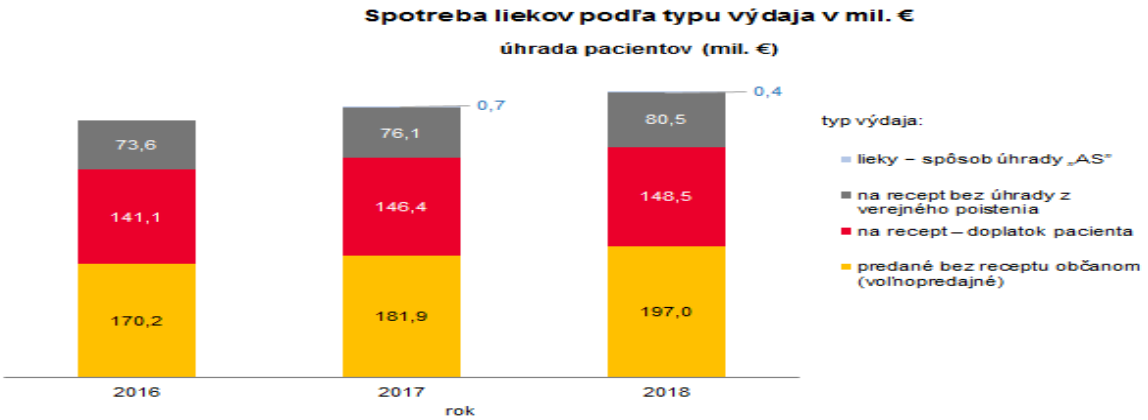
**Obrázok 2: Spotreba vydaných liekov podľa úhrady (v mil. €)**




Zdroj: Národné centrum zdravotníckych informácií.

Zároveň došlo aj k nárastu úhrady pacienta za voľnopredajné lieky, kde úhrada vzrástla medziročne z 181,9 mil. € na 197,0 mil. € (o 8,3 %), suma doplatkov za lieky na recept sa zvýšila z 146,4 mil. € na 148,5 mil. € (o 1,5 %) a platby pacientov za lieky na recept bez úhrady z verejného zdravotného poistenia z 76,1 mil. € na 80,5 mil. € (o 5,8 %).

**Obrázok 3: Spotreba liekov podľa typu výdaja (v mil. €)**




Zdroj: Národné centrum zdravotníckych informácií.

Na recept bolo vydaných 80,3 mil. balení liekov, čo je o 0,9 % menej ako v roku 2017. Nákup voľnopredajných liekov sa zvýšil z 38,4 mil. v roku 2017 na 40,4 mil. balení v roku 2018 (nárast o 5,2 %).

Vyhľadávané boli aj rôzne druhy zdravotníckych pomôcok, ktorých množstvo v baleniach/kusoch sa v priebehu roka zvýšilo o viac ako 2,7 mil. V roku 2017 tak za 131 206 487,9 balení/kusov zdravotníckych pomôcok, zdravotné poisťovne uhradili 193 486 064,8 € a doplatok pacientov činil 8 731 282,0 €. Počet kusov/balení zdravotníckych pomôcok v priebehu 3 rokov zaznamenal nárast o 14,3 %. Stúpajúci trend je možné očakávať aj do budúcnosti.

Faramceutický priemysel bude zohrávať stále väčšiu úlohu pri udržiavaní strieborných v zdraví čo je jeho potenciál v oblasti tvorby pracovných miest vo výskume a distribúcii farmaceutických prípravkov.

### *3.2 Zdravotná starostlivosť*

S pribúdajúcim vekom dochádza aj k zhoršeniu zdravotného stavu občanov, čo vedie k zvýšenej odkázanosti starších na zdravotnú starostlivosť a pomoc iných. Z toho dôvodu je veľkou výzvou do budúcnosti vytvárať nové, moderné zariadenia zdravotnej starostlivosti, ktoré by boli významnou pomocou pri zdravotnej a sociálnej starostlivosti striebornej generácie. Táto skutočnosť bude viesť k tvorbe nových pracovných miest napríklad pre zdravotné stestry, lekárov, rehabilitačných pracovníkov a pod.

**Tabuľka 2: Počet pracovných miest vo vybraných oblatiach**

| Pracovných miest | Ambulantná zdravotná starostlivosť | | Ústavná zdravotná starostlivosť vrátane ambulantných častí | |
|---|---|---|---|---|
| | 2016 | 2017 | 2016 | 2017 |
| lekárov | 7 915,79 | 7 497,84 | 9 176,61 | 9 234,47 |
| sestier | 9 687,96 | 9 311,81 | 20 584,20 | 20 381,36 |
| fyzioterapeutov | 685,67 | 596,83 | 1 195,74 | 1 192,34 |
| zdravotníckych záchranárov | 1 471,40 | 1 509,83 | 92,52 | 92,35 |
| sanitárov | 346,15 | 296,93 | 4 406,84 | 4 386,13 |

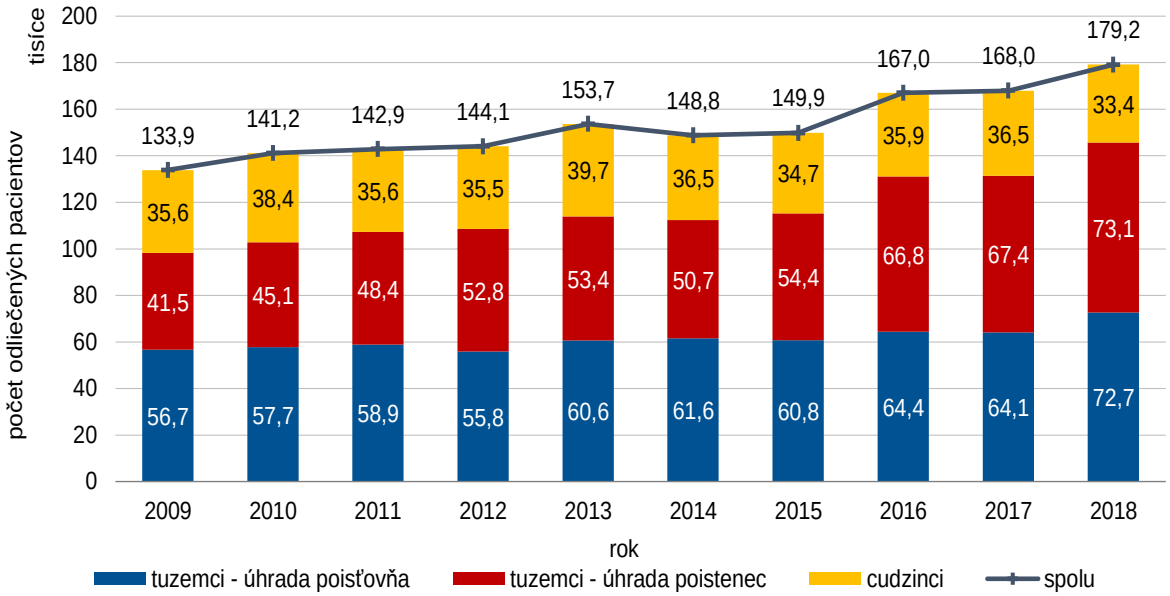
Zdroj: Národné centrum zdravotníckych informácií.

Tento druh služieb je však vo veľkej miere závislý od nemalých finančných prostriedkov. Jedným z riešení by bolo efektívne využívanie finančých prostriedkov vybraných prostredníctvom zdravotného poistenia ako aj zavedenie poistenia na odkázanosť.

### *3.3 Kúpeľná starostlivosť*

Kúpeľníctvo patrí medzi typické strieborné odvetvie, nakoľko priemerný vek klientov kúpeľnej starostlivosti sa v súčasnosti pohybuje na úrovni 45 – 55 rokov. V minulom roku poskytovalo kúpeľnú starostlivosť 30 zdravotníckych zariadení, v ktorých bol poskytnutý liečebný pobyt 145 830 pacientov s trvalým bydliskom v Slovenskej republike. V medziročnom porovnaní došlo k nárastu počtu odliečených tuzemských pacientov o 10,9 %.

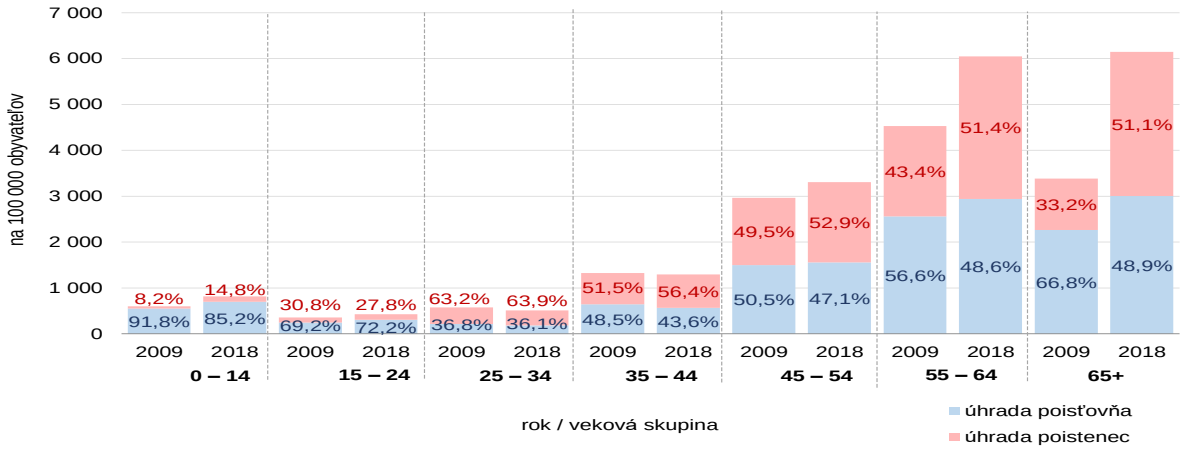
**Obrázok 4: Vývoj odliečených pacientov v kúpeľnej starostlivosti**




Zdroj: Národné centrum zdravotníckych informácií.

Podľa prednovembrových plánov malo byť v roku 2000 na Slovensku vybudovaných 16-tisíc kúpeľných lôžok. Rast sa však v roku 1989 zastavil na čísle 10 500, čo približne zodpovedá aj dnešnému stavu. Trend starnutia sa prejavuje aj na počte odliečených osôb, ktorý sa za posledných desať rokov zvýšil pri domácich pacientoch až o 48,4 %. Kúpeľnú liečbu v roku 2018 najčastejšie využívali vo veku 65 a viac rokov. V tejto vekovej kategórii došlo aj k najväčšiemu nárastu za ostatných desať rokov a to o 81,6 %, pričom podľa úhrady pobytu bol značný nárast pobytov hradených pacientom (o 179,7 %) oproti pobytom hradených poisťovňou (o 32,9 %). Nárast pobytov pacientov vo veku 55 – 64 rokov predstavoval 33,5 %. Toto zvýšenie spôsobil najmä nárast pobytov do 7 dní.

**Obrázok 5: Počet odliečených v kúpeľnej starostlivosti podľa vekových skupín a úhrady pobytu, rok 2009 a 2018**




Zdroj: Národné centrum zdravotníckych informácií.

Z pohľadu dospelých bola kúpeľná starostlivosť poskytnutá najmä pre choroby pohybového ústrojenstva (69,6 %), netuberkulózne choroby dýchacích ciest (14,2 %) a choroby obehového ústrojenstva (5,6 %). (NCZI, 2019)

Nevyhovujúca finančná situácia striebornej generácie sa premieta aj do dĺžky kúpeľnej liečby, nakoľko najvyšší nárast oproti roku 2009 a to o 9,1 % bol zaznamenaný u pobytoch v dĺžke 4 – 7 dní. Naväčší podkles podielu bol pri pobytoch s dĺžkou trvania 15 – 21 dní (z 22,0 % na 13,7 %). Poisťovňa vo výraznejšej miere hradí tuzemcom dlhšie liečebné pobyty nad 15 dní. Pobyty do 14 dní sú hradené prevažne poistencom.

Úspešnosť kúpeľníctva je možný sledovať aj z výsledkov liečenia, nakoľko až u 89,8 % pacientov bol ukončený liečebný pobyt so zlepšením zdravotného stavu a iba u 9,2 % pacientov zostal stav nezmenený.

Slovensko ako krajina s vynikajúcou gegrafickou polohou a veľkým počtom minerálnych a termálnych prameňov disponuje výbornými podmienkami pre rozvoj kúpeľníctva. Otázkou však zostáva, či Slovenská republika dokáže v dostatočnej miere využiť tento potenciál aj v kontexte starnutia obyvateľstva a ich špecifickými požiadavkami zameranými na ich oblasti rozvoja.

### *3.4 Cestovný ruch*

Cestovný ruch je hospodárska činnosť, ktorá je schopná vytvárať rast a zamestnanosť a súčasne prispievať k hospodárskemu a sociálnemu rozvoju a integrácií, pričom môže významným spôsobom zmierňovať regionálne rozdiely. Podiel cestovného ruchu na HDP bol v roku 2012 2,5 %, zatiaľ čo v štátoch EÚ vytvára cestovný ruch viac ako 5 % HDP, čo znamená, že Slovensko je výrazne pod touto hodnotou (MDVaRR SR, 2013, s. 12). Slovenská republika má z tohto pohľadu v porovnaní s priemerom EÚ významný priestor na rast daného odvetvia.

Dôchodcovia najmä s vyššími príjmami vytvárajú vyššie nároky na voľnočasové aktivity a na aktívnejší život, čo sa prejavuje aj v domácom cestovnom ruchu. Významnou mierou im v tejto oblasti napomáha aj opatrenie bezplatnej dopravy na slovenských železniciach, čo sa prejavuje v raste záujmu cestujúcich o tento druh dopravy. Podľa ministerstva dopravy zavedenie bezplatného cestovania umožnilo vymedzeným skupinám ľudí cestovať aj tam, kde

si to predtým dovoliť nemohli. Bezplatné cestovanie po železnici využívajú najmä žiaci a študenti (48 %) a dôchodcovia (36 %), zvyšok tvoria deti do 15 rokov a občania nad 70 rokov.

Významný potenciál cestovného ruchu sám osebe však nie je zárukou vysokej návštevnosti destinácie. Jedným z popredných faktorov je vysoká úroveň kvality poskytovaných služieb ako aj tvorba špecifických produktov pre domáci cestovný ruch zameraný na strieborných.

Medzi faktory, ktoré sú pre starších ľudí dôležité pri rozhodovaní, či opakovane strávia dovolenku na rovnakom mieste, môžeme zaradiť najmä prírodné scenérie a počasie (42 %), kvalitu ubytovacích služieb (28 %), kultúrne a historické pamätihodnosti (28 %). Pre starších ľudí v porovnaní s mladšou vekovou skupinou bol rozhodujúci aj faktor dostupnosti pre ľudí so špeciálnymi potrebami (bezbariérovosť a pod.). (Páleník, 2015, s. 77)

Zameranie cestovného ruchu na seniorov vytvára potenciál pre podnikateľov v cestovnom ruchu eliminovať straty, ktoré sú spôsobené sezónnosťou cestovného ruchu.

### *3.5 Finančný sektor*

Napriek niekoľkým reformám slovenského dôchodkového systému platí, že spoliehanie sa výhradne na dôchodok z prvého piliera nie je celkom správne. Táto situácia je spôsobená najmä starnutím obyvateľstva a nízkou pôrodnosťou. Podľa ekonóma Baláža, je dnes štátny dôchodok vyplácaný z I. piliera približne na úrovni 46 % hrubej mzdy, v budúcnosti sa však výrazne zníži a môže klesnúť až na úroveň 30 %. Táto nelichotivá skutočnosť vedie súčasných poberateľov dôchodkových dávok k rozhodnutiu naďalej participovať na trhu práce. Počet ľudí, ktorí sú aj v dôchodkovom veku aktívni a pracujú, neustále narastá. Ku koncu augusta tohto roku ich bolo 257 719. Je to o takmer 12 tisíc viac, ako v auguste minulého roka, kedy pracovalo 245 968 dôchodcov. Z 257 719 pracujúcich dôchodcov v auguste 2019 bolo 152 451 starobných dôchodcov, 1 713 predčasných starobných dôchodcov a 103 555 invalidných dôchodcov. Riziko dlhovekosti a narastajúci počet dôchodcov predstavuje príležitosť pre oblasť ako je poistenie, zaistenie, správa majektu a správa aktív a mnoho iných oblastí.

Starnutím narastajú výdavky na zdravotnú starostlivosť a vzhľadom na očakávané inflačné pnutie, aj náklady na živobytie. Doteraz je jedinou možnosťou získania väčšieho objemu finančných zdrojov u seniorov v podmienkach Slovenska predaj nehnuteľnosti, čo je často bolestivé rozhodnutie pre vlastníkov nehnuteľnosti. Sľubným riešením takejto situácie by bolo zavedenie reverznej hypotéky v našich podmienkach ako je tomu v niektorých krajinách EÚ. Reverzná hypotéka má formu finančnej dohody medzi veriteľom reverznej hypotéky a dlžníkom, ktorá umožňuje starším osobám previesť reálnu hodnotu ich nehnuteľnosti do úveru v podobe hotovostných preddavkov nevyžadujúce žiadne splátky v budúcnosti. Súbežne je umožnené dlžníkovi zostať žiť v nehnuteľnosti až kým nezomrie, predá nehnuteľnosť alebo sa trvalo nepresťahuje. Veritelia majú záujem ponúkať tento finančný produkt, pretože predstavuje značný potenciál vzhľadom na vysoký počet starších vlastníkov nehnuteľností pri relatívne nízkom riziku generovania finančnej straty. (Husáková, Rievajová, Sika, Šipikalová, 2018)

Vzhľadom na konzervatívnosť slovenských seniorov a silné rodinné väzby nie je reverzná hypotéka riešením pre všetkých seniorov. Reverznú hypotéku považujeme za produkt vhodný pre určitý segment seniorskej generácie, konkrétne pre tých, ktorí sa ocitli v hraničných núdzových situáciách, keď vlastnia nehnuteľnosť ale nemajú dostatočný príjem na bežný život alebo im hrozí exekučné konanie spojené s definitívnou stratou majetku. Táto forma hypotéky môže znamenať prijateľné riešenie aj pre osamelých seniorov bez silných rodinných

vzťahov so silnou túžbou zotrvania po zvyšok života v domácom prostredí a prostredníctvom reverznej hypotéky aj schopnosťou hradiť si aj väčší rozsah domácej opatrovateľskej služby, resp. ďalších terénnych sociálnych služieb. (Husáková, Rievajová, Sika, Šipikalová, 2018)

### *3.6 Stavebníctvo*

Strieborná ekonomika vytvára príležitosti aj pre oblasť stavebníctva. Veľká časť dnešných seniorov žije v domácnostiach, ktoré častokrát nespĺňajú pre nich špecifické požiadavky ako na praktickú činnosť, tak ani bezpečnosť. Byty prispôsobené svojou dispozíciou a službami pre seniorov budú v súvislosti so starnutím a oslabením úlohy rodiny viac žiadané. V Českej republike na základe tejto skutočnosti vznikla spoločnosť Senior Park, a.s., ktorá prevádzkuje svoje zariadenia už v šiestich lokalitách a radí sa medzi významných poskytovateľov bývania pre seniorov a osoby so zníženou schopnosťou pohytu.

Strieborní vytvárajú pre stavebníctvo potenciál aj v oblasti prispôsobovania nehnuteľnosti potrebám starších ľudí. Úpravy bývania častokrát riešia obyvatelia až keď dôjde k pohybovým alebo iným obmedzeniam, namiesto toho, aby boli na túto skutočnosť pripravení vopred.

## 4. ZÁVER

Starnutie populácie, globálne otepľovanie a globalizácia sú hlavné výzvy, ktorým budú čeliť krajiny Európskej únie v najbližších rokoch až desaťročiach. Slovenská republika bude patriť medzi najstaršie krajiny v Európe. Možnosti vysporiadania sa so starnutím obyvateľstva prostredníctvom imigrácie naráža v prípade Slovenskej republiky na súčasnú neatraktívnosť našej krajiny pre migrujúcich. Reformy, ktoré uskutočnila Slovenská republika v oblasti dôchodkov nevytvárajú dostatočný priestor na formovanie spotrebiteľského dopytu seniorov, nakoľko súčasné generácie seniorov nedisponujú dostatočnými finančnými prostriedkami na uspokojovanie svojich potrieb prostredníctvom trhu, tak sú nútení uspokojovať svoje potreby aj prostredníctvom svojej rodiny ako aj svojpomocne. Táto skutočnosť prinesie posun smerom k diskontným maloobchodným predajom, smerom k akciovým produktom, k preferovaniu domáceho prostredia pred reštauračnými zariadeniami, k znižovaniu výdavkov na položky, ktorú nie sú nevyhnutné pre život a vo všeobecnosti treba očakávať vyššiu cenovú senzitivitu (Deloitte, 2011).

Viacerí ekonómovia sa pozerajú na starnutie ako na budúcu hrozbu, ktorá čaká Slovenskú republiku. Menšia časť ekonómov vidí v starnutí aj príležitosť, tak pre ekonomiku ako aj pre podnikateľské prostredie. Rýchlejšie starnutie, vyšší počet starších ľudí s nie vysokými dôchodkami bude v blízkej budúcnosti vytvárať silný tlak na podnikateľské prostredie v oblasti vytvárania pracovných miest určených pre staršiu generáciu ako aj pracovných miest súvisiacich so zmenou spotrebiteľského správania a vyššími nárokmi na nasýtenie potrieb seniorskej generácie obyvateľstva. V prípade, že Slovenská republika zachytí trend striebornej ekonomiky, tak jednoznačne prispeje k zvýšeniu kvality života seniorov ako aj kvality života celej spoločnosti. Strieborná ekonomika je výzvou a šancou pre podnikateľské subjekty dynamicky a inovatívne rozvíjať svoje aktivity pri akceptácii špecifických potrieb seniorskej generácie.

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# THE IMPACT OF PROPTECH 3.0 ON THE REAL ESTATE INDUSTRY WORKPLACES

***Nikolai SINIAK*[106]**
***Adriana GRENČÍKOVÁ*[107]**
***Ninoslav MARINA*[108]**
***Sergey SHAVROV*[109]**

**Abstract:** *A Proptech is characterized by the massive implementation of emerging technology such as home matching tools, drones, virtual reality, building information modeling, data analytics tools, artificial intelligence, IoTs and blockchain, smart contracts, crowdfunding in the real estate sector, fintechs related to real estate, smart cities, regions, smart homes and shared economy. This survey of changes in the real estate industry due to Proptech covers three areas: (a) A brief survey of Proptech applications in the real estate industry, (b) information about implications for real estate market transparency, and (c) comments on the wider implications of these changes on a labour market and an education. Changing the real estate technologies could change system dynamics and improve real estate market transparency. On the other hand, under different institutional arrangements, proptech can affect the changing structure of the labour market, the demand for prospective skills, as well as emerging policy challenges in real estate industry.*

**Keywords:** *Proptech; blockchain; value chain; sustainable development; knowledge management; building information modeling; real estate.*

**JEL Classification:** *J08, J60, J610, J830*

## 1. INTRODUCTION

Real estate and construction are important sectors in the economy, employing large amounts of capital and significant proportions of the workforce and together with health, transportation, trade, agriculture, and others have been targets of digital transformation. In the era of smart sustainable development and growth [2], companies are interested in solutions that allow their processes, machines, employees, and even the products and services themselves, to be integrated into a single integrated network for data collection, data analysis, the evaluation of company development, and performance improvement. Staying smart, sustainable and inclusive in today's global business environment requires continuous improvement in productivity, quality, agility, and service levels [3]. Proptech has the potential to improve productivity and competitiveness, increase energy and resource efficiency and effectiveness and hence to protect the environment and provide opportunities for developed and developing countries to achieve economic growth and sustainable development in line with the 2030 Agenda for Sustainable Development. [4]. Property is at the heart of a smart territory and it's time for the real estate industry to take a leading role.

[106] 1Asst. prof, PhD., University of Information Science and Technology "St. Paul the Apostle", Partizanska bb, Ohrid, 6000, R. Macedonia, e-mail: nikolai.siniak@uist.edu.mk
[107] Assoc. prof., PhD., Alexander Dubček University of Trenčín, Študentská 3, 911 51 Trenčín, Slovakia, e-mail: adriana.grencikova@tnuni.sk
[108] Prof., PhD., University of Information Science and Technology "St. Paul the Apostle", Partizanska bb, Ohrid, 6000, R. Macedonia, e-mail: contact@uist.edu.mk
[109] Asst. prof, PhD., Belarussian State Technological University, 220006, Minsk, 13a, Sverdlova str, R. Belarus, e-mail: shavrov@ipps.by

The concept of «PropTech 3.0: future real estate" was developed in 2017 at the Oxford University School of business, the United States [3]. Proptech became part of the real estate market industry digital transformation, radically new approach to the acquisition, operation and management of the real estate. Proptech - is a collective term used for the determination of start-ups that offer technologically innovative products and new business models for the real estate markets. Proptech means any application in the real estate sector, be it 3D visualizing, home matching tools, crowdfunding in the RE sector, fintechs related to real estate, shared economy, smart cities, smart homes, artificial intelligence, smart contracts or building information modeling. Proptech is still and a new trend, the scale of which will grow up over the time. Therefore today Proptech has been developing in several areas: the real estate market as its own ( PropTech ), smart cities and buildings, the sharing economy, the construction industry ( ConTech ) and finance ( FinTech ). PropTech & ConTech & FinTech are closely related to the real estate industry. This article discusses the major features of the Proptech, the current development trends and the opportunities and the challenges of the Proptech through the prism of the real estate sector.

## 2. PROPTECH IN REAL ESTATE AND DIGITAL TRANSFORMATION.

No business can escape the digital transformation taking place across the global economy, and the real estate sector is no exception. Real estate companies are using Proptech to improve customer experiences, boost sales and increase operational efficiencies. Yet many real estate firms have been slow to keep up with adopting new tools and technologies to transform their companies.

Below examples that real estate companies can take to embrace digital transformation for long-term success [5]:

- Use Rich Media Visualization to Improve Customer Experiences
- Collect Property Data with Internet of Things (IOT) Devices
- Embrace Building Information Modelling
- Employ AI-Powered Data Analytics for Transformative Insights
- Streamline Workflows with Digital Image Classification and ctr.

World Economic Forum classified the PropTech sector into three major categories [1]:

- PropTech 1.0: Growth of online listing sites back in 2007.
- PropTech 2.0: Use of data analytics and virtual reality to offer better and more specialised services for customers.
- PropTech 3.0: Experimentation with emerging technology such as drones, virtual reality tools, IoTs and blockchain which are observing in recent days.

Nowadays almost 50 countries have been created national communities (PropTechRussia, Austrian PropTechInitiative, PropTechBelgium, SwissPropTech, PropTechDach, PropTechSpain, UKPropTechAssociation, PropTechAsia, ProTechBaltic, PropTechNL, NordicPropTechInitiative and ctr.), which have already been united in a single network. The Proptech community has a number of interesting features. It is organized exclusively by business and for business. The community generates B2B services without any government involvement. What is the unusual, they include companies from various fields: investors (institutional and private equity funds, banks and financial groups, venture capital funds, business angels), real estate market participants (rights holders property developers, builders, consulting and brokerage companies, valuers, management and insurance companies) , and technological IT – companies ( suppliers of IT -solutions, integrators, aggregators , developers

of specialized cloud and mobile applications), and startups (developers of technology products and solutions in the field of real estate). The community systematically holds international symposiums, seminars, and competitions that influence the generation of new projects [9].

There is a certain methodology to identify unoccupied PropTech niches in order to initiate startup projects in them. Throughout this purpose, national maps of FinTech and PropTech are developed. They are designed to get an idea of which ICT tools in the country's real estate market are well developed, which are bad, which are not developed at all. The map is based on open sources, includes information about the Proptech community, about IT companies, their projects in the problem areas of Proptech, about Proptech-developments, about Proptech-projects of banks, about developers, about real estate managers, about other Real estate market participants. The Market Map of Proptech (Market Map) gives the most complete picture in which the parameters of the market have a visible development, about the potential and the level of competition. Market map has an information about all market players consolidated and classified by a certain attribute: competitors, intermediaries and sellers. The map certainly includes an image in the form of the layout of the logos of its participants. The classification of participants depends on their position in the global and national markets and their role in marketing activities. The map shows how the company’s roles in market distribution and allows to evaluate the place of individual firms compared to competitors. The creation of such a map is considered today as the final stage of marketing research on the real estate market.

Categories of IT -platform Proptech, proposed by Oxford University, are divided into 12 types [3]:

1. Property Management.
2. Construction Management.
3. Facility Management.
4. Portfolio Management
5. Home Services
6. Commercial Real Estate Search.
7 Long-Term Rentals / Sale Search.
8 Short-Term Rental / Vacation Search
9 Life, Home, Property & Casualty
10. Real Estate Agent Tools
11. Indoor Mapping
12. The IoT Home

Some others community members classify Proptech's IT-platforms into the following categories [2]:

1. Listing and search
2. Marketplace
3. Broker-free List and Search
4. Investment/Crowdfunding/CrowdLending
5. Data, Valuation and Analytics
6. Mortgage Tech
7. Property/Building Management
8. Leasing Management Software
9. Real& Virtual Viewing (3D/VR/AR/Photo)
10. Tech-enabled Brokerage
11. Agent Matching

12. O-2-O Services
13. Smart Building & IoT
14. Smart City
15. ConTech/BIM
16. Sales and marketing
17. PropTech Associations
18. PropTech Startup Accelerator
19. Others

Start-up projects and PropTech Startup Accelerators are the most important in this Proptech concept. Their numbers have been increased significantly every year. You can find the startup-projects examples and structure of them based on the information we collect on a ProptechRiga2019 competition [5].

**Table 1: Structure of startup-projects at the ProptechRiga2019 competition.**

| **Name of a start-up project** | **The company, the country** | **Class of a platform** |
|---|---|---|
| 1. Construction processes synchronization platform based on the BIM (building information model) | BIMSynch (Latvia) | Construction Management |
| 2. A platform for property managing and operating | ODN (Russia) | Facility Management |
| 3. A corporate platform for day-to-day construction management | OROCON (Latvia) | Construction Management |
| 4. Office Management Platform | Pingin (Lithuania) | Property Management, Short-Term Rental / Vacation Search, |
| 5. Business Process Platform for Return Reinvestment | Profitus (Lithuania) | Portfolio Management |
| 6. Smart Contract Real Estate Transaction Automation Platform | SmartLaws (Latvia), Agent House (United Kingdom), | Real Estate Agent Tools |
| 7. SaaS Platform for Sales Synchronization and Tendering services for a variety of companies and suppliers | FIXtender (Latvia), | Portfolio Management |
| 8. Analytical GIS platform with many B2B services | Einpix (Lithuania) | Home Services |
| 9. Cloud portfolio platform for home developers | REALPAD Software (Czech Republic) | Portfolio Management |
| 10. Blockchain platform for cross-border housing transactions | Velvet (Estonia) | Long-Term Rentals / Sale Search |
| 11. Real Estate Portfolio Platform supported by Realtors and Crowdfunding | Reinvest24 (Estonia) | Portfolio Management |
| 12. Digital Commercial Real Estate Operator | R8tech (Estonia) | IoT Home |
| 13. Software complex to support the financing of ongoing projects | Securebadger (Estonia) | Portfolio Management |
| 14. Cloud SaaS Urban Development Platform | Immovativ GmbH (Germany). | Property Management |
| 15. The cloud-based long-term business management platform | Bidrento (Estonia) | Long-Term Rentals / Sale Search |
| 16. SaaS Asset Management Platform with Increased Energy Efficiency | SmartVent (Estonia), | IoT Home |

As you can see in the table, the largest number (five) out of 15 startups belong to the class of Portfolio Management, which accounted for 33% of all applications. In Belarus, two interesting startup projects can be distinguished, were carried out on the roadmap of the

Companies Union of Realtor Activities Reengineering, namely: 1) a project to integrate the Real Estate Agent Tools class platform with the E-government infrastructure, 2) global (Russia / Belarus) Project of the Property Management class for transferring joint homeownership management to a single IT platform.

Analysis of Proptech solutions, including those submitted to the ProptechRiga2019 competition shows that the business models of all the submitted start-up projects are global. Therefore, they are designed for users of the whole world, or Europe, or several regions, but not for a single country. As the allocation of venture capital funding by an increasing band of global investors is deployed to uncovering and developing the digital innovation of the future, traditional operators will come under increasing pressure to adapt or perish.

## 3. PROPTECH AND REAL ESTATE MARKET TRANSPARENCY

Real estate market transparency entails the incorporation of the objectives of smart sustainable development and growth into industry and government operational practices and plays a crucial role in a city's success. It enables governments and public bodies to function effectively, providing long-run benefits to local communities and the environment and helps create a more competitive and flexible environment for investments and businesses, as well as contributing to improvements in quality of life for citizens. Without high levels of transparency, real estate markets cannot work efficiently.

Four key issues, with significant implications for transparency, stand out:

- The emergence of the 'proptech' sector, as new technologies are adopted by the industry;
- The rise of the flexible office space, as major disruptors change real estate market dynamics
- The spotlight on beneficial ownership and anti-money laundering, as public debates around corruption, tax evasion and ownership continue to make headlines;
- The maturing of the 'alternatives' sector, as it goes mainstream and investors demand higher transparency.

The first item is one of the most important. In this new age, digital technology has already become the defining transformational force. They have rapidly become the central new drivers of productivity growth, innovation and the diffusion of knowledge on a global scale. Those who embrace digital technologies as the central transformational force of this new age will prosper. While digital transformation has disrupted almost every type of business, the real estate industry has been traditionally slow to move with the times.

In areas ranging from computer-aided design to development of new construction materials and technologies, to the use of augmented-reality marketing solutions, a long list of innovative new technologies is starting to gain traction, with potentially profound consequences for the real estate and construction industry. It will help to increase the input of the real estate sector in GDP and provide sector's growth and transparency.

The Global Real Estate Transparency Index and methods are used for transparency assessment. Real estate markets in most European countries are transparent [8]. This means that transactions are fast and secured, government behaviour in tax and legal spheres is predictable and regulators fully disclose financial information. European part of the rating is headed by Britain, France, the Netherlands, Germany, Ireland, Sweden and Finland. At the same time, Jones Lang LaSalle (JLL) experts found problems that affected Central and Eastern European markets [1]. The saddest situation in Europe is in Russia (38), Slovenia (46), Serbia (47), Bulgaria (49), Ukraine (69) and Belarus (88). In the newly released biannual Global Real Estate Transparency Index (GRETI) 2018 by JLL, Belarus is ranked

88th, an improvement from the 2016 edition of the Index where the country was ranked 100th from 108th countries. JLL has been tracking the transparency of the global real estate market for 20 years and today. Belarusian real estate market is considered as an opaque all these years - the only European country and the only from CIS countries in 2018. Kazakhstan and Mongolia accompanied Belarus in 2014 ranking as an opaque market. But in 2018 and 2016 Kazakhstan are considered as a Low Transparency market but not an opaque. Jamaica and Mongolia were withdrawn from JLL Global Real Estate Transparency Index update. The world's largest emerging economies are concentrated on the cusp of 'Transparent' status. Accounting for almost 50% of global population, these 'Big 8' markets (Brazil, China, India, Indonesia, Mexico, Russia, Thailand and Turkey) present enormous real estate opportunities that are currently restricted by a lack of transparency. While many of these countries continue to make improvements, further regulatory reforms – and, crucially, stronger enforcement – will be needed to push these markets into the 'Transparent' tier.

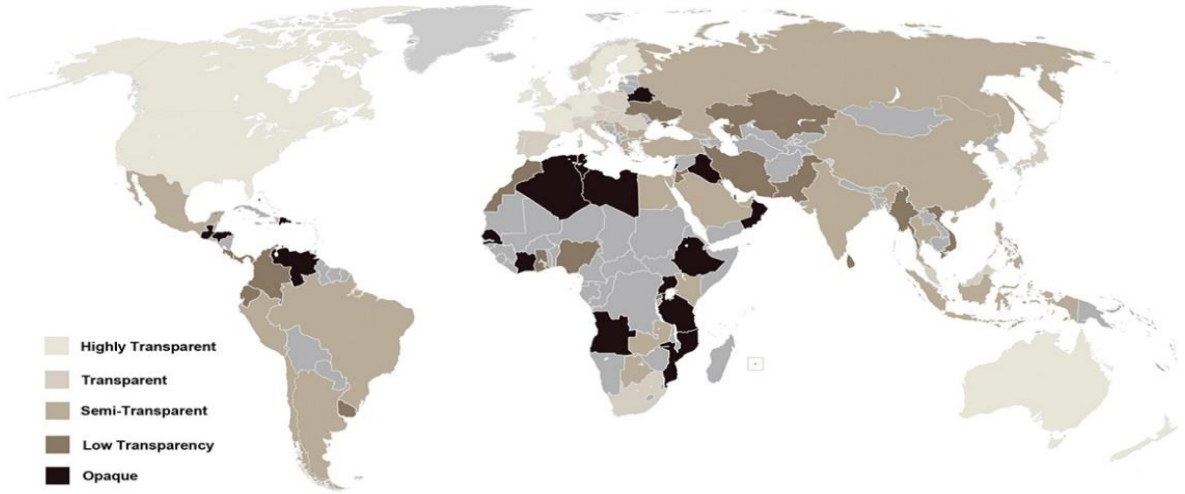
Now let's describe what the Global Real Estate Transparency Index is and what indicators form the final results. The Global Real Estate Transparency Index is based on a combination of quantitative market data and survey results across 100 countries and 158 city markets. 186 individual measures are divided into 14 topic areas, which are then grouped and weighted into six broad sub-indices – performance measurement 28.5%, market fundamentals 16.5%, and governance of listed vehicles 10%, regulatory & legal frameworks 25%, transaction process 15% and environmental sustainability 5%. In the first block are estimated efficiency and effectiveness indicators. These are the price indices for real estate, the share of institutional investors in the market, independence and quality of the evaluation activities of foreign companies and etc. The second block includes market performance: the presence and duration of time scales, reflecting different quantitative data (rent, yield, occupancy (load) in different types of properties and etc.). In the third section are reviewed the financial regulators - how often the market reports are published, how detailed they are, whether the English versions are available. The fourth block deals with the laws there is published all information about real estate registration and taxes. The fifth section is devoted to the transaction process: whether the complete presale information is available, how transparent are the auctions and how honest are realtors. Transparency index is calculated every two years.

The Index scores markets on a scale of 1 to 5 (with 1.00 being the highest possible score). Depending on their overall performance, markets are assigned to one of five transparency tiers. The criteria are qualitative or subjective and these are calculated on the basis of the experts' responses on a scale from 1 (highly transparent) to 5 (opaque).

In 2018 the demand for higher transparency was stronger than ever, as investors continued to increase their allocations to the sector, public debates around property ownership continued and the industry grapples with significant structural changes. Over the past two decades, the Index has become established as the leading industry benchmark for assessing market transparency. Now in its tenth iteration, it continues to guide the sector towards higher standards.

The survey also reveals that the landscape of transparency is shifting, with new issues emerging on the horizon as the real estate Sector undergoes unprecedented structural change (Fig.1).

**Fig. 1: The World of Real Estate Transparency. Source: JLL, LaSalle Investment Management**




The another Real Estate Environmental Sustainability (REES) Transparency Index is based on a survey completed by JLL Energy and Sustainability Services experts in every 100 countries. Canada has joined France, Australia, Japan and the UK in the 'Highly Transparent' group in 2018, while Belarus has still sheared the 'Opaque' group with Kazakhstan, Uruguay, Kuwait, Panama, Ukraine and others. Low REES Transparency has Slovenia, Turkey, Bulgaria, Serbia, Hungary, Saudi Arabia, Egypt, Iran, Lebanon and some other countries.

Real Estate Transparency and Environmental Sustainability market transparency entails the incorporation of the objectives of smart sustainable development and growth, digital and investment performance, into government and industries operational practices.

## 4. PROPTECH AND WORKFORCE AND EDUCATION.

Proptech is the profound transformation of business and organizational activities, processes, competencies and models. Those who thrive in the Proptech will need to develop and execute a vision for digital transformation take an ecosystem-first approach to delivering products and services, manage information effectively, optimize business processes for speed, efficiency, quality, and agility, create flexible and reliable human resource model.

Three types of impact on the labour market are obvious: 1) the labour market is shrinking, 2) the labour market is not changing, but is improving, 3) new niches are emerging in the labour market.

The labour market reduction due to the disappearance of a number of traditional professions that are replaced by Proptech solutions. For example, the labour market of valuers is reduced by the platform «FinCase» (https://f-case.ru), the project developed in Russia, which can be attributed to the class of Portfolio Management. The platform offers the FinCase Scoring Value Analysis System solution - a solution for the automatic valuation of real estate, which allows you to automate the valuation and forecast of the value of the residential and non-residential real estate. In fact, the phenomenon of labour market contraction entails any decision based on artificial intelligence technologies. Thus, BIMSynch (Latvia) delivered a start-up project in Riga with the digital construction platform "BiM Building Synchronization Platform", construction management class. The project proposes an IT- platform for

managing construction processes under the "guidance" of BIM and a mobile application that allows you to compare the real state of the construction object with its model. The platform will provide users with savings in time and money by optimizing the cost of a construction, improving synchronization of joint actions of subcontractors, improving copyright supervision, and construction monitoring processes, quality real estate management while reducing the number of employees.

Proptech is also driving growth in the labour market but in completely new segments. For example, the development of digital real estate marketing leads to the growth of the labour market for specialists in the creation of digital twins of virtual and augmented reality (3D-VR), operators of multi-level earth remote sensing systems, specialists in indoor mapping, facilitators in using IoT.

Companies in leading sectors have workforces that are 13 times more digitally engaged than the rest of the economy. In lagging sectors, the digital engagement of the workforce can be erratic; some organizations have made progress in certain areas but have not yet addressed foundational tasks their workers perform.

Proptech has also influenced on appearance new trends never existed before which influenced on workforce and workplace in the real estate market.

***Trends in the emergence of unique solutions that never previously existed in the history of mankind.*** Let's result from some examples testifying to such tendency. BIM data information models have never driven construction processes, as it is in the case in the aforementioned BIMSynch project. Instruments are known as BIM are the source of information for Artificial Intelligence, which makes construction budgeting in a few minutes. The instruments were developed in which BIM manage the logistics of construction materials on spatial data on the location of the respective warehouses. All of these solutions have a place for the simple reason that BIM had never been before. Another example, the project of the Velvet (Estonia) company. Name of the project: "the Blockchain is the platform of cross-border housing transactions". The platform solves the problem of remote authentication of civil law subjects, the design and implementation of e-transactions, communication with payment systems, etc. Its regulations allow to all interested parties in transactions to identify themselves and make decisions based on big data (the list of sanctions, information on criminal offences) to ensure the fact of cooperation with the proper person. The regulations provide the necessary level of transparency, when customers can see at what level of transaction they have: the payment was made, the payment was accepted; the transaction was done, etc. Regulations of the platform provide an immutable record, when the terms of the transaction cannot be changed under any circumstances, while maintaining a high level of security and confidence to all types of transactions. Regulations of the platform have everything for the execution of transactions that provide interaction platforms for worldwide interbank financial SWIFT messaging for payments with escrow accounts (platforms). Velvet implements transaction of purchase/sale with a high degree of security regardless of the geographic location of the property and civil rights. Possible areas of use of the platform: logistics, E-Commerce, real estate, stocks, etc. The top of the countries in the implementation of the project – Ukraine, Germany, Russia, Finland and Turkey. This project is unique for the simple reason that never before was not used smart contracts, blockchain and token in real estate transactions by this way.

***The trend of companies moving away from office space and moving from permanent offices to fragmented use of common space and workplaces right at home.*** This phenomenon was envisaged by the PropTech concept, which introduced the concept of "separation economy" into practice. Coworking (Co-working, "teamwork") is becoming a new approach to organizing the work of people with different occupations in a common space. Coworking space is often called a shared space, a collective office. Coworking

characterizes the flexible organization of the workspace and the demand form communities. Coworking space is the third place, separate from two ordinary social environments: home ("first place") and workplace ("second place"). Examples of third places are often shown as environments such as cafes, clubs, public libraries, parks, shared offices, etc. According to Jones Lang LaSalle (2016), 25% of average working time is currently spent in the third places. Dennis Frenchman from the Massachusetts Institute of Technology proposed the term "fractionation of real estate" to describe the fragmented use of inefficiently-used space of the same real estate. Fractionated real estate becomes a workspace sharing platform. Projects of the Short-Term Rental / Vacation Search class have already been implemented, allowing to become the owner of the office on the principles of coworking for several hours from the moment of a contact. The demand for joint workspace is caused by the growth of creative and technical industries, as well as a change in the nature of work. The number of collaborators that have been used coworking is growing steadily from year to year and, according to current estimates, reached 1 million participants in 2017.

***Educational Trends***. Three trends should be noted in changes of education. Firstly, the more active participation of universities in startup projects. For example, the company R8tech (Estonia) entered the competition (table 1) with the project "Digital operator of commercial real estate" (IoT Home class). The IT operator is based on a model of facilitation management with elements of artificial intelligence; With the so-called Autopilot on the premises; With the mapping of interior spaces; With continuous communication with customers. The "Autopilot" function of the operator gives users confidence that all rooms are heated/cooled and ventilated properly. This saves 20% of energy consumption. The "Diagnostics" function of the digital operator analyzes the current characteristics of the engineering equipment of the building, determines the details of its anomalies and malfunctions. The "Accident Detection" function is provided by the technical services of a digital operator, which are provided continuously, oriented to owners and managers, in order to ensure long-term operation of engineering equipment, transparency of management, and a comfortable indoor climate. The company's partner in the project is Tallinn University of Technology, which implements modern innovative projects of intelligent agents AI (artificial intelligence) for the technical operation of buildings. Secondly, universities began to train future specialists in the PropTech segment with an expanded profile. They are equally prepared in four areas: information technology, legislation, economics and management. Thirdly, universities strive to transfer to practical and project-oriented training, attracting students to startup projects carried out in partnership with companies in the PropTech community.

This approach even allows you to teach what is not yet but will appear in the future. Undoubtedly, the main challenge of the future is constantly changed. To cope with this constant change, the educational unit must be more flexible.

## CONCLUSION

The new battleground in real estate is Proptech. Global technology entrepreneurs and investors have already begun turning their attention to reinventing the real estate sector, through business model innovation and product innovation. Companies are using Proptech to raise the bar in operational efficiency, customer engagement, innovation, and workforce productivity. Practical examples, such as Airbnb, WeWork and Amazon demonstrate how digital disruptors can materially affect the markets in which they operate, leaving incumbents scrambling to catch up.

The impact on the labour market is mixed with widespread dislocation of workers but a proliferation of Proptech that offer new ways of working, education, matching skills, and acquiring skills.

University graduates must have the skills to adapt to a rapidly changing labour market; they must have the skills to solve the still unknown problems of the future. The fact is that professional and technical skills can be acquired and updated at a later stage of their career, while theoretical problem- solving skills, self-development skills can be achieved only through the process of academic preparation at universities. To cope with this constant change, the educational base must be more flexible, universal and Proptech oriented.

We believe that the survey obtained in the research may be helpful for companies, foreign investors and government in terms of making a proper choice of a real estate sector digital development and creating clear investor-friendly conditions in different countries.

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# THE ROLE OF TELECOMMUNICATION PERSONNEL FOR INDUSTRY 4.0 JOB CREATION

***Biruta SLOKA*[110]**
***Laura KERŠULE*[111]**
***Iluta SKRŪZKALNE*[112]**

**Abstract:** *Telecomunivcation industry is among the leaders in Industry 4.0 creation and realization with introduction of 5 G mobile networks (in Latvia LMT was first) and innovations in telecommunications with application of recent findings in research and development. All those achievements could not be possible without skilled and motivated personnel for reaching new goals related to Industry 4.0 and job creation. All requested specialists cannot be found immediately and cannot be trained quickly – skills and knowledge of personnel in telecommunication industry need to grow faster as technology development: this task is especially essential for telecommunication industry personnel and motivation of persoonel. Aim of the current research is to investigate personnel motivation factors in telecommunication industry. Research methods applied – scientific publications and previous conducted research studies, survey of employers, survey of employees in telecommunication industry. For survey data analysis there are used descriptive statistics methods and multivariante analysis methods – factor analysis, correlation analysis and analysis of variance - ANOVA.*

**Key words:** *Industry 4.0, job creation and preservation, personnel motivation, telecommunications*

**JEL Classification:** *L21, L23, M52, M54, O3*

## 1. INTRODUCTION

Telecomunivcation industry is among the leaders in Industry 4.0 creation and realization with introduction of 5 G mobile networks (in Latvia Latvijas Mobilais Telefoons - LMT was first) and innovations in telecommunications with application of recent findings in research and development. All those achievements could not be possible without skilled and motivated personnel for reaching new goals related to Industry 4.0 and job creation. All requested specialists cannot be found immediately and cannot be trained quickly – skills and knowledge of personnel in telecommunication industry need to grow faster as technology development: this task is especially essential for telecommunication industry personnel and motivation of persoonel. Aim of the current research is to investigate personnel motivation factors in telecommunication industry. Research methods applied – scientific publications and previous conducted research studies, survey of employers, survey of employees in telecommunication industry. For survey data analysis there are used descriptive statistics methods – indicators of central tendency or location (arithmetic mean, mode, median), indicators of variability (range, standard deviation and standard error of mean) and multivariante analysis methods – factor analysis, correlation analysis and analysis of variance - ANOVA.

## 2. PROBLEM FORMULATION AND METHODOLOGY

Globalisation, fiercer competition and growing uncertainty in the business environment and reality of Industry 4,0 make organisations continuously adapt to changes in the market structure, legislation and legal structure as well as to changes in the needs of various

[110] Profeesor, Dr.oec., University of Latvia, Aspazijas bulv 5, Riga, LV – 1050, Latvia, Biruta.Sloka@lu.lv
[111] Vice President, LMT (Latvijas Mobilais Telefons), Ropažu iela 6, Riga, LV – 1000; Laura.Kersule@lmt.lv
[112] As.Professor, Dr.oec., RISEBA University, Meža iela 3, Riga, LV-1048, Latvia, Iluta.Skruzkalne@gmail.com

generations of the workforce. Also, the classical sources of competition advantages within Industry 4,0 situation are changing, e.g. manufacturing and process routines and technologies, access to regulated markets, the economy of scale become less and less significant compared to the not-so-distant past. Recently more and more new technologies are developed and the life cycles of technological products become shorter, the advantages of the unique differences in technologies and long-term competition reduce including within Industry 4,0.

The unstoppable globalisation trends together with changes in the age structure of the workforce are already now creating a serious crisis regarding workforce and talent. Acknowledging the growing lack of workforce in the nearest future in the growing economic situation, it must be learnt how to manage companies in these conditions of continuous, endless and mostly unpredictable changes and it is connected with increased stress for both organisations and employees. In organisations, as they adapt to the new conditions of global competition, the employee becomes the main competitive advantage, and stresses change in the organisation itself: from marketing-orientated competitiveness to human-resource-orientated competitiveness. Consequently, human resources management becomes a critical function, not only in the organisation's competitiveness and achievements (creativity, efficiency), but also viability. Thus, organisations are not only facing external changes, but are also experiencing the largest changes in human resource management in the last hundred years.

Practically, Latvian companies compete on a global scale for knowledge workers. Furthermore, emigration is a great challenge to the Latvian economy. Since 2010, the Latvian population has dropped by 170 thousand, or 8%. Due to migration, in this period Latvia has lost more than 100 thousand people, and 57 thousand due to negative natural growth in population. Emigration results in Latvia losing those of working age in particular, and the ratio of the youngest, most educated generation is high; e.g. in 2018, most emigrants were young people in the age group 25-29 (2,881 people), then in the age group 30-34 (2,250 people), followed by the age group 20-24 (2,031) (CSB, 2019). Skill and knowledge of the workforce has become a product that the organisations of developed countries buy for a higher price especially in situation of Industry 4,0. In Latvia, the lack of workforce sits alongside low productivity, which reduces the competitiveness of the country and its companies in the global markets. Traditionally, organisations mostly compete and try to survive by lowering prices and optimising costs, transforming business processes, reducing the employee count, providing the long-standing argument that the competitiveness of Latvian companies needs to be increased especially in the situation of global competition within Industry 4,0 (Grencikova, Petrusova, Sokol, 2019); Habanik, Grencikova, Krajco, 2019; Kumah, Yaokumah, Okai, 2019). However, assuming that there is a critical threshold for reducing costs and optimising, new approaches are to be sought, and they are, how the organisation could increase productivity and retain employees.

In looking for answers to the aforementioned challenges in economy and business, organisation management researchers (Cameron, et al., 2003) and company management turns more towards human capital, recognising a company's human resources as a sustainable differentiation of competitiveness advantage, as this form of capital is the most difficult to be reproduced by competitors (Macey, Schneider, 2008). Along with this, recognising that people spend a considerable part of their lives in a workplace, the understanding by organisations' management grows on the role of the human factor in the aspect of long-term survival and excellence especially in the situation of rapid development of information technologies and Industry 4.0 (Erro-Garcés, 2019). Different researchers have confirmed the logical relationship: if human capital (Swart, 2007) is skilfully managed and integrated in workplaces, it has a positive effect on the organisation's results (Nakashima, 2019; Swart, 2007; Peterson, et al, 2011). Consequently, human capital in organisations becomes more and

more important because not only does more have to be done with lower human resources, but organisations also need motivated employees (Ghobakhloo, 2018; Bal, et al, 2010) who can and wish to contribute their resources to work: time and energy. Therefore, organisations' management, in order to adapt to the new circumstances, not only have to revise their business processes, structures and systems, but mainly have to change the mindset and style of work: conceptions, assumptions, attitudes and behaviour (Kordos, 2019; Kordos, 2018).

One of these new attitudes to work is employee engagement, which, next to *employee retention* and commitment, is among the greatest challenges that organisations (Rejikumar, 2019; Aithal, Kumar, 2015) face in this decade. In practice employee engagement (Wilkesmann, Wilkesmann, 2018; Albrecht, et al, 2015; Van Woerkom, 2015) is closely connected with the company's performance, but in the theoretical perspective researchers have always perceived this concept as one of the factors that help develop new views on theories on the efficient management of companies. Although there are uncountable definitions of engagement (Suherdi, 2019; Lodahl, Kejner, 1965), an integral part is employee feelings, psychological presence at work and close bonding with the job itself and organisation. Psychological presence is defined as a condition of personal employee engagement (Bordel, et al, 2019; Kumar, Pansari, 2014) demonstrating engaged behaviour, for example, doing more and performing tasks with enthusiasm and without stress. Psychological presence is influenced to a great extent by the employee's work role models that also include the feeling of security, whether the employee (Kiss, et al, 2019; Cropanzano, Wright, 2001) feels secure in realising themselves and expressing courage and how much; to what extent the employee devotes themselves to work and identifies with their work role (Bordel, Alcarria, 2017; Kahn, 1990; Schaufeli, 2002).

On the whole, external environment changes have created a new approach to employee management, called psychologisation of the workplace by researchers (Axmann, 2016; Schaufeli, 2013; Meyer, Allen**,** 1997). It means that, for the organisation to be able to manage continuous changes, develop and survive, it is a requirement that employees are able and wish to psychologically adapt to new circumstances; motivation (Beard-Gunter, et al, 2019; Cerasoli, et al., 2014) and continuous engagement are required. Thus, for example, changes require that employees have flexibility, self-control, emotional intelligence; demand for excellence (Alcácer, Cruz-Machado, 2019; Gordon, et al, 2015) have refered to employees' personal initiative, and for the management of diversity.

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

As in academic research previously conducted research findings and scientific publication analysis results itr was found that employee attitude to company is very important to have stable, creative and inspired personned for Industry 4.0 realisation. Authors have analysed in detail survey results of employees in telecommunication companies involved in realization of high tech projects.

The survey was conducted using several aspects to be evaluated by respondents. One of the analysed aspect was caracteristics of their company using 23 statements included in table 1. All statements were evaluated by evaluation scale 1 – 7, where 1 – not inhered and 7 – fully inhered. As there were included 23 different aspects which could be better used for conclusions and respective decision making – it was applied one of the multivariate analysis methods for dimension reductions – factor analysis. Main results of factor analysis is included in Table 1.

**Table 1: Main Results of Factor Analysis Rotated Component Matrix**

| Initial factors | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Stable | 0,715 | -0,008 | 0,317 |
| Honest | 0,844 | 0,161 | 0,196 |
| Fair | 0,843 | 0,221 | 0,185 |
| Responsive | 0,789 | 0,338 | 0,157 |
| Arranged | 0,753 | 0,213 | 0,162 |
| Supporting development of personality | 0,675 | 0,438 | 0,200 |
| Inspiring | 0,607 | 0,482 | 0,293 |
| Ensure unique experience for personnel | 0,512 | 0,339 | 0,272 |
| Creative | 0,406 | 0,570 | 0,317 |
| Dynamic | 0,439 | 0,412 | 0,464 |
| Inspectionable | 0,147 | 0,060 | 0,644 |
| Not restrictable (not restricting with too many regulations) | 0,318 | 0,732 | -0,054 |
| Ambitional (aimed to big aims) | 0,228 | 0,075 | 0,691 |
| Elastic | 0,336 | 0,715 | 0,215 |
| Not byrocratic | 0,133 | 0,751 | 0,125 |
| Non-formal | -0,028 | 0,760 | 0,012 |
| Exacting (high requirements to individual performance) | 0,184 | 0,123 | 0,794 |
| Democratic | 0,411 | 0,574 | 0,273 |
| Problem formulating and solution attitude | 0,426 | 0,515 | 0,362 |
| Oriented to customer relations | 0,422 | 0,343 | 0,425 |
| Oriented to profit | 0,114 | 0,089 | 0,678 |
| Energic | 0,435 | 0,447 | 0,508 |
| Oriented to quality | 0,546 | 0,193 | 0,488 |

*Extraction Method: Principal Component Analysis.*
*Rotation Method: Varimax with Kaiser Normalization.*
*a. Rotation converged in 4 iterations.*

Source: Author's calculations based on Laura Keršule conducted survey in 2018, Evaluation scale 1 – 7, where 1- not inhered; 7 – fully inhered

After multivariate statistical analysis on dimension reduction - factor analysis which was realised with extraction method – principal component analysis with Kaiser normalisation which was converted in 4 iterations by use of varimax rotation it was calculated three complex factors:

I – Company organisation factor

II - Personnel relations factor

III - Strategic development factor.

More detailed analysis is prepared for company organisation factor forming initial factors as it is one of the most important to know evaluations of employees for more resasonable decision making and managing of employees. Main statistic indicators (indicators of central tendency or location – arithmetic mean, mode, median and indicators of variability – standard deviation, standard error of mean and range) of evaluations by respondents of company organisation factor is included in table 1.

**Table 2: Main Statistic Indicators of Company Organisation Factors**

| | | Stable | Honest | Fair | Responsive | Arranged | Supporting development of personality | Inspiring | Ensure unique experience for personnel | Oriented to quality |
|---|---|---|---|---|---|---|---|---|---|---|
| N | Valid | 608 | 608 | 608 | 608 | 608 | 608 | 608 | 608 | 608 |
| | Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | | 6,50 | 6,24 | 6,08 | 6,04 | 5,95 | 5,78 | 5,81 | 5,82 | 6,31 |
| Std. Error of Mean | | 0,029 | 0,036 | 0,040 | 0,039 | 0,042 | 0,046 | 0,045 | 0,044 | 0,034 |
| Median | | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 |
| Mode | | 7 | 7 | 7 | 7 | 6 | 7 | 6 | 6 | 7 |
| Std. Deviation | | 0,719 | 0,897 | 0,980 | 0,953 | 1,025 | 1,137 | 1,112 | 1,089 | 0,838 |
| Range | | 4 | 4 | 6 | 5 | 6 | 5 | 6 | 6 | 4 |
| Minimum | | 3 | 3 | 1 | 2 | 1 | 2 | 1 | 1 | 3 |
| Maximum | | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |

Source: Author's calculations based on Laura Keršule conducted survey in 2018, Evaluation scale 1 – 7, where 1- not inhered; 7 – fully inhered

Data included in table 2 indicate that evaluations of employees on analysed factors are very high with high average evaluations for all analysed aspects with the highest evaluations on company is "stable" and "oriented to quality" where the minimal evaluation was 3 and mode and median was 7, for those factors variability indicators were the lowest.

More detailed analysis on employee evaluations of company organisdation factors was conducted of employees on years worked in profession using analysis of variance – ANOVA – results are included in table 3.

**Table 3: Main Statistic Indicators of ANOVA on Company Organisation Factors by Years Worked in Profession**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Stable | Between Groups | 5,142 | 5 | 1,028 | 2,005 | 0,076 |
| | Within Groups | 308,843 | 602 | 0,513 | | |
| | Total | 313,985 | 607 | | | |
| Honest | Between Groups | 6,204 | 5 | 1,241 | 1,551 | 0,172 |
| | Within Groups | 481,691 | 602 | 0,800 | | |
| | Total | 487,895 | 607 | | | |
| Fair | Between Groups | 9,932 | 5 | 1,986 | 2,086 | 0,065 |
| | Within Groups | 573,119 | 602 | 0,952 | | |
| | Total | 583,051 | 607 | | | |
| Responsive | Between Groups | 5,147 | 5 | 1,029 | 1,135 | 0,340 |
| | Within Groups | 545,742 | 602 | 0,907 | | |
| | Total | 550,888 | 607 | | | |
| Arranged | Between Groups | 12,644 | 5 | 2,529 | 2,436 | 0,034 |
| | Within Groups | 624,973 | 602 | 1,038 | | |
| | Total | 637,617 | 607 | | | |
| Supporting development of personality | Between Groups | 11,073 | 5 | 2,215 | 1,722 | 0,128 |
| | Within Groups | 774,269 | 602 | 1,286 | | |
| | Total | 785,342 | 607 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Inspiring | Between Groups | 15,871 | 5 | 3,174 | 2,601 | 0,024 |
| | Within Groups | 734,614 | 602 | 1,220 | | |
| | Total | 750,485 | 607 | | | |
| Ensure unique experience for personnel | Between Groups | 15,228 | 5 | 3,046 | 2,604 | 0,024 |
| | Within Groups | 704,231 | 602 | 1,170 | | |
| | Total | 719,459 | 607 | | | |
| Oriented to quality | Between Groups | 9,581 | 5 | 1,916 | 2,769 | 0,017 |
| | Within Groups | 416,667 | 602 | 0,692 | | |
| | Total | 426,248 | 607 | | | |

Source: Author's calculations based on Laura Keršule conducted survey in 2018, Evaluation scale 1 – 7, where 1- not inhered; 7 – fully inhered

Data of ANOVA analysis included in table 3 indicate that there is a significant difference by years worked in profession in evaluations by emploees on organisational factors. More detailed analysis results of lower evaluated organisation factors by years worked in profession are included in table 4.

**Table 4: Distribution of Main Statistic Indicators of Company Organisation Factors by years worked in profession**

| How many years do you work in your profession | | Arranged | Supporting development of personality | Inspiring | Ensure unique experience for personnel |
|---|---|---|---|---|---|
| Till one year | Mean | 6,31 | 6,02 | 5,96 | 6,02 |
| | N | 45 | 45 | 45 | 45 |
| | Std. Deviation | 0,821 | 1,118 | 1,043 | 1,033 |
| From 1 to 2 years | Mean | 6,00 | 6,03 | 6,05 | 6,13 |
| | N | 39 | 39 | 39 | 39 |
| | Std. Deviation | 1,124 | 1,013 | 1,050 | 0,923 |
| From 2 to 4 years | Mean | 5,69 | 5,60 | 5,81 | 5,51 |
| | N | 89 | 89 | 89 | 89 |
| | Std. Deviation | 1,051 | 1,074 | 1,096 | 1,271 |
| From 4 to 7 years | Mean | 5,96 | 5,86 | 5,99 | 5,79 |
| | N | 101 | 101 | 101 | 101 |
| | Std. Deviation | 0,969 | 1,077 | 0,995 | 0,993 |
| From 7 to 13 years | Mean | 5,93 | 5,84 | 5,85 | 5,90 |
| | N | 143 | 143 | 143 | 143 |
| | Std. Deviation | 0,990 | 1,142 | 1,119 | 1,066 |
| More than 13 years | Mean | 5,99 | 5,68 | 5,59 | 5,82 |
| | N | 191 | 191 | 191 | 191 |
| | Std. Deviation | 1,069 | 1,209 | 1,175 | 1,082 |
| Total | Mean | 5,95 | 5,78 | 5,81 | 5,82 |
| | N | 608 | 608 | 608 | 608 |
| | Std. Deviation | 1,025 | 1,137 | 1,112 | 1,089 |

Source: Author's calculations based on Laura Keršule conducted survey in 2018, Evaluation scale 1 – 7, where 1- not inhered; 7 – fully inhered

As data of table 4 indicate the lowest evaluations of employees are by those employees who work in profession from 2 to 4 years. In this group of employees the variability of the evaluations was the biggest (indicated by standard deviations).

Theoretical findings have indicated that age of employees have influence on evaluations on work organisation. Empirical results of survey data analysis have indicated that only for some aspects – "company is stable", "company is inspiring" and "company is oriented to quality" have statistically significant correlation coefficients which are included in table 5.

**Table 5: Statistically Significant Correlation Coefficients of Organisational Factors and Age of Respondent**

| | | Stable | Inspiring | Oriented to quality |
|---|---|---|---|---|
| Your age | Pearson Correlation | -0,108** | -0,108** | -0,146** |
| | Sig. (2-tailed) | 0,008 | 0,008 | 0,000 |
| | N | 608 | 608 | 608 |

Source: Author's calculations based on Laura Keršule conducted survey in 2018, Evaluation scale 1 – 7, where 1- not inhered; 7 – fully inhered

Data of table 5 indicate that employees getting older give lower evaluations for – "company is stable", "company is inspiring" and "company is oriented to quality". It means that those older employees have to be asked on their opinion on how the aspects could be improved and have to be more communication with older employees.

## 4. CONCLUSION

Scientific publications on Industry 4.0 realisation have indicated that there are many important factors to be successful including employees education level, experience, age, gender and also regional aspects.

Telecommunication industy which is one of the most active and creative industries for Industry 4.0 have to pay a lot of attention on personnel inovolvement in realization of aims of the company for working in competitive working environment.

Company evalution aspects could be divided in three complex factors: organizational factor of company; personnel relations factor and strategic development factor.

Employees who have professional experience from 2 to 4 years are more critical on company organizational aspets than other employees, it means that to those employees it could be changed communication and involvement.

Company management have to pay utmost attention to company organization for people getting older to feel for employees that "company is stable", "company is inspiring" and "company is oriented to quality".

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# POSITION OF SMES IN THE CONTEXT OF INDUSTRY 4.0

***Jana SOCHUĽÁKOVÁ***[113]
***Katarína KRÁĽOVVÁ*** [114]

**Abstrakt:** *The SME environment is at present a very rapidly and dynamically changing environment, which is largely exposed to the challenges of the advent of Industry 4.0 and the development of new modern technologies. These are settled in almost all sectors of the national economy. Due to dynamic developments around the world, SMEs need to respond to the changes that are taking place in their environment and thus remain competitive. Small and medium-sized enterprises make up 99% of business entities in the Slovak Republic, provide employment opportunities to almost three-quarters of the workforce and significantly contribute to the creation of added value. The aim of the paper is to evaluate the impact of Industry 4.0 on the development of small and medium-sized enterprises in the Slovak economy. We will focus on the position of SMEs in the labor market and the change in the structure of employees in the context of Industry 4.0.*

**Kľúčové slová:** *Industry 4.0, small and medium-sized enterprises, labor market, employees*

**JEL Classification:** *L16, O32, O15,*

## 1. INTRODUCTION

The concept of the Fourth Industrial Revolution was piloted by the German government in order to create a coherent policy framework in order to maintain and increase the competitiveness of German industry. It is a whole new philosophy bringing societal change and extending across a range of areas ranging from industry through technical standardization, security, education, the legal framework, science and research to the labor market and social system. Industry 4.0 is the name of large-scale changes rapidly entering the current industry. These changes are driven by digitization. It involves digitizing products, digitizing and optimizing all business processes, including services. The current wave of digitization will affect almost all areas of human life. Continuous progress in the field of modern digital technologies, complemented by the development of artificial intelligence, is pushing the boundaries of industrial production ever further. The development of digital technologies in recent years has also had a significant impact on the SME sector. Small and medium-sized enterprises are characterized by a high degree of flexibility and the ability to adapt faster to changing market conditions compared to large enterprises. SMEs have significant potential for the national economy because they have a number of important functions, eg. social, economic, export, import, development, etc. Small and medium-sized enterprises constitute the EU's fundamental economic support. They are a key source of job opportunities. They are an indispensable source of growth, contributing to the flexible introduction of new products, increasing innovation activities, developing a competitive environment, creating progressive solutions, creating new jobs and thus reducing unemployment. They create jobs with relatively low capital costs and their performance is more cost-effective. They adapt quickly and respond to changes. [3] Small and medium-sized enterprises make up 99% of business entities in the Slovak Republic, provide employment opportunities to almost three-quarters of the workforce and contribute significantly to the creation of added value. And it is the small and medium-sized enterprises that we focus in the contribution. The aim of the paper is to

[113] Ing. PhD., FSEV TnUAD v Trenčíne, Študentská 3, Trenčín, Slovenská republika, e-mail: jana.sochulakova@tnuni.sk
[114] Ing. PhD., FSEV TnUAD v Trenčíne, Študentská 3, Trenčín, Slovenská republika, e-mail: katarina.kralova@tnuni.sk

evaluate the impact of Industry 4.0 on the development of small and medium enterprises in the Slovak economy.

## 2. SMALL AND MEDIUM ENTERPRISES IN SR

Small and medium-sized enterprises are one of the most important parts of the economy in all countries with developed economies. Small and medium-sized enterprises are increasingly gaining market share and increasing their share of gross domestic product. The year 2018 represented another successful period for Slovakia, during which the national economy continued its growth trend from previous years. However, in the area of small and medium-sized enterprises, the number of SMEs has declined year-on-year after previous growth. This is mainly due to a decline in the number of self-employed.[9]

**Table 1:** Number of enterprises by legal form and size categories of enterprises as at 31.12.2018

| size categories / legal forms | enterprises | freelancers | free jobs | farmer | together | | Index 2018/2017 |
|---|---|---|---|---|---|---|---|
| | | | | | abs. | share in % | |
| **Microenterprise (0 - 9)** | **213462** | **302677** | **22703** | **3683** | **524525** | **96,8%** | **98,6** |
| **Small business (10 - 49)** | **13062** | **1236** | **20** | **10** | **14328** | **2,6%** | **101,2** |
| **Medium-sized enterprises (50 – 249)** | **2940** | **47** | **1** | **0** | **2988** | **0,5%** | **101,1** |
| **Large businesses (250 a viac)** | **679** | **1** | **0** | **0** | **680** | **0,1%** | **102,7** |
| **Together SMEs (0 - 249)** | **229464** | **303960** | **22724** | **3693** | **559841** | **99,9%** | **98,7** |
| **Total business entities** | **230143** | **303961** | **22724** | **3693** | **560521** | **100,0%** | **98,7** |

Source: Register of SO SR organizations, processed by SBA

From the long-term point of view, the development of the number of small and medium-sized enterprises in the conditions of the Slovak Republic has been increasing since 2007. This development was maintained until 2011. Then the number of small and medium-sized enterprises in the Slovak Republic increased by 15,5% compared to 2006. After 2011, the overall number of small and medium-sized enterprises is characterized by different trends.[10]

**Table 2:** Development of the number of small and medium - sized enterprises in the period 2006 - 2018

| | **Development of small and medium - sized enterprises** | | | | | |
|---|---|---|---|---|---|---|
| **Year** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
| **MSP together** | 500 557 | 537481 | 540 617 | 552 725 | 555 608 | 551 608 |
| **Year** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** |
| **MSP together** | 563 501 | 565 241 | 531 063 | 557 122 | 567 131 | 559 841 |

Source: SBA

Of the total number of active business entities, micro-enterprises accounted for 96.8%. The SME structure in 2018 is complemented by small businesses with a share of 2.6%. Medium-sized enterprises with the lowest share are 0.5%.

## 3. IMPLEMENTATION OF INDUSTRY 4.0 IN SME

The issue of Industry 4.0 has been discussed in Slovak companies for several years. The year 2018 confirmed the trend of dynamization of the onset of digital transformation in Slovak

companies. The share of companies applying intelligent industry elements is slowly increasing. Businesses are beginning to perceive the fact that Industry 4.0 is not only a technological shift but also a gradual change of mindset in the wider context of the smart future. Today we can say that it has reached a stage where companies are approaching its real implementation. Two thirds of companies consider it important. Implementation is ongoing, but the pace is not uniform across processes and technologies. Most of the SMEs implement some isolated optimization measures without a comprehensive strategy. The application of the Industry 4.0 concept was mainly started by companies with foreign capital. According to the latest surveys, the share of Industry 4.0 enterprises increased to 31% compared to 15% in 2017. [5] Enterprises are starting to create separate teams of employees who are in charge of Industry 4.0 and managing innovation. Effective prerequisites for successful involvement in Industry 4.0 processes include a quality innovation system and research and development.

**Table 3:** Expenditure on research and development in the Slovak Republic in mil. Eur

| Year | Expenditure on research and development | | | R&D expenditure per capita (Eur) | Share of R&D expenditure from GDP (in %) |
|---|---|---|---|---|---|
| | together expenditure | capital expenditure | common expenditure | | |
| **2010** | 416,4 | 63,1 | 353,3 | 77,2 | 0,62 |
| **2011** | 468,4 | 94,8 | 373,6 | 86,9 | 0,66 |
| **2012** | 585,2 | 109,3 | 475,9 | 108,3 | 0,80 |
| **2013** | 610,9 | 97,3 | 513,6 | 112,9 | 0,82 |
| **2014** | 669,6 | 115,7 | 553,9 | 123,6 | 0,88 |
| **2015** | 927,3 | 374,2 | 553,1 | 171,0 | 1,18 |
| **2016** | 640,8 | 45,8 | 595,0 | 117,9 | 0,79 |
| **2017** | 749,0 | 72,8 | 676,2 | 137,6 | 0,88 |
| **2018*** | 750,9 | 53,9 | 697,0 | 137,9 | 0,83 |

Source: www.statdat.statistics.sk, * preliminary data

R&D expenditures in Slovakia have been increasing steadily between 2010 and 2015,. Current expenditures account for a larger proportion throughout the analysis period. The percentage of R&D expenditure from GDP reached its maximum in 2015, namely 1.18% of GDP. The percentage of R&D expenditure from GDP reached its maximum in 2015, namely 1.18% of GDP. The increase in the percentage of total R&D expenditures for 2015 was due solely to capital expenditures, with significant use of the Structural Funds. In 2016, there was a decrease, with EUR 640.8 million spent on research and development, which represented 0.79% of HPD. In the years to come, there is a renewed increase in R&D expenditure.

**Table 4:** Expenditure of SMEs on R&D by size categorization (EUR million)

| | 2014 | 2015 | 2016 | Share in 2016 v % | Index 2016/2015 |
|---|---|---|---|---|---|
| **Microenterprise (0 - 9)** | 5,9 | 8,2 | 5,2 | 1,6% | 63,6 |
| **Small business (10 - 49)** | 28,1 | 24,9 | 29,4 | 9,1% | 118,4 |
| **Medium-sized enterprises (50 – 249)** | 60,5 | 66,2 | 78,8 | 24,4% | 119,0 |
| **Large businesses (250 a viac)** | 152,2 | 159,9 | 209,3 | 64,8% | 130,9 |
| **Together SMEs (0 - 249)** | 94,4 | 99,3 | 113,5 | 35,2% | 114,3 |
| **Total business entities** | 246,7 | 259,2 | 322,7 | 100% | 124,5 |

Source: www.statdat.statistics.sk

Expenditure on research and development of the business sector in 2016 amounted to 322.7 mil. EUR, with the share of SMEs reaching more than one third. In terms of size category, large enterprises are mainly involved in research and development. In general, the larger the size category of enterprises, the higher the rate of R&D activities. The share of SMEs in R&D is 35.2%, of which the largest contribution of R&D investment is made by medium-sized enterprises. There is an upward trend in spending in all businesses.

When implementing Industry 4.0 in enterprises, the issue of employees is also an important factor. Industry 4.0 can be characterized by an unstable changing environment and is compatible with an organic organizational structure characterized by decentralization, empowerment of individuals, fewer written and formal rules, horizontal communication and teamwork. [9] Small and medium-sized enterprises are an important part of the economy of the Slovak Republic, because they create new job opportunities and therefore have a positive impact on the level of employment in the economy.

**Table 5:** Number of persons employed by size category

| Legal forms and size categories | 2017 | 2018 | | difference 2018 a 2017 | Index 2018/2017 |
|---|---|---|---|---|---|
| | | abs. | % | | |
| **FO-entrepreneurs (estimate)** | 636500 | 637750 | 33,2% | 1250 | 100,2 |
| **microenterprises (0-9)** | 252385 | 251228 | 13,1% | -1157 | 99,5 |
| **small businesses (10-49)** | 220700 | 239988 | 12,5% | 19288 | 108,7 |
| **medium - sized enterprises (50-249)** | 278263 | 278608 | 14,5% | 345 | 100,1 |
| **large businesses (250 a viac)** | 493682 | 513817 | 26,7% | 20135 | 104,1 |
| **Total SMEs (0-249)** | 1387598 | 1407324 | 73,2% | 19726 | 101,4 |
| **Total business entities** | 1881280 | 1921391 | 100,0% | 40111 | 102,1 |

Source: www.statdat.statistics.sk

SME participation in job creation has increased significantly over the last decade. In 2018, small and medium-sized enterprises achieved 73.2% of employment in the corporate economy and 58.8% of total employment in the Slovak economy. [10] We can therefore state that Slovakia is one of the countries with a high share of small and medium-sized enterprises in employment.

**Table 6:** Skills of employees in the enterprise of the future

| | The skills that employees must have | Abilities that "should" have employees | Abilities that "can" have employees |
|---|---|---|---|
| **Technical skills and abilities** | -IT knowledge and skills<br>- Processing and analysis of data and information<br>-statistic<br>- Understanding of organizational and procedural issues<br>-Ability to interact with modern devices | - Knowledge management<br>-Interdisciplinarita<br>-Special knowledge of production activities and processes<br>-Information about IT security and data protection | - Programming skills<br>-Special knowledge about inf. technology<br>- Knowledge of ergonomics<br>- Understanding legal matters |
| **Personality skills and abilities** | -Equipment and time management<br>-Adapting to change and the ability to accept change<br>-Ability of teamwork<br>-Social skills<br>-Communication skills | - Confidence in new technologies<br>- Emphasis on continuous improvement and lifelong learning | |

Source: SBA

Companies are beginning to realize that if they want to be successful in the transition to Industry 4.0, education and training of employees must become one of their key priorities. Managers must devise procedures in the area of human resources in order to promote innovation and education in the organization. In the table we can see what qualifications and skills the employees should have in companies of the future. [9] The abilities and skills of employees are divided into technical and personal. In companies of the future, the need for digital work skills will increase at the expense of manual skills. The creation of a suitable environment that reflects new technologies and adapts their implementation to organizational structure.

## 4. CONCLUSION

Small and medium-sized enterprises are an important part of every country's economy. They are much more flexible in adapting to new conditions than large enterprises. They are considered to be an accelerator of the development of any developed economy, including the territorial development of the country. Small and medium-sized enterprises are described as the most flexible, most efficient and progressive forms of business. They play an important role in ensuring growth and developing the competitiveness of the economy. SMEs are credited with high innovation and development potential. SMEs are beginning to realize the opportunities and benefits of the 4.0 sector to ensure their long-term competitiveness. In order to be successful in the transition to Industry 4.0, training and qualifications for employees must become one of their key priorities. Without sufficiently skilled people, we cannot talk about intelligent industry. The human impact factor is the highest risk factor for SMEs in carrying out their activities. There is a need for more support for the dual education system, including the provision of study programs according to the real needs of regional labor markets. It is essential that schools focus more on specific vocations relevant to their particular regions. It is important to support investment in high-tech areas, to build a pro-innovation infrastructure, to foster business collaboration with science and research organizations, to stabilize the quality of workforce in enterprises, to improve the quality of school graduates, to improve the dual education system and business environment.

It will be necessary for employees to reorient to new types of jobs for which demand will increase. In the long term, it can be expected that around one fifth of employees will change jobs outside the area for which they were originally trained. New jobs resulting from the introduction of automation will require employees with new skills and abilities that they do not currently have. Improving the skills of employees is important across industries and services, in all parts of the value chain - from development to production to sales. The Fourth Scientific Revolution and Industry 4.0 will affect all aspects of human life. It should be remembered that it will not only concern industry, the labor market, the education system, but will become everyday. [4] In the segment of small and medium-sized companies with Slovak capital, we expect a more sophisticated approach to the preparation of the transformation strategy and its implementation concepts.

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# REDUCING JOB INSECURITY IN THE LIGHT OF INDUSTRY 4.0: THE ROLE OF SUSTAINABLE HRM

***Živilė STANKEVIČIŪTĖ***[115]
***Eglė STANIŠKIENĖ***[116]

**Abstract:** *Generally, job insecurity reflects a threat to the continuity and stability of employment as it is currently experienced. Recently, the topic of job insecurity has been attracting growing attention, especially in the light of Industry 4.0. seeing that digital transformations may lead to labour displacement or substitution. Until recently, the majority of research has been focused on consequences of job insecurity, with relatively less research being devoted to finding out how job insecurity could be mitigated. Trying to close the gap, the paper introduced sustainable HRM practices as means for reducing job insecurity. To this intent, quantitative data were collected in Eastern Europe. The results support the idea that organisational communication, employee participation, employee training, procedural justice, and supervisory support are the main practices leading to a lower job insecurity. The paper has strong practical implications as the results support the idea that organisations can implement sustainable HRM practices for making the employees feel less insecure.*

**Key words:** *job insecurity; Industry 4.0; sustainable HRM; employee participation; organisational communication.*

**JEL Classification:** *M540; M510; M550; J03.*

## 1. INTRODUCTION

Over several past decades, work has been the subject of transformation (Shoss, 2017). Due to economic, political and technological changes, work has become more volatile (De Cuyper et al., 2012). Examples of the volatility include continuing growth in temporary employment, organization downsize, outsource labour, frequent restructurings, and demand that employees do more with less (De Witte, 2005; Shoss, 2017). More recently, the literature has been booming about far-reaching effect of digital transformation on the labour market (Dengler and Matthes, 2018). The core message is that digital technologies (automatisation, robots, artificial intelligence) may lead to labour displacement or substitution (Moniz, 2014; Moniz and Krings, 2016; Zhang, 2019). Naturally, under such circumstances employees may feel insecure about the future of their jobs.

Generally, job insecurity reflects a threat to the continuity and stability of employment as it is currently experienced (Shoss, 2017). Previous research on job insecurity has mainly focused on the following direction. First, the number of studies have sought to identify the antecedents of job insecurity in terms of subjective characteristics and objective situations (Keim et al. 2014; Shoss, 2017; Gallie et al. 2017). Second, the consequences of job insecurity for an individual worker and for organisations have been revealed (Sverke and Hellgren, 2002; Cheng and Chan, 2008; De Witte, Pienaar and De Cuyper, 2016). A growing body of literature suggests that the perception of job insecurity may have harmful consequences in terms of poor job attitudes, poor employee health and well-being, decrease in employee performance, and adaptability and creativity (Jiang and Probst, 2014; De Cuyper et al. 2012; De Spiegelaere et al, 2014; Niessen and Jimmieson, 2016). Having detrimental effects in

[115] Assoc. Prof., PhD., Kaunas University of Technology, School of Economics and Business, Gedimino str. 50, Kaunas, LT- 44249, Lithuania, e-mail: zivile.stankeviciute@ktu.lt
[116] Prof., PhD., Kaunas University of Technology, School of Economics and Business, Gedimino str. 50, Kaunas, LT- 44249, Lithuania, e-mail: egle.staniskiene@ktu.lt

mind, more recently, the factors for reducing job insecurity have become the topic of interest. For instance, De Cuyper et al. (2012) introduced perceived external employability as a factor for reducing the feeling of job insecurity. Loi, Lam and Chan (2012) proposed procedural justice and ethical leadership, while Vander Elst et al. (2010) suggested organisational communication and participation as the means for coping with job insecurity. However, the literature remains fragmented and a sophisticated approach is still missing. Trying to close the gap, the paper proposes sustainable HRM framework as a means to reduce the feeling of job insecurity. One of the core targets of sustainable HRM is to reduce the harm on employees (Mariappanadar, 2014). This could be achieved by "demonstrating sincerity towards the employees, including providing a decent work environment and conditions, providing development opportunities and being attentive to employees' physical and psychosocial well-being at work" (Wikhamn, 2019, p. 103).

The aim of this paper is to reveal whether and which practices of sustainable HRM may reduce job insecurity. The paper is based on the survey of employees working in Eastern Europe.

The paper contributes to the literature in several ways. First, the paper expands the literature on the topic on the necessity for reducing the job insecurity as job insecurity is a key concern for employees nowadays. Second, the paper introduces sustainable HRM as a means for job insecurity reduction. In doing this, the paper adds some insights to sustainable HRM literature supporting the idea that sustainability in people management could lead to mitigation of side effects for the employees.

The remainder of the paper is structured as follows. The theoretical part gives an overview of the job insecurity, emphasising the role of Industry 4.0 and describes sustainable HRM for job insecurity reduction. Simultaneously, hypotheses are developed. Then, the research method is described. The empirical results and discussion come further. Finally, conclusions are drawn.

## 2. THEORETICAL BACKGROUND

### *2.1 Job insecurity*

Job insecurity is defined in various ways in the literature (Shoss, 2017). For instance, De Witte (2005) claims that job insecurity is "the perceived threat of job loss and the worries related to that threat" (p. 1). According to Sverke and Hellgren (2002), "job insecurity reflects a fundamental and involuntary change concerning the continuity and security within the employing organisation" (p. 27). The current paper follows the attitude of Shoss (2017) arguing that job insecurity could be defined as "a perceived threat to the continuity and stability of employment as it is currently experienced" (p. 1914).

Despite the variety of definitions, several common features of job insecurity could be mentioned (Shoss, 2017). First, job insecurity is a subjective experience leading to practice that the same objective situation may be interpreted by different employees differently. Second, job insecurity is a future-focused construct. Third, job insecurity involves uncertainty. Finally, the nature of job insecurity is involuntary.

In general, job insecurity refers to employees' negative reactions to the changes concerning their jobs (Sverke and Hellgren, 2002). Job insecurity is situated between employment and unemployment, because employees (employed people) feel threatened by unemployment (De Witte, 2005). Some scientists make a distinction between quantitative and qualitative job insecurity (Gallie et al., 2017). Quantitative job insecurity refers to perceived threats to the job as a whole (people are uncertain whether they will be able to retain their current job), while qualitative job insecurity refers to insecurity regarding the continued existence of valued

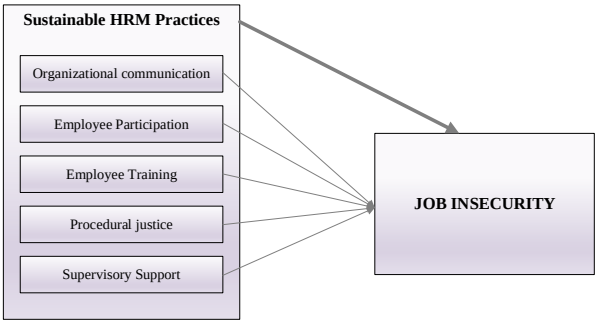
aspects of the job (working hours, pay and so on) (De Witte, 2005). In this paper, job insecurity is examined in a wider sense, rather than focusing on quantitative or qualitative components more narrowly.

As the antecedents of job insecurity are beyond the scope of this paper, the paper draws attention only to characteristics of Industry 4.0. Despite the variety in definitions (Lu, 2017), generally, Industry 4.0 refers to "recent technological advances where the internet and supporting technologies (e.g. embedded systems) serve as a backbone to integrate physical objects, human actors, intelligent machines, production lines and processes across organizational boundaries to form a new kind of intelligent, networked and agile value chain" (Schumacher, Erol and Sihn, 2016, p. 162). Thus, Industry 4.0 refers mainly to digitisation, automation and adaptation, and human–machine interaction. Among other consequences, the mentioned digital transformation may have a far-reaching impact on labour market and employment, as it is still controversial whether new technologies substitute jobs or create more and new jobs (Dengler and Mattles, 2018). In the light of such uncertainty, Industry 4.0 may led to a higher job insecurity of employees.

### *2.2 Sustainable HRM practices*

The term sustainable HRM is quite a new one (Ehnert and Harry, 2012) linking sustainability and HRM (Kramar, 2014). The complexity of the construct is reflected well in the definition provided by Ehnert et al. (2015) arguing that "sustainable HRM can be defined as the adoption of HRM strategies and practices that enable the achievement of financial, social and ecological goals, with an impact inside and outside of the organisation and over a long-term time horizon while controlling for unintended side effects and negative feedback" (p. 3). From the scope of the paper, the "unintended side effects" are of high importance. In sustainable HRM, there is the commitment to redesign HRM practices in such way that these practices do not harm the employees (Mariappanadar, 2014). Referring to the idea of the paper, job insecurity could be reduced implementing sustainable HRM practices. In general, HRM practices are sustainable when they match the characteristics of sustainable HRM. Various characteristics and practices of sustainable HRM are provided in the literature. For instance, Zaugg (2009) incorporates the following characteristics in sustainable HRM: flexibility, employee participation, value orientation, strategy orientation, competency and knowledge orientation, stakeholder orientation, and building mutually trustful employee-employer relationships. Ehnert (2014) underlines these characteristics: long-term oriented; impact-control oriented; substance and self-sustaining oriented; partnership-oriented; multiple-bottom lines-oriented; and paradox-oriented. More recently, based on a qualitative study, Järlström et al. (2018) introduced four dimensions as sustainable HRM characteristics, namely justice and equality, transparent human resource practices, profitability, and employee well-being. Stankevičiūtė and Savanevičienė (2018) proposed long-term orientation, care of employees, care of environment, profitability, employee participation and social dialogue, employee development, external partnership, flexibility, compliance beyond labour regulations, employee cooperation, fairness, and equality as the core characteristics of sustainable HRM. Referring to the abovementioned characteristics, the paper introduces five sustainable HRM practices (organisational communication, employee participation, employee training, organisational procedural justice, and supervisory support), which might have an impact in reducing harm on employees, in terms of making them feel less insecure about their jobs. The theoretical model is provided below (Figure 1).

**Figure 1: Theoretical research model**




***Organisational communication*.** According to Price (1997), communication is the degree to which information is transmitted between the members of an organisation. Vander Elst et al. (2010) perceive organisational communication as the extent to which employees receive sufficient information in terms of quantity and quality about the functioning of the organisation.

Empirical studies show a negative association between organisational communication and job insecurity. For example, Adkins, Werbel and Farh (2001) found that perceptions of receiving sufficient and accurate information were negatively associated with job insecurity. Moreover, Mauno and Kinnunen (2002) demonstrated a positive association between poor organisational communication and job insecurity. More recently, Vander Elst et al. (2010) disclosed that organisational communication was negatively related to job insecurity. The same conclusion was drawn by Keim et al. (2014) in their meta analysis by revealing that a lower level of job insecurity was associated with greater amounts of organisational communication.

The negative association between organisational communication and job insecurity can be understood along two theoretical models. First, according to Greenhalgh and Rosenblatt (1984), the linkage between job insecurity and subjectively experienced job insecurity involves perceptual processes. The perceptual processes are aggravated by the complexity of information processing or by different attention given to official organisational message. Referring to this paper, poor organisational communication may result in vagueness about the employee's position and the future of the organisation, and, in turn, may lead to a higher level of job insecurity. Second, following Motivation to Reduce Uncertainty Model (Kramer, 1999; Kramer et al., 2004), the nature of organisational communication is critical in understanding the association with job insecurity: rumours may create confusion and accordingly enhance insecurity, whereas supporting organisational communication may reduce insecurity (Vander Elst et al., 2010). In line with the empirical research and theory presented, the paper hypothesises the following:

H1: Organisational communication will be negatively related to job insecurity.

***Employee participation***. Patterson et al. (2005) defined employee participation as a degree to which employees have considerable influence over decision-making. The humanistic approach treats participation as beneficial to human growth and satisfaction of social needs, meanwhile the management approach views participation as an instrument to enhance the employees' attachment and loyalty to a particular organisation (Joensson, 2008). Participation reflects the essence of sustainability as participation makes it possible to shifting to the treatment of employees not as an object but as a subject (Zaugg, 2009).

Turning to empirical evidence, previous research has explicitly or implicitly focused on the association between employee participation and job insecurity. For instance, Probst (2005) revealed that employees with greater participative decision-making opportunities reported

fewer negative consequences of job insecurity compared with employees with fewer participative decision-making opportunities. Based on the results of a cross-sectional study of 3,881 employees from 20 organisations in Flanders and Brussels (Belgium), Vander Elst et al. (2010) found that participation was negatively related to job insecurity.

The negative association between employee participation and job insecurity may be theorised along stress theories that include control, seeing that participation in organisational decision-making is often interpreted as a form of employee control (Probst, 2005). In general, control may lead employees to perceive an aversive situation as less threatening., whereas employees who feel in control tend to eliminate or reduce the job insecurity (Vander Elst et al., 2010; Kordoš, Habánik, 2018). In line with the empirical research and theory presented, the paper hypothesises the following:

H2: Employee participation will be negatively related to job insecurity.

***Employee training.*** Patterson et al. (2005) referred to employee training as a concern with developing employee skills. Training is extremely important in the light of Industry 4.0. According to the World Economic Forum „given the wave of new technologies and trends disrupting business models and the changing division of labour between workers and machines transforming current job profiles, the vast majority of employers <...> expect that, by 2022, the skills required to perform most jobs will have shifted significantly" (p. viii). The lack of required skills may be eliminated by employee training. According to Van Hootegem et al. (2019), training has at least two positive consequences. On the one hand, training might protect from dismissal by allowing employees to adjust to new demands in their job. On the other hand, participation in training might help prepare for future job changes by decreasing the room to become long-term unemployed. Going further, training may reduce job insecurity as future skills could be acquired.

Turning to empirical evidence, to the best knowledge of the authors of this paper, the number of studies examining the association between employee training and job insecurity is scant. Van Hootegem et al. (2019) examined the linkage between two constructs and found that job-insecure individuals are more willing to participate in training in order to strengthen their position outside the organisation. However, in the light of provided explanations, it is suggested that:

H3: Employee training will be negatively related to job insecurity.

***Procedural justice.*** Four dimensions of justice are usually identified in justice research: distributive, procedural, informational, and interpersonal (Colquitt, 2001). Loi et al. (2012) argue that procedural justice is likely to have the most relevance to job insecurity. Procedural justice refers to the extent to which the procedures in organisation are applied with accuracy, correctability, consistency, representativeness, ethicality, and bias-suppression (Leventhal, 1980; Loi and Ngo, 2010). According to Cropanzano et al. (2001), procedural justice signals to people that they have standing and dignity within a collective and, moreover, lets them know that they are valued and respected by others. Keeping this in mind, it could be predicted that procedural justice lead to lower uncertainty about their organisational membership, and in turn lower job insecurity. This presumption was supported by empirical research. For instance, Loi et al. (2012) found that procedural justice was negatively related to job insecurity in China context. Based on empirical research and theory presented, the paper hypothesises the following:

H4: Procedural justice will be negatively related to job insecurity.

***Supervisory support.*** Patterson et al. (2005) defined supervisory support as the extent to which employees experience support and understanding from their immediate supervisor.

Supervisory support is the degree to which employees form impressions that supervisors value their contributions and care about their well-being (Eisenberger et al., 2002). Poor relationships with supervisors might induce threats via selection and (or) perceptual mechanisms (Hershcovis and Barling, 2010). Employee perception that their well-being is of high importance to the supervisor may lead to feeling less insecure. In the light of the provided explanations, it is suggested that:

H5: Supervisory support will be negatively related to job insecurity.

To sum up, the general hypothesis will be as follows:

H6: Sustainable HRM will be negatively related to job insecurity.

## 2. METHODOLOGY

**Sample and data collection.** Employees from Eastern Europe were selected to participate in the pilot study. The questionnaire was distributed online. There were 89 responses collected throughout the period of September 2019 – October 2019. Among the respondents in the overall sample, 88.8% were females, 51.7% were aged between 19 and 37, 76.4% were employees with a university degree, and 60.6% had more than 10years of working experience.

**Measures.** The respondents rated items for all the measures, except on demographic characteristics, on a five-point Likert-type scale (from 1= "strongly disagree" to 5 "strongly agree").

Job insecurity was measured using the scale of De Witte (2000), which was translated for its use in other European countries by Vander Elst, De Witte and De Cuyper (2014). The scale includes 4 items. An example of item is "I think I might lose my job in the near future".

Organisational communication was measured using a 9-item scale developed by Jiang and Probst (2014) to tap the employee perceptions of communication within a particular organisation. An example of an item is "I get the information I need about the company".

Employee participation was measured with four items from Patterson at al. (2005). An example of an item is "Management involve people when decisions are made that affect them".

Employee training was measured with four items from Patterson at al. (2005). An example of an item is "People receive enough training when it comes to using new equipment".

Procedural justice was measured using a scale of Byrne (1999), which includes 4 items. An example of an item is "The organisation's procedures and guidelines are very fair".

Supervisory support was measured with four items from Patterson at al. (2005). An example of an item is "Supervisors here are friendly and easy to approach".

Demographic characteristics such as gender, education, age, and working experience were included in the questionnaire. Moreover, in order to reveal whether various aspects of Industry 4.0 increase the employee concern about future work, a one more question was included. Specifically, the respondents were asked if they agreed that 3D Printing, internet of things, workplace robotisation, artificial intelligence, and rapid technological development raise concern for their future work.

## 3. RESULTS

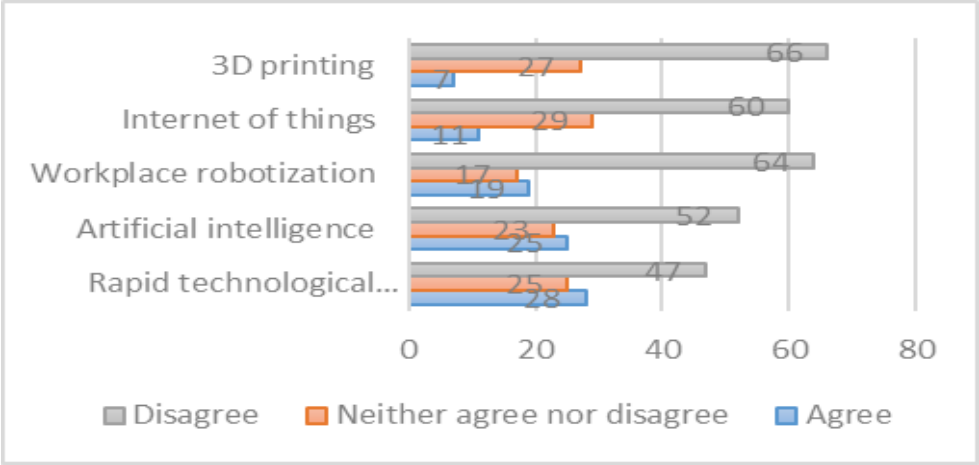
The research data were analysed using a SPSS (version 22) software package. The scale reliability of survey was tested using Cronbach's α. The Cronbach's α value was analysed through two-scale coefficients in order to carry out the research data reliability analysis. If Cronbach's α value is 0.6 or higher, the theoretical model construct items are "acceptable", whereas if Cronbach's α value is 0.7 or higher, the theoretical model construct items are "respectable" (DeVellis, 2016). The calculated Cronbach's α showed that the scales had respectable values for further research analysis (Table 1).

**Table 1: Construct scale items' reliability analysis**

| Constructs | **Reliability** | **Mean** | **SD** |
|---|---|---|---|
| **Job insecurity (N of items=4)** | .860 | 2.441 | .784 |
| **Organisational communication (N of items=9)** | .898 | 3.553 | .696 |
| **Employee participation (N of items=4)** | .678 | 3.110 | .901 |
| **Employee training (N of items=4)** | .758 | 3.303 | .757 |
| **Procedural justice (N of items=4)** | .839 | 3.421 | .804 |
| **Supervisory support (N of items=5)** | .858 | 3.838 | .702 |

The results revealed (Figure 2) that majority of respondents did not agree that Industry 4.0 raised their concerns regarding employment in the future.

**Figure 2: Employee agreement that Industry 4.0 raises their concern regarding future employment**




Hypotheses regarding the effect of sustainable HRM practices on job insecurity were tested using descriptive statistics and Pearson's correlation. This allowed getting insights into the meaning of the coefficients and testing their significance. Correlation analysis was used to test the relationship between the variables. Table 2 shows significance correlations between the constructs.

As it is seen from Table 2, all sustainable HRM practices have significant negative correlation with the job insecurity. The strongest correlation was recorded between organisational communication and job insecurity, which is medium (r=-.418), but significant. Thus, all hypotheses were confirmed.

**Table 2: Correlations of the theoretical construct model**

| Constructs | Correlations between the theoretical model constructs | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **1. Job insecurity** | 1 | | | | | | |
| **2. Organisational communication** | -.418** | 1 | | | | | |
| **3. Employee participation** | -.347** | .778** | 1 | | | | |
| **4. Employee training** | -.352** | .617** | .669** | 1 | | | |
| **5. Procedural justice** | -.368** | .773** | .753** | .671** | 1 | | |
| **6. Supervisory support** | -.325** | .782** | .586** | .568** | .562** | 1 | |
| **7. Sustainable HRM** | -.419** | .912** | .892** | .820** | .879** | .799** | 1 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | | | |

## 4. DISCUSSION

This study investigates whether and which practices of sustainable HRM might reduce job insecurity in the light of Industry 4.0. Five sustainable HRM practices, namely organisational communication, employee participation, employee training, organisational procedural justice, and supervisory support were examined. As predicted, the results supported all the hypotheses.

The study found that the majority of respondents did not agree that Industry 4.0 raised their concern regarding employment in the future. This could be explained that the fact that according to Industry 4.0 Readiness Index, the country where the research was conducted belongs to the Traditionalist country group. The Traditionalist countries still thrive on their sound industrial base, but few of them have thus far launched initiatives to take industry into the next era. (Roland Berger strategy consultants, 2014). Thus, Industry 4.0 is not firmly embedded in the country and hence in the mind of respondents.

According to the findings of this study, organisational communication serves as a means for reducing job insecurity. Jiang and Probst (2014) argue that “the purpose of organisational communication is to disseminate information to employees so that all employees have timely, important, and relevant information regarding their job and the workplace” (p. 562). In case of effective communication, employees feel less ambiguity about what their responsibilities are and less confusion about what is expected from them (Keim et al., 2014). The hypothesis that through enhanced communication employees should experience less job insecurity has been already tested in the literature . The results of this study supplement the previous research (Keim et al., 2014; Vander Elst et al., 2010; Jiang and Probst, 2014) demonstrating the positive effect of organisational communication on job insecurity.

Referring to employee participation, the results of this study confirm the standpoint that participation reduces anxieties relating to insecurity. The literature suggests that more participative organisations may provide their employees the opportunity to discuss and influence organisational change and encourage a sense that individuals’ needs are taken into account when new work roles are constructed (Gallie et al., 2017). The empirical support of this notion was provided by Probst (2005), Vander Elst et al. (2010), and Gallie et al. (2017) The findings of this study are in line with the previously mentioned research and support the idea that employee participation leads to lower job insecurity.

As regards employee training, the theoretical proposition implies that employees might be more willing to take part in training because they view it as instrumental in re-establishing job security and remaining attractive in the labour market (Van Hootegem et al., 2019). In their

study, Van Hootegem et al. (2019) found that job-insecure individuals were more willing to participate in trainings in order to strengthen their position outside the organisation. The current study extends the research and demonstrates that training serves as a means for reducing the job insecurity.

The results referring to the supervisor support demonstrated the existence of a negative relationship with job insecurity. This indicated that employee perceptions that supervisors value their contributions and care about their well-being lead to lower job insecurity (Eisenberger et al., 2002).

Concerning procedural justice, the results demonstrate that procedural justice has a direct impact on reducing the job uncertainty. This means that employees rely on the organisation's fair procedures to determine their future (Loi et al., 2012). The results echo the findings of Van den Bos (2001) strengthening the notion that fairness matters to people because it provides them an opportunity to manage uncertain aspects of their lives. Furthermore, the results are in line with the findings of Loi et al. (2012) where procedural fairness was revealed as a factor for reducing job insecurity among workers in China.

Referring to sustainable HRM, the results indicated that sustainable HRM can serve as an organisational intervention that allows the organisations to reduce side effects on employees, in terms of job insecurity (Mariappanadar, 2014).

## 5. CONCLUSION

The paper aimed at exploring whether and which practices of sustainable HRM may reduce job insecurity in the light of Industry 4.0. Although the majority of respondents did not agree that Industry 4.0 raised their concern regarding employment in the future, the respondents still felt insecure about their jobs (mean = 2.441). The results revealed that sustainable HRM practices, specifically organisational communication, employee participation, employee training, organisational procedural justice, and supervisory support, lead to a lower job insecurity.

The paper provides several practical implications. The empirical results support the idea that sustainable HRM practices can serve as means for job insecurity reduction. Although organisations cannot guarantee job security, there is a relatively simple organisational intervention in terms of organisational communication, employee participation, employee training, organisational procedural justice, and supervisory support that allows them to make the employees feel less insecure. This leads to the suggestion to invest more in sustainable HRM as this leads to lower job insecurity experienced by employees.

The paper has several limitations to consider when interpreting the mentioned findings. First, the paper uses a sample from a single country; it has a limitation due to its restrictive generalisability. To overcome this factor, future research could be extended to a whole region. Second, the paper uses a sample comprising the employees working in various sectors. As job insecurity manifests in the sectors differently, it would be worthwhile to conduct a research among the employees working in manufacturing, retail etc. and to compare the findings. Next, seeing that the paper incorporates five sustainable HRM practices, future research could include more practices. Finally, the research could be expanded including antecedents and consequences of job insecurity.

To conclude, considering that job insecurity is a key concern for employees today, this paper challenges the researchers and managers to shift towards more sophisticated assessments of job insecurity, antecedents and factors, which may help the employees to feel less insecure about their jobs.

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# BIG DATA AND MUNICIPAL WASTE MANAGEMENT: CHALLENGES AND OPPORTUNITIES

***Andrius STANKEVIČIUS*** [117]

**Abstract:** *Industry 4.0 characterized by the convergence of digital, physical, and biological technologies in ways that are changing both the world around us and our very idea of what it means to be human. Climate change and digital development are topical issues on today's political agendas in the EU and worldwide. Municipal waste management is one key element of climate change issues, and Bid Data- element of digital development. Topic reveal possible interaction between municipal waste management and Big Data. This interaction presupposes to discuss such subject as new EU law regulation (Directive on waste or General Data Protection Regulation), specific law provision of the municipal waste management in EU member state level (For example- Lithuanian), political-strategic documents (environmental protection, zero waste, circular economy), and technological-infrastructure aspects. Based on the obtained data, were identified the specifics and trends of the interaction phenomenon.*

**Key Words:** *big data, circular economy, data protection, industry 4.0, municipal waste management.*

**JEL Classification:** *J11, I25, O140, O15*

## 1. INTRODUCTION

Climate change is a major challenge in today's social life. Industrial 4.0 impacts environmental in different ways: demands of ecological resources; increasing consumption influences waste generation; technological-engineering breakthroughs turn waste into a useful resources or product. Environmental issues presuppose resources to use more efficiently, that’s positive influents economic, environmental and social trends. Turn waste into resources very important for increasing resource efficiency and creating circle economic (Kordos, 2019; Kordos, 2018).

It determines the manifestations of various interest groups in the municipal waste management sector: scientists, green organizations, public authorities, business.

A hallmark of the Fourth Industrial Revolution is the way in which it converges with, relies on, and employs digital technologies and business models in order to create, exchange, and distribute value, requiring digital infrastructure and network availability in addition to business sophistication. (WEFORUM, 2017)

Digitalization and big data processing capabilities are the main basement of Industry 4.0 evolution. The *Big Data* phenomenon is implemented and are implementing in many business sectors: medicine, pharmacy, livestock production systems (*Pig data*), banking sectors and many others. In the era of smart and digital development, companies are interested in solutions that allow their processes, machines, employees, and even the products and services themselves, to be integrated into a single integrated network for data collection, data analysis, the evaluation of company development, and performance improvement. (Siniak et al, 2019).

Discussion about BIG DATA Employment in the municipal waste management sector are actual and novel in the context of environmental protection, circular economy, sustainable development.

[117] Lecturer, PhD student, Mykolas Romeris University, Ateities str. 20, Vilnius, LT-08303, Lithuania, e-mail: stankevicius@mruni.eu

### *1.1. Municipal waste management (hereinafter-MWM) as a systemic phenomenon.*

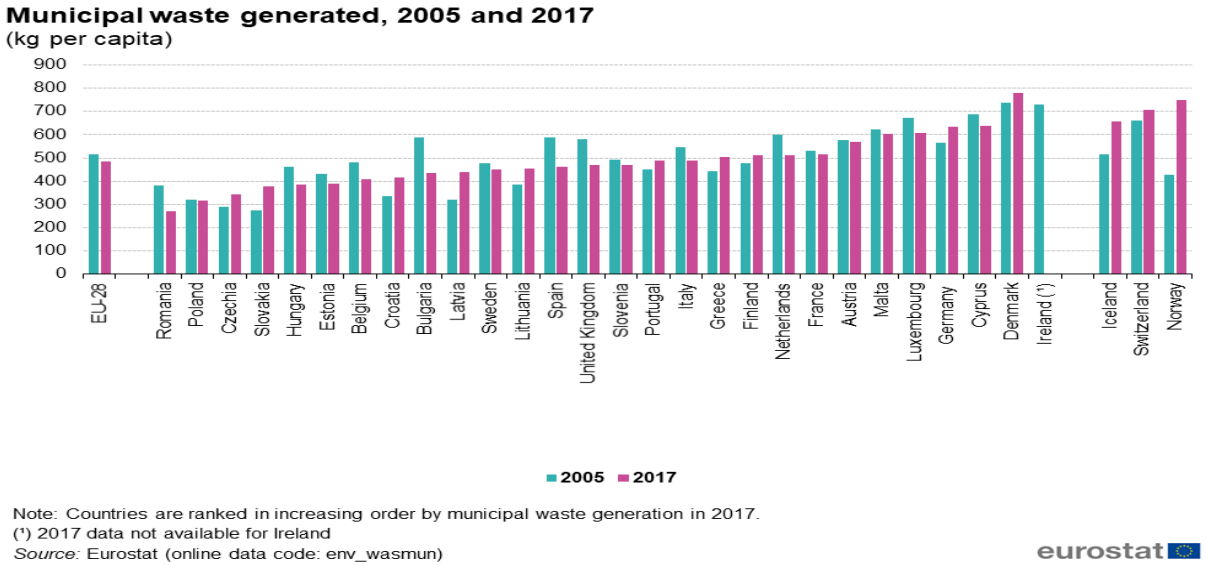
To disclosure peculiarities of MWM, presupposes this phenomenon analyses from political, industrial and law perspectives.

*Firstly*, The TFEU[118] divulge environment as principal area of politics discourse and Union policy on the environment shall contribute to pursuit of the following objectives: preserving, protecting and improving the quality of the environment. Regarding the protection of the environment in particular, The European Court of Human Rights pointed out, that 1. "... this is an increasingly important consideration in today's society, having become a cause whose defense arouses the constant and sustained interest of the public, and consequently the public authorities" (Depalle v. France); 2. "Public authorities assume a responsibility which should in practice result in their intervention at the appropriate time to ensure, that the statutory provisions enacted with the purpose of protecting the environment are not entirely ineffective" (S.C. Fiercolect Impex S.R.L. v. Romania).

*Secondly*, MWM is a business sector, which consisting of various subsectors. This determines the manifestations of lobbying activity by various interest groups in legislature process. Transparent legal concepts - a major legislative challenge. Directive 2008/98/EC reveals definitions of municipal waste management and municipal waste.[119]

*Thirdly*, MWM is identified as critical infrastructure, which are interacted with various sectors of the economy (Novikovas & Stankevicius, 2019). Emphasizes interdependencies with energy sector (for example electricity, heating), digital technology implementation (process automation, cyber security), the sphere of engineering (new technology adoption).

**Figure 1: Situation on municipal waste sector.**




Note: Countries are ranked in increasing order by municipal waste generation in 2017.
(¹) 2017 data not available for Ireland
*Source:* Eurostat (online data code: env_wasmun)

eurostat

[118] The Treaty on the Functioning of the European Union. Official Journal C 326 , 26/10/2012, articles 4 and 191.

[119] Article 3, 2b.: (a) mixed waste and separately collected waste from households, including paper and cardboard, glass, metals, plastics, bio- waste, wood, textiles, packaging, waste electrical and electronic equipment, waste batteries and accumulators, and bulky waste, including mattresses and furniture; (b) mixed waste and separately collected waste from other sources, where such waste is similar in nature and composition to waste from households;

Article 3, 9: 'waste management' means the collection, transport, recovery (including sorting), and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker;

*Fourthly*, MWM sector has social phenomenon. To be emphasized, that every person on the planet leaves waste. According to Eurostat, for 2017, municipal waste generation totals vary considerably, ranging from 272 kg per capita in Romania to 781 kg per capita in Denmark (Average EU-28 to 486 kg per capita) (see Figure 1). The variations reflect differences in consumption patterns and economic wealth, but also depend on how municipal waste is collected and managed.

*Fifthly*, cultural-economic nature. Waste management in the EU should be improved and transformed into sustainable material management, with a view to protecting, preserving and improving the quality of the environment, protecting human health, ensuring prudent, efficient and rational utilization of natural resources, promoting the principles of the circular economy,[120] enhancing the use of renewable energy, providing new economic opportunities and contributing to long-term competitiveness. (Directive (EU) 2018/851).

### *1.2. Big data (hereinafter-BD)- definition and features*

To establish explicit definition of *Big Data* is not simple: in one hand- meaning may be too narrow, other hand- too wide. Widely discussed revealed concept of BD was proposed by Gartner: "high-volume, high- velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making" (Gartner, 2012). The definition refers to the 3Vs (volume, velocity and variety) which are the three-dimensional characteristics of big data. Other authors add to this concept additional aspects and definition refers to the 5Vs: veracity and variety. (Table N.1)

**Table 1. Dimensional characteristics of *Big Data*.**

| | |
|---|---|
| Volume | refers to the size of data which is huge and needs an intensive processing. (M. Halaweh & A. El Massry, 2015) |
| Velocity | refers to the speed at which data is created, processed and analyzed. (M. Halaweh & A. El Massry, 2015) |
| Variety | (range of data types and sources): not all data in a form that is ready for processing. Data can be in many different formats such text, photo, audio, video, web content, GPS data, sensor data, documents, SMS, blogs etc. (M. Halaweh & A. El Massry, 2015); the different types of media the data are stored in. (West et al, 2018). |
| Veracity | the truthfulness of the data. (West et al, 2018). |
| Value | covers all components that describes Big Data. (West et al, 2018). |

Source: made by author.

Also, scientific literature reveals features of BD definition: "that disrupt fundamental notions of integrity and force new ways of thinking and doing to reestablish it" (Lagoze, 2014); offers the potential to create new ways to optimize processes, identify interdependencies and make informed decisions." (Helbirg D., 2019); refers to datasets whose size is beyond the ability of typical software tools to capture, store, manage, and analyze".(McKinsey, 2011); is an increasingly popular data collection and analytical technique predicated on collecting large amounts of data across multiple data sources and types for future analysis.( West et al.2018).

[120] According EU position: a circular economy is based on sharing, leasing, reuse, repair, refurbishment and recycling, in an (almost) closed loop, where products and the materials they contain are highly valued. In practice, it implies reducing waste to a minimum. Expected benefits: reducing pressure on the environment; improving the security of the supply of raw materials; increasing competitiveness; stimulating innovation; boosting economic growth; creating jobs. (European Commission Report COM (2019) 190 final).

In summary, it can be stated, that definitions do not reveal the exact meaning of what exact "data" is called big data, its rather subjective, evolution element, technological development affected by a technological advance. Some authors suggest, that "big data is becoming the oil of the twenty-first century, a new commodity that can be tapped for profit" (Helbirg D., 2019).

EU established two Regulations, which ensure free movement of data. Together, the Free Flow of Non-Personal Data Regulation (EUdataFF)[121] and the GDPR[122] are building the foundation for the free flow of all data within the European Union and a highly competitive European data economy. According to this law documents, it's possible to distinguish *Big Data* procedural levels: Business Case Evaluation; Data Identification; Data Acquisition & Filtering; Data Extraction; Data Validation; Data Analysis and visualization.

## 2. PROBLEM FORMULATION AND METHODOLOGY

The aim of topic- to reveal the features of the interaction between the municipal waste management sector and *Big Data*. Identified tasks: to reveal the peculiarities of the municipal waste management phenomenon; to disclosure definition of big data; to identify features of the interaction between MWM and BD; to provide a classification of peculiarities. Methods used in the study: document analysis (analyzed scientific literature, legal documents), systematic analysis method was used to disclosure systematic nature; statistical data analysis, linguistic and analytical-critical methods.

## 3. PROBLEM SOLUTION, DISCUSSION

### *3.1. BD implementation in first phase of MWM - collection.*

The author suggests, that the most efficient use of BD is in the first phase of the MWM hierarchy- prevention.[123] This phase starts from waste collection. Collection means the gathering of waste, including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility (Directive 98/2008/EC).

Features of interaction on this stage:

a) It is the first link between the user and the MWM system. The data obtained at this stage can guarantee: the exact amount and type of waste; individualize the exact cost of service for each user.

b) Are the source of many legal, political disputes, based on the content and criteria of prices (tax) of service.[124] The fee (tax) is establishing by the carrier or the municipal subject, with subjective criteria (mentioned above), causes many social conflicts these days. Price (tax) policy requires a comprehensive solution, that is adaptable with technological advances, environmental protection, circular economy and justice principles. Author suggest, that manifestation of BD in waste collection phase, positively affects factors (Table 2), which influence price politics.

[121] Regulation (EU) 2018/1807 of the European Parliament and of the Council.

[122] Regulation (EU) 2016/679 of the European Parliament and of the Council.

[123] According Directive 98/2008/EC Article 4, Waste hierarchy: prevention; preparing for re-use; recycling; other recovery, disposal. Article 3, 'Prevention' means measures taken before a substance, material or product has become waste, that reduce the quantity of waste.

[124] Municipal waste is currently taxed using criteria: area of real estate; number of persons; the volume (size) of the container; frequency of transporting.

**Table 2. Factors influencing the price (tax) of the service.**

| Subjects | Principles | Economic factors | Technological factors | Fiscal incentives |
|---|---|---|---|---|
| Consumers (polluter) | This tax/price is the public interest. | Waste as commodity (re-use) | Exact amount of waste | For donation of products |
| MWM service chain entities | Proportionality of price volume | Waste as resources (recycling, incineration) | Process optimization | EU investment in waste management infrastructure |
| Subjects of public administration (municipalities) | Principles of circular economy | Waste as semi-finished product (recycling) | Identification of the type of waste (paper, glass, plastic) | to promote the uptake of products and materials that are prepared for re-use or recycled |
| Control authorities (agencies) | Principle of justice | | Development of waste recovery opportunities | Systems for coordination, including by digital means |
| Waste buyers (subjects who direct use waste in business activity) | | | | Encouraging companies to report on waste |

Source: made by author

c) Manifesting the hierarchy of MWM.
d) It's part of systems for coordination, including by digital means, between all competent public authorities involved in waste management;
e) Basis to promote continuous dialogue and cooperation between all stakeholders in waste management and encouraging voluntary agreements and company reporting on waste.

### *3.2. BD, GDPR & EUdataFF*

The concept of data first of all reveals, what kind of data is being processed: personal,[125] non-personal[126] or mixed. In most real-life situations, a dataset is very likely to be composed of both personal and non-personal data. This is often referred to as a 'mixed dataset'. It's no doubt, data must be collected for specified, explicit and legitimate purposes. Implementing BD in the MWM sector, must be ensured obligatory provisions mentioned above law documents. According to data regulation, author distinguish two directions of mandatory provisions: *general* and *special*. 1. General-reveals provisions, which are common to most sectors of the economy where data is processed, such as banking, medicine, transporting. For example, BD processing aspects, developing codes of conduct, establishing data protection certification mechanisms. 2. Special- characteristic of MWM sector. As mentioned earlier, interaction between BD and MWM sector, makes a positive impact to the pricing, clearly identifies the amount of waste and its type. It is noteworthy, that these specific data can influence the interests of personal data protection: the content of the waste, its nature can

[125] 'personal data' means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person;

[126] Where the data are not 'personal data' as defined in the General Data Protection Regulation, they are non-personal.

reveal person's consumption habits, financial status, even data concerning health.[127] Its arguable, structural-functional problematic aspects need to be resolved, ensuring appropriate realization of GDPR and EUdataFF on MWM sector: for example, functional distribution between waste collection actors (private and public); personal data pseudonymisation[128].

### *3.3. Practical implementation and workforce aspects.*

BD's practical implementation in the MWM sector includes *hard* and *soft* skills realization: computer programming and engineering, environmental, accounting, finance, mathematics, legal, creative thinking, teamwork and other qualitative and quantitative skills. It is challenge for business and government. Question - what are the potential threats?

Technology and globalization are significantly transforming work and workforce policy. For example President D.Trump highlighted, that "In the US alone there are more than 500,000 open technology jobs, but our universities produce only 50,000 science graduates each year"; according to WEFORUM (2016), 65% of children entering primary school today will ultimately end up working in completely new job types that don't yet exist; Mckinsey (2017) states, "there is already a significant mismatch of skills in the global workforce, with high levels of youth unemployment and, at the same time, a shortage of job seekers with critical skills".

According to WEFORUM (2016), BD is characterized mutual: in one hand as disruptor-changing nature of work, drivers of change by industry; other hand- as job creation potential and is described as job family. BD and MWM interaction under the conditions of the Industry 4.0, reveals new problematic aspect- destruction and creation of jobs. Author provides possible methodological-storylines of solutions in this sector.

*First*- holistic approach, which requires close cooperation among education providers, governments, and businesses. Education system must ensure the quantity and quality of skills, governments- timely prediction of learning programs, business- social responsibility.

*Second*- Combining theory and practice in the learning process, especially in vocational training sector. It presupposes to apply dual teaching methods: the same time includes theory, practice and real job (for example this method is used in Switzerland, Denmark).

*Third*- the content of the learning programs must be universal. Workers with data in MWM sector, must operate skills in the field of engineering, environmental, digital literacy, critical thinking, specific of waste and specific principles of law.

## 4. CONCLUSION

The interaction between Big Data and municipal waste management can be described as evolutionary, adapting to Industry 4.0 digital and engineering developments. Big Data implementation in municipal waste manage positively effects EU political-strategical and law documents:

[127] 'data concerning health' means personal data related to the physical or mental health of a natural person, including the provision of health care services, which reveal information about his or her health status; ; Regulation (EU) 2016/679, Article 4

[128] 'pseudonymisation' means the processing of personal data in such a manner that the personal data can no longer be attributed to a specific data subject without the use of additional information, provided that such additional information is kept separately and is subject to technical and organizational measures to ensure that the personal data are not attributed to an identified or identifiable natural person; Regulation (EU) 2016/679, Article 4.

- Implementation of measures to protect the environment and human health by preventing or reducing the generation of waste.
- Are realized the principles of circular economy.
- Ensuring the hierarchy of waste- as a priority order in waste prevention and management.

Interacts with economic instruments (Directive 2008/98/EC): use of fiscal measures or other means to promote the uptake of products and materials that are prepared for re-use or recycled; use of best available techniques for waste treatment; systems for coordination, including by digital means; encouraging company reporting on waste.

Big data and Municipal waste interaction reveal features, that can be divided into *general* and *specific*. General- typical for Big Data appliance in others sectors: general principles of data protection and free flow of non-personal data, new job creation, coordination between actors. Specific- related to the specifics of municipal waste management: pricing (tax) principles, waste type identification, weight accounting, personal data pseudonymisation.

Big Data and municipal waste management are sectors, which require high skills workers. Workforce politic in this sector must be solved through holistic approach, highlighting cooperation between education system, business and government. The basis of the educational process- dual realization of theory and practice.

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# ANALYSIS OF THE IMPACT OF THE FOURTH INDUSTRIAL REVOLUTION ON EMPLOYEES OF INDUSTRIAL COMPANIES IN THE CONTEXT OF GENERATIONS

***Lucia STUPAVSKÁ*** [129]
***Veronika JOHANESOVÁ*** [130]
***Miloš ČAMBÁL*** [131]

**Abstract:** *We are witnessing a technological revolution that radically changes the lives of eachone of us, whether we live or work. Digitization is one part of this revolution. This should bring a new wave of efficiency and productivity growth and intelligent support to employees. It is the context between employees and the 4thIndustrial Revolution that concerns major changes. Above all, it is the understanding and skills of the employees that are needed in the 4thIndustrial Revolution. Human action is based on our individuality and it is influenced by internal and external stimuli. It is necessary to generalize people or employees in the company into smaller groups with the same or similar features. In our work, we generalize employees according to age into four primary groups, the so-called generations. The article is devoted to the analysis of the impact of the 4thIndustrial Revolution on employees of industrial companies in the context of generations.*

**Key words:** *4th Industrial Revolution, generations of employees, industrial companies*

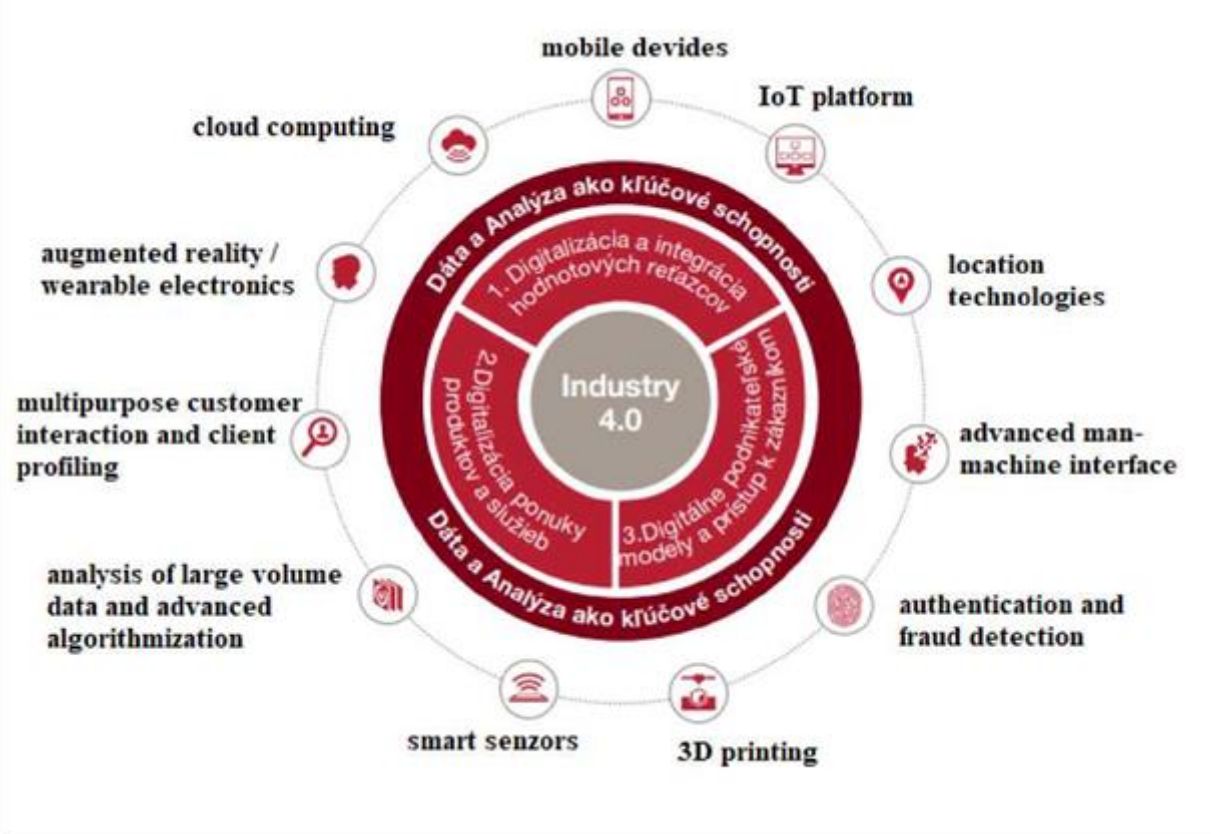
**JEL Classification:** *D4, L6, O3*

## 1. INTRODUCTION

In the past, the industry was affected by technological change and innovation. These paradigms are called industrial revolutions. These revolutions were caused by mechanization (1st industrial revolution), use of electrical energy (2nd industial revolution) and electronics and automation (3rd industial revolution) [12]. All these industrial revolutions did not influence only the production itself, but also the labor market and the educational system as well. As a result of these changes some professions and jobs disappeared [1]. The notion "Industry 4.0" which is used in our article means the fourth industrial revolution. Other notions we have met belongs "Smart manufacturing", "Industrial Internet of Things" (IoT), or "Digital Enterprise". While Industry 3.0 was focusing on automating individual devices and processes, Industry 4.0 has focused on the complete digitization of all physical assets and their integration into the digital ecosystems that communicate with each other [9]. Term Industry 4.0 is in recent years as a very popular term to describe the trend towards digitization and automation of the manufacturing environment [14]. Picture no. 1 illustrates the digital technologies that make up Industry 4.0.

[129] Ing., Institute of Industrial Engineering and Management, Faculty of Material Science and Technology of STU, Ulica Jána Bottu č. 2781/25 917 24 Trnava, e-mail: lucia.stupavka@stuba.sk
[130] Ing., Institute of Industrial Engineering and Management, Faculty of Material Science and Technology of STU, Ulica Jána Bottu č. 2781/25 917 24 Trnava, Slovakia, e-mail: veronika.zaludova@stuba.sk
[131] Prof., Ing., CSc Institute of Industrial Engineering and Management, Faculty of Material Science and Technology of STU, Ulica Jána Bottu č. 2781/25 917 24 Trnava, Slovakia, e-mail: mlos.cambal@stuba.sk

**Figure 1: Digital technologies that make up Industry 4.0 [9]**




Source: Benešová, Tupa, (2017)

However, Industry 4.0 will integrate in sequence into all areas of human life and accomplish major or minor changes. The society needs not only people who will create new Technologies but especially those who can use them [9]. Currently, in time to the development of digitalization and robotics, when we are facing the fourth industrial revolution, it is expected that some traditional professions will be replaced another. However only qualified and highly educated employees will be able to control these technologies. So we naturally raise the question of whether people and the whole of society are ready and able to face these fundamental changes in the work environment. The emerging technologies have huge effect on the education of people and the industry should be start collaborate with universities to a large extent [2]. New technology will influence the size of the world population and life expectancy and will influence our working lives in other deeper and more indirect ways — the way we engage with others, our views on morality and our own human nature. By 2025, we can expect that more than five billion people will be connected by mobile devices, the Internet 'Cloud' will deliver low-cost computing services, an increasing amount of work will be performed by robots and self-created content will join the digitalisation of books to create an unprecedented amount of information in the world knowledge net. We can expect that, across the globe, billions of cognitive assistants will be collecting information, monitoring people's behaviour and taking actions from their preferences. This massive crowd of computers is becoming increasingly capable of learning and creating new knowledge entirely on its own and with no human help [10].

## 2. PROBLEM FORMULATION AND METHODOLOGY

### *2.1 Focus on people and digital transformation*

The biggest interrogation command for industrial leaders is not technology but people. While digital technologies are rapidly becoming a commodity, success largely depends on how the company's management is able to define, communicate and manage this transformation. Sufficient qualifications of key personnel are needed to develop digital processes and services. The introduction of any significant change in the business is accompanied by a difficult transition period, so the ability to manage and manage such a change will be critical. The employees need to understand the changes which are happening in the company and should know, how they can be part of the changes [9]. With regard to future developments in the labour market, the key questions are: What will digitalisation's overall employment impact be? Will jobs be lost? If so, who will be affected? By contrast, in what areas will new jobs be created [6].

The Industry 4.0 will have a significant impact on the labor market. The middle class will turn back to the craft manufacturing based on a combination of technology and communication skills to provide specialized and high quality services. In the future, it is expected that work will be more closely linked to their own business and that people will have more jobs, and ICT will help them to do so. Working time will be less strict and employees will be more autonomous in carrying out their work but on the other hand they will face a higher risk of losing their jobs [17].

As in the past and in the present, individual generations of the population perceive the image of society and its possible development in the future differently. Young people often called "millennials" or generation Y, they are presented themselves as a generation brought up to do everything and can do anything. In this respect, the generation X, born and matured after World War II and in the years of stabilizing social processes, it presents more conservative views of the issues of the present and in particular, caution and relative responsibility towards the future [15] .

In technological changes, it is not only necessary to explore the evolution of the technological surroundings but also to explore and analyze changes in the way technologies are used and the opportunities that technology brings to users. As well as changes in the technological environment affect people's behavior so generations of users approach differently to the use of technology, leading to innovations of different kinds [11].

One of the first problems for most small and medium-sized businesses is the unpreparedness and lack of managerial experience in developing digital business strategies. This problem is based on the character of the communication which takes place between the individual components of the system on both horizontal and vertical lines. This communication has to exist in line with the continual new flow of information that digital systems create solutions and to which management must be able to respond with regard to the organization of the vertical and middle management lines on the one hand and the horizontal line between clients and suppliers, the company has to work together. In both directions, integration processes have to emerge as a result of digitalisation. Vertical integration takes the form of linking decision-making processes, creating digital applications and data analysis throughout the entire process, including procurement, production and sales. Horizontal integration requires the interconnection of production processes from acquisition of materials, energy, information to communication with customers. The implementation of these digitization management processes is in place a number of small and medium enterprises under-mapped. Especially, small and medium business will need support in developing new development

strategies to map first and foremost the potential of digitalisation in their business areas and secondly, to prepare for the effective and maximum use of the opportunities they offer [16].

Current studies are grappling with the question of whether and to what extent technological unemployment will be a key concern in future. Some studies and popular science texts have even reignited the discussion about an "end of work" [7].

New jobs opportunities resulting from the deployment of automated systems will require employees with new skills and abilities, they do not often have at the present. The employers' concern also stems of all this, with up to 30 percent seeing as one of the main challenges in digitalisation just the lack of qualifications of their employees [5].

Insufficient qualification of employees is one of the possible threats to the development of new opportunities in the field of Industry 4.0. Less qualified people with low digital skills will be most at risk but also as people over 50 are becoming the standard. On the basis of the prediction computerization threatens especially occupations, nowadays where education is without Upper secondary school examination [20].

The much-quoted finding that 47 per cent of jobs in the United States are at risk due to automation (42 per cent in Germany), assumes everything that theoretically can will in fact be automated, and that all activities required in certain occupations can be automated. [7].

In reality, however, only specific individual activities are being automated, not necessarily entire occupations. If this is taken into consideration, around 12 per cent of workers in Germany today hold jobs which are at a high risk of being automated. Bonin et al. 2015, Ubertragung der Studie von Frey/Osborne 2013 auf Deutschland (Application of the Frey/Osborne 2013 study to Germany). Regarding other countries, see also Arntz et al. 2016b on behalf of the OECD. The reason for the relatively high level in Germany is the comparatively low proportion of high-skilled and communicative and interactive activities. The study also highlights low ICT investment in Germany. Again, this is only a potential risk, as there are many legal, societal and economic limits on automation. In addition, workers are adjusting their activities and taking on more complex tasks.44 Bearing in mind that each year over three per cent of workers in Germany change occupation, and, in the long term, a fifth of workers do not work in the occupation for which they have been trained, puts the predicted impacts on employment into perspective [8].

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

Technological and resulting economic changes resulting from digital transformation will bring education and skills, labor legislation and occupational health and safety where changes will have to be made to fully master digitization and Industry 4.0 [16].

From the point of view of developing education and competences or skills, it will be necessary to make changes in the regions of preparation of future graduates for new opportunities in the labor market. Future education reforms will have to focus on science, technology and IT skills where the largest influx of new jobs is projected due to technology penetration into an increasing number of traditional sectors of the economy. Digital technologies will have to connect up in all areas of education in order to many students and graduates as possible will be prepared for the digital transformation of individual areas of industry and services. In addition, a new challenge is need to apply lifeltime learning into common practice and to create conditions for employees and the unemployed people to cope with changes in the field of work. The result should be institutional support for education programs for people of working age to ensure greater assurance of digitization and Industry 4.0 [4].

According to the Innovation Readiness Index, senior management in manufacturing small and medium business is more cautious about introducing aspects of Industry 4.0. Reservedness on the side of business management creates an obstacle to the faster launch of digitization processes. Without unambiquous usurpation, understanding of Industry 4.0's ideas from this level of management, along with the role that its implementation requires precisely by engaging in planning processes, it is difficult to run these processes on a large scale. Digitization will require a complete restructuring of processes and corporate organization at almost all levels. In addition to this, defining and adopting clear qualifications for employees that will be necessary for the successful operation of the company, as well as a business strategy that will adjust the business model and open up to new markets abroad, must be added. These changes will not be possible without a clear commitment from management and without preparing the groundwork to maximize the potential of Industry 4.0. Currently, as many as four out of ten small and medium business has no Industry 4.0 development strategy, in the coming years the growth of digitization may be limited to a level below its true potential [18].
Industrial business should focus on experience and skills more than a graduate school or CV position. Job experience extends to the basic aspects of formal education. The employers will have to focus on specific skills for specific jobs.

## 4. CONCLUSION

It is important to realize that 4.0 implementation in industrial enterprises can not be done abruptly, but rather it is a gradual change. In order to implement Industry 4.0 flawlessy into business practice, companies will first need to correctly identify their assumptions, and companies will need to have a clear vision of future manufacturing processes and manage them. Based on these assumptions, the deployment of Industry 4.0 should be gradual and not sudden. Changes in the implementation of Industry 4.0 will also result in changes in the organizational structure of enterprises. Some job positions will disappear and some will be newly created. The main reason for retaining existing employees is their knowledge of the current manufacturing process. If you look at the individual stages in terms of education and qualifications, it can be assumed that the early days of retraining and qualifications will be problematic [2].

The technologies associated with the deployment of Industry 4.0 will bring important changes to the business for employees. Physically strenuous work and work whose long-term performance endangers health and causes occupational diseases will be dispensed with. This work will be done by machines and production digitization [13].

However, the Fourth Industrial Revolution also has a far-reaching impact on the global economy. Ultimately, all macroeconomic variables such as GDP, consumption, investment, employment, trade, inflation will be affected. In particular, employment and economic growth will be significantly affected [20].

In the labor market, large-scale changes will affect the middle class of the population, which will be forced to return to craft production based on technology and communication skills in order to generate high-quality and niche services. Employees will have more flexible working time, more autonomy, on the other hand, the risk of losing their profession will be higher [17].

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# MANAŽMENT RIZÍK AKO NÁSTROJ NA ZVYŠOVANIE ÚSPEŠNOSTI INOVAČNÝCH PROJEKTOV

# RISK MANAGEMENT AS A TOOOL FOR INCREASING THE SUCCESS OF INNOVATIVE PROJECTS

***Jana ŠIMÍČKOVÁ***[132]
***Katarína BUGANOVÁ***[133]

**Abstrakt:** *Inovácie v súčasnosti predstavujú jeden z najvýznamnejších nástrojov ako udržať a zlepšiť vývoj ekonomiky štátu a zlepšiť konkurencieschopnosť podnikov v lokálnom aj globálnom podnikateľskom prostredí. Otázka budúcej konkurencieschopnosti priemyslu v zmysle Industry 4.0 je kľúčová pre životnú úroveň ľudí v celom štáte, keďže priemysel pokrýva značnú časť pracovných miest. Preto štát prispôsobuje legislatívu tak, aby podporovala inovácie. Zavádzanie inovácii, ako výsledkov výskumu a vývoja sa najčastejšie uskutočňuje ako vo forme projektov. Cieľom článku je vymedziť špecifiká a postup manažmentu rizika pre potreby inovačných projektov. Inovačné projekty dlhodobo patria medzi najrizikovejšie projekty a dôvodom je okrem veľkej finančnej náročnosti aj nesprávne a neefektívne realizovaný manažment rizík, ktorý je často vnímaný menejcenný nástroj projektového manažmentu.*

**Kľúčové slová:** *industry 4.0, inovácie, manažment rizík, projekt, riziko.*

**Abstract:** *Innovation is currently one of the most important tools to maintain and improve the development of the state's economy and improve the competitiveness of businesses in the local and global business environment. The question of the future competitiveness of the industry in terms of Industry 4.0 is crucial for the standard of life´speople across the state, as industry covers a significant proportion of jobs. Therefore, the state adopts legislation to support innovation. Implementation of innovation as a result of research and development is most often carried out as in the form of projects. The aim of the article is to define the specifics and procedure of risk management for the needs of innovative projects. Innovation projects have long been among the riskiest projects and the reason is, besides the high financial demands, also incorrect and ineffective risk management, which is often perceived as an inferior project management tool.*

**Keywords:** *industry 4.0, innovation, project, risk, risk management.*

**JEL Classification:** *L20, L26, D20, Q30, G32*

## 1. ÚVOD

V dnešnom rýchlo sa meniacom ekonomickom prostredí, kde konkurenčné tlaky nútia spoločnosti, aby neustále napredovali a inovovali, s cieľom udržať ziskovosť, rast a docieliť úspech v podnikaní, je potreba riadenia rizík v inovačných projektoch kľúčová. Inovácie sú v podstate nevyhnutnosťou, a to nielen prostredníctvom vývoja nových výrobkov alebo služieb, ale aj prostredníctvom hľadania nových obchodných modelov, čo často znamená zmenu pravidiel hry, organizačnú inováciu, nájdenie nového spôsobu, ako zlepšiť efektívnosť výroby a celkovo podnikania, inováciu procesov, ako aj zavádzanie nových marketingových nástrojov.

[132] Ing., Žilinská univerzita v Žiline, Fakulta bezpečnostného inžinierstva, Katedra krízového manažmentu, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: jana.simickova@fbi.uniza.sk
[133] doc. Ing. PhD., Žilinská univerzita v Žiline, Fakulta bezpečnostného inžinierstva, Katedra krízového manažmentu, Univerzitná 8215/1, 010 26 Žilina, Slovensko, e-mail: katarina.buganova@fbi.uniza.sk

Čím je podnikateľské prostredie konkurencieschopnejšie, tým väčšie sú investície potrebné na úspešnú inováciu. Spoločnosti s obmedzenými zdrojmi môžu osloviť strategických obchodných partnerov a zamerať sa na spoluvytváranie inovačných projektov. Spoločný riadiaci inovačný projektový manažment môže viesť k rýchlejšiemu uvedeniu produktu na trh, menšiemu vystaveniu sa riziku, väčšej spokojnosti zákazníkov, väčšiemu zameraniu na tvorbu hodnoty a lepším technickým riešeniam. Vytváranie inovácií musí zahŕňať odôvodnené očakávanie možných výsledkov, ako aj adekvátne načasovanie a tvorbu peňažných tokov. Projektoví manažéri, ktorí sú požiadaní o riadenie inovačných projektov, musia pochopiť, že prostredie, v ktorom budú teraz pracovať, sa môže výrazne líšiť od tradičného prostredia. Inovačné projekty sú systematicky riadené snahy, ktoré využívajú transformáciu vstupov na výstupy s určitým rozsahom a ich cieľom je dosiahnuť niečo nové, novým spôsobom alebo zlepšiť niečo, čo existuje (Stošić, 2017; Kerzner, 2019; Yordnova, 2018).

## 2. CIEĽ A METODOLÓGIA

Inovácie a inovačné projekty sa vo všeobecnosti spájajú s novými druhmi techniky a technológií, a preto sa zaraďujú medzi vysoko rizikové investície. Cieľom článku je vymedziť špecifiká a postup manažmentu rizika pre potreby inovačných projektov.

Pri spracovaní príspevku boli na dosiahnutie stanoveného cieľa použité základné vedecké metódy ako pozorovanie pri zhromažďovaní údajov o kvalitatívnej a kvantitatívnej stránke skúmaného problému a pri porovnávaní a zovšeobecňovaní údajov bola využitá komparácia, analýza a syntéza. Metodológia článku v súlade so stanoveným cieľom obsahuje vymedzenie inovácii a inovačných projektov v súvislostiach a manažmentu rizika ako nástroja na zvyšovanie úspešnosti inovačných projektov.

## 3. INOVÁCIE A INOVAČNÉ PROJEKTY

Inovácie sa stávajú stredobodom úspechu a prežitia spoločnosti. Uskutočňovanie inovácií prináša výhody a je skutočnou hodnotou pre zákazníka, čím oddeľuje víťazov od porazených častejšie ako ktorýkoľvek iný faktor. Úspech inovačných projektov sa stáva nevyhnutnosťou a vyžaduje posudzovanie všetkých kritických faktorov úspechu, ktoré môžu ovplyvniť proces a akýmkoľvek spôsobom ho poškodiť. Existuje veľa faktorov a problémov, ktoré môžu ovplyvniť úspech inovačných projektov. Finančné obmedzenia majú najväčší vplyv na pravdepodobnosť ukončenia inovačného projektu vo fáze koncepcie. Okrem toho finančné zdroje nie sú počas životného cyklu inovačného projektu neutrálne. Počas fázy návrhu sú podniky citlivejšie na interné finančné zdroje, zatiaľ čo vo fáze realizácie sú citlivejšie na externé zdroje (Yordnova, 2018; García-Quevedo, 2018; Hudáková, 2018).

Štúdie preukázali, že spoločnosti, ktoré uprednostňujú inováciu, majú najvyšší nárast obratu. V tejto súvislosti výskum Európskej komisie odhalil, že približne 79% spoločností, ktoré zaviedli aspoň jednu inováciu od roku 2011, zaznamenalo do roku 2014 zvýšenie svojho obratu o viac ako 25% (European Commission, 2019). Inovácia preto získala štatút kľúčového faktora a predpoklad konkurencieschopnosti je navyše kľúčovým prvkom moderného riadenia a každodennej kultúry podnikov.

Avšak je potrebné špecifikovať aj obmedzujúce faktory inovácií, ktoré súvisia najmä s ich financovaním. Podľa výsledkov zisťovania bolo v období 2014-2016 inovačne aktívnych 30,7 % podnikov v priemysle a vybraných službách. Nedostatok zdrojov financovania v rámci podniku považuje za najväčšiu inovačnú bariéru 29 % inovujúcich podnikov, príliš vysoké náklady na inováciu 25,9 % a nedostatok prostriedkov z úverov 10,2 % podnikov. Z trhových

faktorov sú to ťažkosti pri získavaní štátnych dotácií alebo grantov pre inovácie, ako uviedlo 22,1 %, príliš vysokú konkurenciu na trhu 19,5 % a neistý dopyt po inovovaných výrobkoch alebo službách 12,9 % podnikov s inováciami. Zo znalostných faktorov je to najmä nedostatok kvalifikovaných zamestnancov 15 % a nedostatok spolupracujúcich partnerov pre inovačné activity 5,9 % (Inovačná aktivita podnikov, 2018).

Slovenská republika v rámci inovácií obsadzuje dlhodobo najnižšie priečky v Európskej únii. Spomedzi 28 krajín EÚ sa Slovensko z hľadiska inovačnej výkonnosti za rok 2018 umiestnilo až na 23. mieste. Rozvoju inovácií najviac bránia zlé podmienky pre vznik a rozvoj start-up firiem vrátane zlej dostupnosti rizikového kapitálu. Ďalším problémom je nízky podiel súkromných firiem na financovaní vedy a výskumu, či malá výkonnosť sektora vedy a výskumu v oblasti patentov, ochranných značiek a priemyselných vzorov. V súčasnosti sa inovácie na Slovensku zameriavajú hlavne na oblasť informačných a komunikačných technológií, do ktorej bolo investovaných až 63,3 % z celkového objemu financií investovaných do start-upov v Slovenskej republike. Zaostávame v investíciách do kapitálovo náročnejších odvetví, akými sú napríklad biomedicína, robotika i proekologicky zamerané technológie. Investičná podpora z verejných zdrojov bude v nasledujúcej dekáde smerovať najmä na inovačné projekty s vysokou pridanou hodnotou (Teraz, 2019; European Commission, 2019; European Commission, 2019; InnoNewa.blog, 2018).

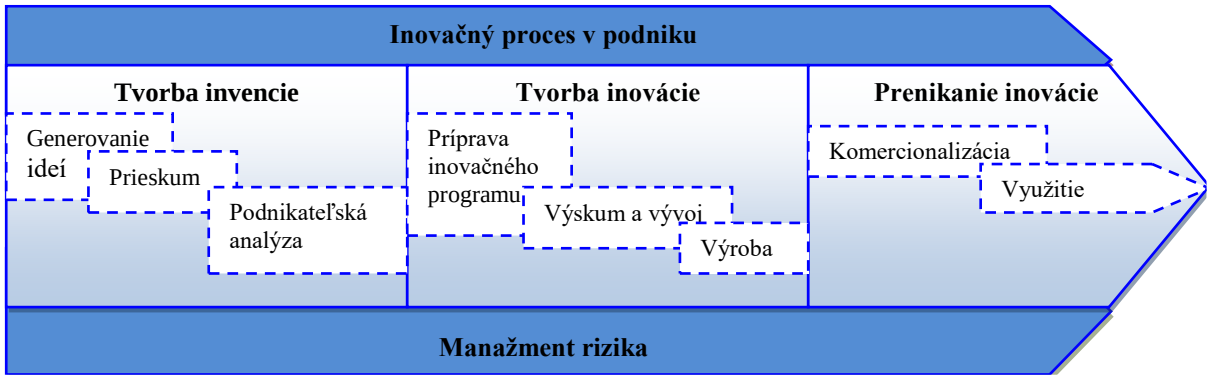
Ministerstvo hospodárstva Slovenskej republiky v roku 2018 vyhlásilo výzvu, ktorá svojím zameraním podporuje princípy koncepcie Industry 4.0. Ponúka slovenským podnikom realizovať inovatívne „smart“ investície a byť aktívnymi pri zavádzaní inteligentne riadených technológií a systémov vo svojich produkčných prevádzkach. Systémy obsahujúce princípy koncepcie Industry 4.0. sa vyznačujú charakteristickými znakmi, ako napr.:

- podnikové a výrobné systémy sú navzájom prevádzkované a riadené v reálnom čase, resp. s malým oneskorením, umožňujúcim priamo ovplyvňovať prebiehajúci proces,
- výrobné systémy sú nastavené pre individualizáciu projektov pri zabezpečení ziskovosti ich produkcie a jednotlivé prvky podnikového alebo výrobného procesu si vzájomne vymieňajú údaje podľa aktuálnej potreby,
- prevádzka zariadení a strojov a spôsob vývoja a produkcie výrobkov prebieha v digitálne a funkčne previazaných väzbách, ktoré v prípade nutnosti navzájom komunikujú so zámerom nájsť efektívne a účinné riešenie,
- optimalizovaná je výroba z hľadiska celého podniku, jeho výrobného úseku alebo funkčného celku, uskutočňuje sa v prostredí fyzických výrobných zariadení a informačného systému s funkčným použitím dát,
- inteligentné a automatizované riadené systémy zvládnu funkčne zastúpiť ľudskú prácu prvotne pri fyzicky intenzívnych, rutinne opakovaných a ďalšími spôsobmi zaťažujúcich činnostiach (Operačný program, 2018).

## 4. MANAŽMENT RIZÍK V INOVAČNÝCH PROJEKTOCH

Inovačný projekt by sa mohol považovať za úspešný, ak je projekt ukončený v rámci vopred stanovených lehôt (času), priniesol výsledky a výhody požadované organizáciou, jej partnermi a ostatnými zúčastnenými stranami (výkonnosť) a čerpanie zostalo v rámci finančných rozpočtov (náklady). Riziká sú súčasťou všetkých inovačných projektov. Inovačná stratégia založená na vyhýbaní sa riziku nemôže byť úspešná, preto je potrebné proaktívne riadenie rizika, v ktorom sú identifikované riziká už v počiatočných fázach vývoja produktu, keď ešte existuje čas ovplyvniť priebeh činností. Manažment rizík by mal byť súčasťou inovačného procesu počas celého životného cyklu projektu (Obrázok 1).

**Obrázok 1 : Inovačný proces podniku vo vzťahu k manažmentu rizika**




Zdroj: vlastné spracovanie

Inovačné projekty najčastejšie čelia nasledujúcim významným vnútorným rizikám ako kultúra averzie k riziku, zdĺhavé doby vývoja, nedostatok informácií o zákazníkovi a nedostatočná podpora zo strany vedenia podniku. Zatiaľ čo najmenšími prekážkami úspešných inovačných projektov sú podpora vodcovstva a personálne riziko. Osobitná pozornosť by sa mala zamerať na podporu vedenia a riziko nedostatočných informácii o zákazníkovi, ktoré patria medzi najväčšie skryté riziká ovplyvňujúce neúspech projektu. Preto by si mali manažéri už pred začatím projektu zabezpečiť plnú podporu zo strany vedenia a intenzívne komunikovať so zákazníkom. Ak inovačnému projektu chýba vodcovská podpora alebo sú informácie od zákazníka a komunikácia nedostatočné, zvyšuje sa pravdepodobnosť jeho neúspechu (Keizer, 2009; Bennett, 2014; Holla, 2017).

Vzhľadom na novosť a jedinečnosť konkrétneho projektu inovácie produktu a jeho dynamickú povahu, následne rozlišujeme tri zložky, aby sme určili úroveň rizika určitého problému v inovačnom procese. Pri diagnostike rizík v osobitnom kontexte inovačných činností by sa malo uvažovať s trojrozmerným rizikom. Kombináciou týchto troch dimenzií bude problém definovaný ako riskantný, ak je jeho (Keizer, 2009):

- istota nízka - pravdepodobnosť uspokojivého riešenia pre problém inovácie je nízka,
- ovládateľnosť nízka - schopnosť inovačného tímu ovplyvňovať priebeh činností takým spôsobom, aby uspokojivé riešenie bolo možné zrealizovať v čase a limity zdrojov projektu sú malé,
- relatívny význam vysoký - nedosiahnutie uspokojivého riešenia pre problém inovácie môže ohroziť realizáciu požadovaného výkonu projektu.

Východiskom pre implementáciu projektového manažmentu sú aktuálne uplatňované nástroje, postupy a štandardy, ako napr. (Buganová, 2012; Hudáková, 2019):

- International Project Management Association (IPMA Competence Baseline),
- World Wide Project Management Methodology (WWPMM),
- A Guide to the Project Management Body of Knowledge (PMI PMBOK ),
- Active Threat and Oportunity Management (ATOM),
- PRINCE2® (PRojects IN Controlled Environments 2nd edition),
- Project Risk Analysis and Management (PRAM), The APM Body of Knowledge (APMBOK).

Manažment rizík predstavuje neoddeliteľnú súčasť projektového manažmentu. Z tohto dôvodu vzniklo viacero noriem a štandardov v rôznych sférach činností podniku, ktoré sa touto problematikou zaoberajú. Medzi najpoužívanejšie je možné zaradiť (Buganová, 2012; Hudáková, 2019):

- ISO 21500:2012 Guidance on project management,
- IEC 62198:2013 Managing Risk in Project - Application Guidelines,
- ISO 31000:2018 Risk management – guidelines,
- ISO/IEC 16085:2006 Systems and Software Engineering - Life Cycle Processes - Risk Management,
- ISO 10006:2017 Quality management systems - Guidelines for quality management in projects,
- ISO 9001:2015 Quality management systems - Requirements,
- ISO/IEC Guide 73:2009 Risk Management - Vocabulary.

V Tabuľke 1 sú popísané etapy procesu manažmentu rizika v projekte podľa najznámejších štandardov, kde je zrejmé, že základné etapy procesu sú vo všeobecnosti totožné, odlišný je len formálny postup a obsah dokumentácie, ktorá sa vyžaduje.

**Tabuľka 1: Komparácia vybraných noriem, štandardov a metodík so zameraním na proces manažmentu rizika v projektoch**

| IEC 62198:2013 - ISO 31000 | PMBOK - PMI | IPMA | PRAM | ATOM |
|---|---|---|---|---|
| Vytváranie súvislostí | Plánovanie manažmentu rizika | Identifikácia rizík a príležitostí a odhad ich vplyvu na projekt | Iniciačná etapa – definuje sa projekt a prispôsobuje sa manažment rizika | Iniciačná etapa – stanovenie cieľov |
| Posudzovanie rizika – identifikácia | Identifikácia rizika | Plán reakcie na rizika príležitostí a jeho odsúhlasenie | Identifikácia rizika | Identifikácia rizika |
| Posudzovanie rizika - analýza | Kvalitatívna analýza rizika | Aktualizácia projektových plánov s plánom reakcie | Posudzovanie rizika | Posudzovanie rizika |
| Posudzovanie rizika – hodnotenie (prijatie rizika) | Kvantitatívna analýza rizika | Opakované hodnotenie pravdepodobnosti dosiahnutia cieľov (čas a náklady) | Plán reakcií na rizikové udalosti a na celkové riziká projektu | Plánovanie reakcie |
| Riadenie rizika | Plán reakcií na riziko | Identifikácia nových rizík, hodnotenie a modifikácia plánov | Implementácia reakcií | Výkazníctvo |
| Monitorovanie a preskúmanie | Monitorovanie a riadenie rizika | Riadenie a kontrola reakcie na rizika a príležitostí | Riadenie procesu manažmentu rizika | Implementácia reakcie |
| Komunikácia a konzultácie | | Tvorba dokumentácie a aktualizácia nástrojov na identifikáciu rizík | | Revízia (monitoring) |
| | | | | Zhodnotenie výsledkov |

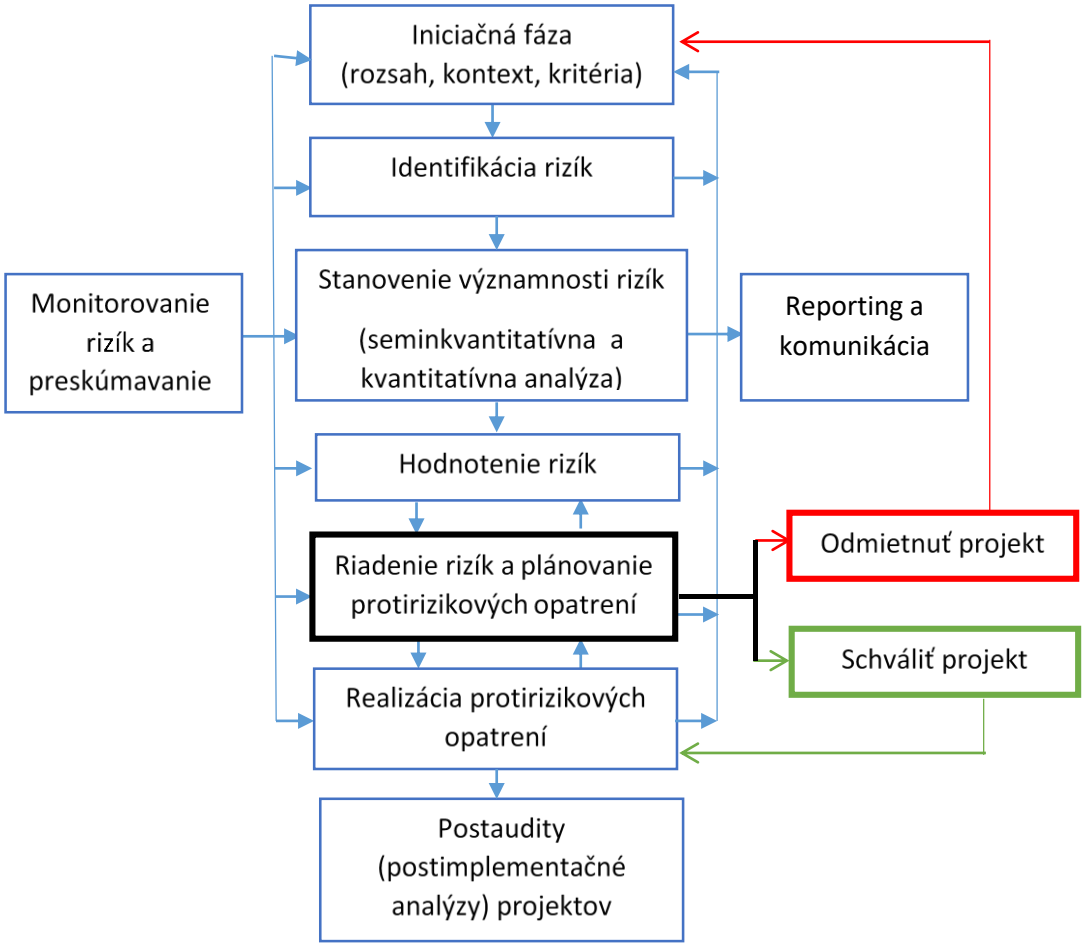
Zdroj: upravené podľa Hudáková, 2019

Prvotným krokom pri príprave inovačných projektov je preskúmanie rozdielov medzi súčasným stavom (existujúcimi schopnosťami) a strategickými cieľmi organizácie ako aj stavom externého prostredia, so zámerom identifikovať inovačné príležitosti. Práve tejto analytickej fáze je potrebné venovať veľkú pozornosť, pretože na základe relevantnosti získaných informácií sa formuje projekt vrátane všetkých jeho obmedzení a z nich vyplývajúcich rizík a príležitostí. Výstupom iniciačnej fázy je spracovanie plánu manažmentu rizika inovačného (investičného) projektu. V etape identifikácie rizika projektu je potrebné zistiť čo najviac rizík, porozumieť ich podstate a správne ich popísať. Táto etapa je zameraná

na riziká a príležitosti projektu po kvantitatívnej stránke, aj keď viaceré budú neskôr vylúčené ako nevýznamné.

Okrem priamych riešiteľov projektu je potrebné do identifikácie zapojiť aj všetky zainteresované skupiny (stakeholders) ako napr. investor, zákazníka, priameho užívateľa výsledkov projektu, dodávateľov, interných a externých expertov atď. V priebehu identifikácie rizika je potrebné podnecovať ich interaktivitu a tvorivosť. Identifikácia, stanovenie významnosti a hodnotenie rizík na základe vhodne zvolených metód (semikvantitatívnych, kvantitatívnych atď.) sú východiskom pre hodnotenie rizika projektu z hľadiska jeho prijateľnosti alebo neprijateľnosti. Následne sú na základe významnosti rizík navrhnuté opatrenia na ich riadenie (zmiernenie). V prípade, že protirizikové opatrenia nedokážu účinne znížiť hodnotu posudzovaných rizík na akceptovateľnú úroveň, je možné inovačný projekt v tomto štádiu zamietnuť ako vysoko rizikový, alebo ukončiť jeho prípravu (Obrázok 2).

**Obrázok 2 : Proces manažmentu rizika v inovačných projektoch**




Zdroj: upravené podľa Buganová, 2018

Na určenie významnosti rizika je možné využiť viacero metód ako príklad môžeme uviesť Metódu diagnostiky rizika (RDM), ktorá je zameraná na posudzovanie a kontrolu rizík v inovačných projektoch. Táto metóda umožňuje podniku komplexne a systematicky identifikovať technologické, organizačné a obchodné riziká, ktorým môže projekt čeliť, a sformulovať a implementovať vhodné stratégie riadenia rizík. Obsahuje deväť krokov, ktoré sú: počiatočné briefingy, úvodné stretnutie, individuálne rozhovory s účastníkmi, spracovanie

rozhovorov (návrh rizikového dotazníka), vyplnenie dotazníka o riziku, zostavenie profilu rizika, príprava relácie riadenia rizika, relácie riadenia rizika, vypracovanie a vykonanie plánu riadenia rizika (Vargas-Hernández, 2011).

Všetky uvedené kroky manažmentu rizika prebiehajú sekvenčne a priebežne sa realizuje monitoring rizík a komunikácia založená na príprave podkladov a správ pre interné zainteresované strany na projekte (vrcholový manažment, dozorná rada atď.), ale aj externých užívateľov podľa typu projektu. V neposlednom rade je potrebné využívať adekvátnu softvérovú podporu v oblasti manažmentu rizík počas celého projektu. Po ukončení projektu je vhodné zrealizovať postaudit, resp. postimplementačnú analýzu, zámerom je vyhodnotenie vplyvu a účinnosti realizácie protirizikových opatrení.

## 5. ZÁVER

Úspešné inovácie sú v kontexte Industry 4.0 jedným z hlavných zdrojov hospodárskeho rastu ako aj zdrojom nových pracovných príležitostí. Integrácia fyzických a digitálnych technológií umožňuje vytváranie nových druhov pracovných miest a poskytuje príležitosti na zlepšenie existujúcich podmienok.

Inovácie súvisia aj s potrebou odbornej prípravy zamestnancov tak, aby ich zručnosti prispôsobili novým požiadavkám a využívaným technológiám. Na druhej strane tým, že všetky inovačné projekty sú vysoko rizikové, nedostatočné znalosti manažérov projektu v oblasti manažmentu rizík, môžu spôsobiť v prípade finančne náročných investičných projektov pre podniky obrovské straty. Kvalifikovaný manažment rizika a adekvátne metódy na posudzovanie a riadenie rizík majú významný vplyv na celkovú úspešnosť projektu.

### *Dodatok*

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# THE IMPACT OF INDUSTRY 4.0 ON THE LEVEL OF SHADOW EMPLOYMENT

***Inna TIUTIUNYK*[134]**
***Tatiana VASYLIEVA*[135]**
***Yuriy BILAN*[136]**
***Evgenij KOVALENKO*[137]**

**Abstract:** *The rapid development of digital technologies in all spheres of society, the robotization of production, the computerization of jobs pose challenges for the successful functioning of most markets, one of which is the labor market. By creating conditions for increasing production efficiency, reducing material consumption, the four industrial revolutions thereby destroying most traditional jobs while generating new jobs and occupations, leads to increased unemployment in the country. This article discusses the major features and opportunities of the four industrial revolutions. Econometric analysis concludes that Industry 4.0 has a statistically significant effect on shadow employment in most of the countries analyzed: the growth of the industrialization of economy has a negative impact on the shadow employment in the country. The objective of the research is to study the link between Industry 4.0 and the level on the shadow employment. This research proves significant influence of the Industry 4.0 on the level of shadow employment and underlines the necessity to review the current state policy to stimulate the industrial revolution from the viewpoint of traditional professions to the new demands of the labor market in the context of Industry 4.0*

**Key words:** *Labor, Management; Employee, Business relations, Professional groups, industry 4.0, Project team, Innovative products*

**JEL Classification:** *F63, G17, H3, K22*

## 1. INTRODUCTION

Transformation of forms and conditions of business, the global economic crisis, the development of the shadow economy, the high level of corruption in the world lead to increased efforts of both economic entities and individuals to find legal and illegal channels of concealing their income. In the context of high impact of tax payments on the resulting economic performance, tax evasion is one of the most important sources of profit maximization (Kundelis and Legenzova, 2019).

Diversification of forms and types of economic activity, development of digital entrepreneurship, introduction of electronic payment system, on the one hand, facilitate the procedures of creation and further doing business, on the other hand, lead to the emergence of a wide variety of non-traditional forms of employment, thereby complicating the processes of state control over the completeness of accounting and payroll calculations. In the context of the active use of various revenue shading schemes and the lack of effective financial monitoring and control procedures, the digitization of economic activity only widens the gaps between potentially possible and actual amounts of tax payments.

[134] PhD, Department of Finance and Entrepreneurship, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, i.karpenko@finance.sumdu.edu.ua
[135] D.Sc., Department of Finance and Entrepreneurship, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, tavasilyeva@fem.sumdu.edu.ua
[136] dr hab. Faculty of Management, Rzeszow University of Technology, Aleja Powstańców Warszawy 12, Rzeszów 35-959, Poland, y.bilan@prz.edu.pl
[137] PhD, Economics, Entrepreneurship and Business Administration Department, Sumy State University, Ryms'koho-Korsakova St, 2, Sumy 40000, Ukraine, kovalenko@econ.sumdu.edu.ua

## 2. PROBLEM FORMULATION AND METHODOLOGY

The fourth industrial revolution is the result of economic and technological transformations, which involves the manufacturing automation, where all processes are managed in real time and taking into account changing external conditions (Krykavskyy et al., 2019). If the earlier stages of the Industrial Revolution were characterized by the acceleration of production rates, the electrification and automation of production, mass use of computers, the fourth stage of the Industrial Revolution is a natural continuation of the ideas and technologies of the Third Industrial Revolution while simultaneously rethinking the functionality of production facilities. Industry 4.0 involves building an interactive network of connections between the analogue industry and the digital world through big data, offline systems, cloud computing, social media (Behun et al. (2018), Butko et al. (2019), Castro (2019), Świadek et al. (2019).
At the same time, the active development of digital technologies and their introduction into manufacturing activities creates additional challenges for the economy (Ipatov and Grebeniuk (2018), Koisova et al. (2018)). Along with the few advantages of Industry 4.0, the active introduction of digital technologies deepens the economic imbalances in countries and serves as a catalyst for shadow processes in the economy (Table 1).

**Table 1: Benefits and Challenges of implementing Industry 4.0**

| | Benefits | Challenges |
|---|---|---|
| Production | – production optimisation by using smart devices, that will lead to almost zero production downtime;<br>– increased productivity higher quality, flexible production | – the increase in complexity in the manufacturing system; |
| Management | – automatization of jobs;<br>– increased productivity;<br>– safer work condition. | – decreasing the numbers of workers;<br>– change the decision-making center;<br>– data leaks and security breaches;<br>– increasing the need to protect industrial systems and manufacturing lines and system data from cyber security threats. |
| Ecological | – saving of natural resources<br>– waste reduction | |
| Economic | – increase in customer satisfaction, competitive advantage by the successful digital business model implementation and technology creation;<br>– increase in revenue;<br>– increase in innovative company's image | – the need for significant investment;<br>– uncertainties about financial benefits due to a lack of demonstrated business cases justifying investments. |

Source: summarized by authors based on McKinsey and Company (2015), Waibel et al. (2018), Saurabh et al. (2018) , Stock and Seliger (2016), Dennis et al. (2017), Bilan et al. (2019), Ginevicius et al. (2018), Postelnicu and Câlea (2019), Petrenko et al. (2017), Infante and Smirnova (2016), Janekova et al. (2016), Lapinskienė et al. (2017), Tiutiunyk et al. (2018), Marková et al. (2017).

Given the fact that e-commerce, including virtual currencies, automation and computerization of process of production do not involve direct interaction with customers, providing anonymous financing, and therefore a convenient tool for revenue shadowing. These processes are exacerbated by the absence of state-developed software, tailored to the specific features of Industry 4.0, capable of identifying the most suspicious transactions (from the point of view of legality) and arresting assets involved in the implementation of money laundering schemes.

Having examined the size and tendencies of the shadow economy and Industry 4.0 we focus on the "shadow labor market", as the category most closely related to the phenomena analyzed above (table 2).

**Table 2: Comparative analysis of traditional and digital shadow economy**

| Characteristic | Traditional shadow economy | Digital economy | Digital shadow economy |
|---|---|---|---|
| Nature | Illegal, criminal | legal, Illegal, criminal | Illegal, criminal |
| Drivers | Tax system (a number of tax payments, the total tax burden on the business), labour system (the citizens' incomes volume, the official level of unemployment, real average salary, level of the labour migration), the trade openness (level of import and export, the foregone earnings for export of goods and services and payment for import, which did not come, the volume of public debt , the unregistered outflow of funds), banking system (weighted average interest rate by all interest-bearing tools, the interest rate for deposits, interest rate for credits, level of the deposit outflow, number of the solvent banks, official exchange rate of UAH in relation to Euro), quality of state regulations (level of the legal system efficiency in the arbitrary regulation, index of corruption, level of inflation, the yield of government securities at the primary market), industry development (the quantity of the sold industrial production, the share of the profitable enterprises) | Administrative, economic and technological factors. | Taxation (high taxes, low after-tax earnings), overall regulation (administrative system, regulation complexity, difficult business registration procedures, etc.), cyberspace-related determinants (contrast between personal and corporate, anonymity, lack of ethics in software and IT business, inclusion that online act is victimless, doubtful copyrights, low level of perceived risk, etc.) |
| Participants | Service providers, product suppliers, customers | Service providers, product suppliers, customers | Service providers, product suppliers, customers |
| Finance | Cash, web money, electronic money, online payment systems | web money, electronic money, online payment systems | Web money, electronic money, online payment systems, well-hidden financial transactions are processed by legitimate merchant accounts |
| Communication | Face-to-face, Online | Online | Online |
| Security | Comparatively high and medium | Comparatively high | Comparatively high |
| Geographical area | Local and international | International | International |
| Psychology | Individual and social (tax moral) | Individual and social | Individual and social |
| Way of operation | Single activity, collaboration, networking | collaboration, networking | Collaboration, networking |

Source: summarized by authors based on Gaspareniene and Remeikiene (2015), Shkarlet et al. (2019), Remeikienė et al. (2018) , Stock and Seliger (2016 ), Dennis et al. (2017), Bilan et al. (2019), Ginevicius et al. (2018),

The functioning of the modern labor market is characterized by an increase in the share of innovative methods of finding and attracting employees. Thus, along with the traditional forms of employment, non-standard types of employment (including shadow ones) are

becoming widespread (Bánociová and Martinková (2017), Harmider et al. (2019), Vorontsova et al. (2018)). According to the analysis, the volume of this segment in the labor market is increasing every year. So far, about a third of the workforce in the European Union countries is engaged in the form of non-traditional employment. In Ukraine, almost 30% of all companies rely on outsourcing services. The most widely used are IT outsourcing (27%), legal (25%), accounting (20%), transport (12%) and personnel (6%) outsourcing (World Bank, 2019). One of the reasons for such tendencies is the low level of regulation of employment issues in the unconventional form, and hence the facilitation of the procedures for shadow registration of such workers, payment of salaries in "envelopes", etc.

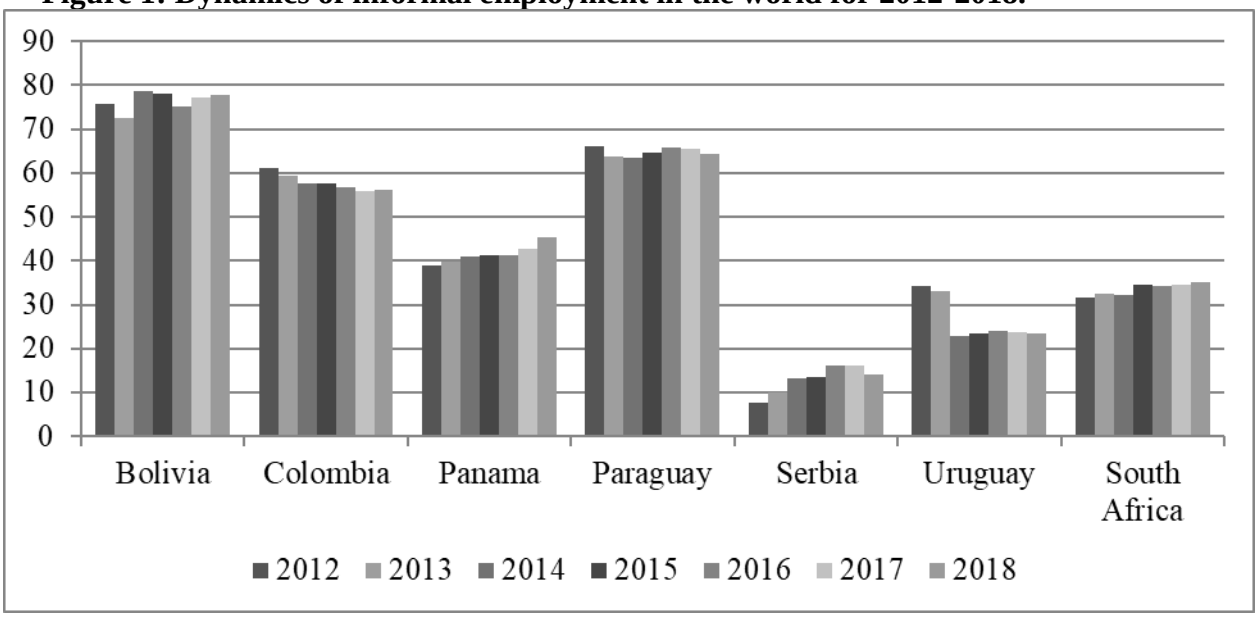
The most pressing problem is in countries with budget deficits. Given that tax payments are one of the most important and stable sources of state and local budget replenishment (Tiutiunyk et al. (2019), Szymańska (2018), Djalilov et al. (2018), Dobrovič et al. (2018), Onofrei (et al. (2016)), the issue of tax evasion is most urgent for both academics and civil servants.

Unfortunately, structural changes in the economy in recent years, accompanied by declining levels of material wealth and social protection of the population, are exacerbating the problem of tax evasion, both by entrepreneurs and individuals (Skare and Porada-Rochoń (2019), Vasylieva et al. (2018), Meyer (2016), Miłek (2018), Stjepanović et al. (2017), Marcel (2019), Mačaitytė and Virbašiūtė (2018)).

Increasing social contribution rates, rising inflation and the cost of most goods and services are a catalyst for finding new mechanisms for concealing income from government employees, one of which is informal employment. Data from the International Labor Organization shows that the share of shadow employment in the non-agricultural sector varies from 55% in Latin America to 45-85% in various parts of Asia, and almost 80% in Africa. In particular, 47% in the Middle East and North Africa; 51% in Latin America, 71% in Asia and 72 % in sub-Saharan Africa. In Africa, informal employment accounts for nearly 80% of non-agricultural employment, and more than 60% of urban employment and over 90 percent of new employment over the last decade (Chen, 2002).

According to the World Bank, the shadow employment rate in the world is on average 40-50% (Figure 1) and importance negatively affects the indicators of economic development of countries and the world.

**Figure 1: Dynamics of informal employment in the world for 2012-2018.**




Source: own elaboration based on the World Bank data

The scientific literature has a great variety of approaches to identify the shadow employment, which differ by understanding the essence of the concept, the main determinants of its appearance. Many authors identify the concept of shadow employment with such definitions as undeclared work, unregistered employment, hidden work, informal employment, illegal employment, informal employment, etc.

According to Kolot (2014), non-standard employment includes all non-standard activities. The Organization for Economic Co-operation and Development uses the term hidden employment, which means legitimate activity that has not been declared by one or more administrative bodies (OECD, 2004).

A similar definition is provided by the European Commission (OECD, 2004). It defines undeclared work as "any paid activities that are lawful as regards their nature, but not declared to public authorities, taking into account differences in the regulatory systems of the Member States". These definitions exclude from the concept of undeclared work criminal activity and work that is not declared.

The amount of undeclared work varies depending on the nature of the institutional environment of each country, the main elements of which are:

- the level of tax and social burden;
- the level of administrative costs;
- compliance of labor legislation with new forms of activity;
- the level of competitiveness of firms in the least developed sectors of the economy that are in need of low skilled labor;
- the level of cultural perception of the informal economy in society;
- ease of entry into the informal employment market;

The European Commission identifies four main groups of undeclared workers:

- persons with two or more jobs;
- economically inactive population (students, housewives, early retirees);
- unemployed;
- illegal immigrants.

At the same time, as part of the Eurobarometer survey, the following informal activities are identified (Special Eurobarometer, 2019):

- within the officially registered enterprise - wholly or partially undeclared activity, the remuneration of which is paid "in envelopes";
- as a self-employed person or employer;
- as a self-employed person or with neighbors, friends or acquaintances (other social groups) to deliver goods and provide services to end consumers.

A large group of authors understand undeclared work as official wage cuts, paying the difference in envelopes, reducing official working hours, and more.

Illegal employment is a complex phenomenon in terms of forecasting and management, which is a prerequisite for the emergence of a whole range of economic, social and political factors. Identifying them in a timely manner will help to revise the existing policy on combating illegal employment and increase the effectiveness of the implemented measures.

One of the most common methods of employment relations in the sphere of communication technologies, informatization and software is full unofficial payment of wages. Often, these individuals are not given a job because most orders can be executed remotely without being physically attached to the location of the business.

## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

In order to investigate the relationship between the Fourth Industrial Revolution and the level of shadow employment, we will analyze the correlation between the analyzed indicators. As a result, we have selected share in undeclared work of GDP. Factor indicators include: the Digitization Index (DI), Digital Evolution Index (DEI), Industry Digitization Index (IDI), Digital Economy and Society Index (DESI), household access to the Internet and IT (HA), non-cash payments (NCP), frequency of payments in cryptocurrencies (FPC). The results of the calculations are shown in table 3.

However, it is necessary to take into account that often the results of the correlation-regression analysis indicate the presence of different coefficients by values for the same country at different intervals. Thus, we can conclude that there is a nonlinear relationship between the resulting and factorial features. For a more detailed analysis of the relationships between the analyzed and the factorial indicators, we evaluate the presence of a nonlinear connection through the following regression:

$$TG_{i,t} = \alpha_i + \beta_0 + \beta_1 D_{i,t-1} + \beta_2 D^2_{n,i,t-1} + \beta_3 TG_{i,t-1} + \beta_4 t + \epsilon_{i,t} \qquad (2)$$

**Table 3: Results of the hypothesis verification regarding the nonlinear relationship between indicators of digitization of the economy and Undeclared Work in the EU**

| | DI | DEI | IDI | DESI | HA | NCP | FPC |
|---|---|---|---|---|---|---|---|
| Austria | 0.01824 | 0.03695 | 0.04056 | 0.10425 | 0.14991 | 0.16672 | 0.12730 |
| Belgium | 0.12644 | 0.26742 | 0.16444 | 0.14587 | 0.18306 | 0.18249 | 0.17810 |
| Bulgaria | 0.12806 | 0.07410 | 0.17128 | 0.15077 | 0.06621 | 0.05785 | 0.18410 |
| Cyprus | 0.22316 | 0.12977 | 0.12352 | 0.02023 | 0.23731 | 0.48735 | 0.02470 |
| Czech Republic | 0.14312 | 0.13859 | 0.13588 | 0.09250 | 0.24608 | 0.10731 | 0.08032 |
| Denmark | -0.01663 | -0.00789 | -0.08864 | -0.03485 | -0.10707 | -0.02109 | -0.04256 |
| Estonia | 0.10327 | 0.01454 | 0.07724 | 0.05679 | 0.17499 | 0.23351 | 0.06935 |
| Finland | 0.05928 | 0.01606 | 0.08484 | 0.09095 | 0.12255 | 0.51766 | 0.11106 |
| France | -0.00181 | -0.00342 | -0.00561 | -0.00117 | -0.00684 | -0.00751 | -0.00143 |
| Germany | 0.04965 | 0.01345 | 0.07105 | 0.06394 | 0.07572 | 0.31386 | 0.05553 |
| Greece | 0.13931 | 0.11306 | 0.12443 | 0.05311 | 0.03821 | 0.07776 | 0.04612 |
| Hungary | 0.16635 | 0.13500 | 0.14858 | 0.07554 | 0.06185 | 0.12825 | 0.09225 |
| Ireland | 0.10127 | 0.14754 | 0.07895 | 0.11787 | 0.18668 | 0.10555 | 0.14393 |
| Italy | 0.00114 | 0.00076 | 0.00057 | 0.00039 | 0.00067 | 0.00114 | 0.00048 |
| Latvia | -0.01169 | -0.00684 | -0.00741 | -0.00545 | -0.01701 | -0.01482 | -0.00665 |
| Lithuania | -0.17157 | -0.21157 | -0.14317 | -0.11421 | -0.12407 | -0.13310 | -0.13946 |
| Luxembourg | -0.06869 | -0.09880 | -0.14317 | -0.10402 | -0.11505 | -0.07078 | -0.12702 |
| Malta | 0.05418 | 0.09778 | 0.11703 | 0.06187 | 0.09721 | 0.13519 | 0.05372 |
| Netherlands | 0.08481 | 0.12356 | 0.06611 | 0.08287 | 0.11535 | 0.06399 | 0.07196 |
| Poland | 0.01528 | 0.03095 | 0.03397 | 0.07330 | 0.09263 | 0.10109 | 0.06365 |
| Portugal | -0.00095 | -0.00064 | -0.00048 | -0.00027 | -0.00041 | -0.00069 | -0.00024 |
| Romania | -0.05539 | -0.04342 | -0.04256 | -0.03400 | -0.11790 | -0.06251 | -0.04152 |
| Slovakia | -0.00095 | -0.00209 | -0.00067 | -0.00117 | -0.00181 | -0.00114 | -0.00143 |
| Slovenia | 0.17091 | 0.16549 | 0.16226 | 0.13156 | 0.39825 | 0.17699 | 0.16065 |
| Spain | 0.13605 | 0.07964 | 0.08163 | 0.05722 | 0.03786 | 0.09331 | 0.04969 |
| Sweden | 0.06470 | 0.11676 | 0.13975 | 0.08799 | 0.15732 | 0.22297 | 0.10745 |
| United Kingdom | 0.16245 | 0.09510 | 0.09747 | 0.08138 | 0.06128 | 0.15390 | 0.09937 |

The results of the analysis of nonlinear relation between the analyzed indicators presented in Table 2 confirmed the existence of a stable correlation between the resulting indicator and all

indicators of digital economy. A sufficiently strong positive correlation is found in Belgium, Cyprus and Slovenia. Thus, an increase in Digital Evolution Index by 1% leads to an increase in the level of shadow employment in Belgium by 26.74%. The least sensitive shadow employment are in Italy, Portugal and Slovakia. Negative correlation for countries such as Denmark, France, Latvia, Lithuania, Luxembourg, Portugal, Romania, Slovakia. One of the reasons for this situation is the existence of an effective policy to counteract the shadow economy and the mechanisms of regulation of electronic payments, online banking, etc. Under these conditions, the Industry 4.0 is an instrument for the de-shadowing of cash flows, withdrawal them into official circulation through investment and innovation activities, expansion of production, etc.

## 4. CONCLUSION

The results of the analysis allowed to identify trends and patterns of influence of indicators of digitization of the economy on the level of Undeclared Work in the EU: sufficiently strong positive correlation found in Belgium, Cyprus, Slovenia, Slovakia. At the same time, countries which are characterized by the absence of a statistically significant relationship were defined. These findings have important implications for both academics and managers in the whole world. First, they can be the basis for further research, in the context of determining the most effective instruments to counter shadow employment. Secondly, it is possible to assess the risk of shadow employment in the process of economic and technological transformation in a country, its transition to a digital society.

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# VPLYV PRIEMYSLU 4.0 NA TRH PRÁCE SLOVENSKEJ REPUBLIKY V KONTEXTE PRACOVNEJ MIGRÁCIE

# IMPACT OF INDUSTRY 4.0 ON THE LABOR MARKET OF THE SLOVAK REPUBLIC IN THE CONTEXT OF LABOR MIGRATION

***Magdaléna TUPÁ***[138]

**Abstrakt:** *Premenlivosť trhov, skracovanie životného cyklu výrobkov, rast zložitosti výrobkov či silnejúci vplyv globálnych dodávateľských reťazcov – vytvárajú prostredie, v ktorom sa snažia podniky prežiť. Industry 4.0 hľadá a implementuje riešenia a spôsoby ako je možné uvedené výzvy zvládnuť. Hospodárstvo Slovenskej republiky generuje stále vyšší počet voľných pracovných miest, vyžadujúcich kvalifikáciu na úrovni stredoškolského vzdelania. Trh práce krajiny nedokáže dopyt po pracovnej sile uspokojiť z vlastných zdrojov, preto sa otvára pracovnej imigrácii. Predkladaná štúdia hľadá odpoveď na otázku, aký vplyv má a bude mať Industry 4.0 na pracovnú silu prichádzajúcu zo zahraničia? Použitím teoretických všeobecných metód vedeckého poznania vytvára základ k skúmaniu závislostí vybraných ukazovateľov trhu práce a makroekonomických ukazovateľov odrážajúcich vplyv Industry 4.0.*

**Kľúčové slová:** *trh práce, pracovná migrácia, Industry 4.0*

**Abstract:** *Market variability, shortening the life cycle of products, increasing the complexity of products, or the increasing impact of global supply chains - create an environment in which businesses try to survive. Industry 4.0 is looking for and implementing solutions and ways to meet these challenges. The economy of the Slovak Republic generates an increasing number of vacancies requiring qualifications at the secondary level. The country's labour market is unable to satisfy labour demand from its own resources and therefore opens up to labour immigration. The present study seeks to answer the question, what impact does Industry 4.0 have and will have on the workforce coming from abroad? Using theoretical general methods of scientific knowledge, it forms the basis for examining the dependencies of selected labour market indicators and macroeconomic indicators reflecting the impact of Industry 4.0.*

***Keywords:*** *labor* market, labor migration, Industry 4.0

**JEL Classification:** : *F22, J21, J23*

## 1. ÚVOD

O súčasnosti sa hovorí ako o dobe počiatku štvrtej priemyselnej revolúcie (Popkova 2019). Už dnes môžeme pozorovať jej ekonomické, ale aj sociálne vplyvy, ktorých dosah sa bude prehlbovať na celú spoločnosť (Kordoš, Vojtovič, 2016; Reich, 2002).

Štvrtej priemyselnej revolúcií predchádzali tri významné fázy: zavedenie parného stroja do výroby, využitie elektrickej energie v podobe elektromotora v priemyselnej produkcii či zavedenie informačných a telekomunikačných technológií v produkcii statkov a služieb. Prienikom všetkých je nahrádzanie ľudskej práce prácou technických zariadení, čím dochádza k zvyšovaniu produktivity práce (Kamal-Chaoui, 2018) a následne k nadbytočnosti časti pracovnej sily. Na druhej strane vzniká potreba nových profesií s viazanosťou na novovznikajúce pracovné miesta (Winick, 2018; Ślusarczyk, 2018; Schwab, 2016). Tak ako v

[138] Ing., PhD., Trenčianska univerzita A. Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, 911 50 Trenčín, Slovenská republika, e-mail: magdalena.tupa@tnuni.sk

období 40. a 50. rokov 20. storočia, keď pod vplyvom vedecko-technickej revolúcie vzniká povolanie vedec.

Dnes tiež stojíme na počiatku novej etapy označovanej ako „priemysel 4.0“. Na jej vymedzení sa odborná a vedecká verejnosť nezhodujú. Manažéri priemyselných podnikov sa uzatvárajú vo význame vyššej automatizácie a vzájomnej prepojenosti komunikácie jednotlivých systémov, tzv. inteligentnej výroby (Crnjac, Veza a Banduka 2017; Schwab, 2016) rozširujúcich sa aj na poskytovanie služieb v súkromnom i verejnom sektore. Odborníci v informačných technológiách vyvíjajú stále nové samoučiace sa softvérové systémy ovládajúce stroje a zariadenia nielen pre výrobu ale aj pre bežného spotrebiteľa, ako napr. smart televízory, inteligentné robotické vysávače, smart automobily, smart hodinky, smart sporáky, práčky a pod. Technologické zariadenia denného užívania sú riadené človekom užívateľom prostredníctvom telefónu či počítača, v sofistikovanejších prípadoch samovyhodnocovacím programom podľa potrieb človeka. Virtuálny priestor v kombinácii s neustále sa vyvíjajúcimi technológiami umožňuje organizovanie pracovných porád v nasimulovanej konferenčnej miestnosti za okrúhlym stolom pre pracovníkov nachádzajúcich sa v jednom čase na rôznych geograficky vzdialených miestach. Jeho prenikanie do bežného života jednotlivca je nezastaviteľné. Ďalším rozmerom je zhromažďovanie dát o človeku z jeho aktivity so zariadeniami a technológiami, ktoré zostávajú zaznamenané v podobe tzv. „big dat“ a ich cloudové spracovanie. Len zlomok dokážu spoločnosti využívať, no už len táto malá časť predstavuje obrovský krok smerom k človeku ako spotrebiteľovi, občanovi či aktívnemu členovi domácnosti. Ďalším článkom v skladačke štvrtej priemyselnej revolúcie sú roboty ako autonómne, samoučiace sa systémy či systémy, ktoré dokážu poskytnúť človeku spätnú reakciu nesúcu so sebou pocit. A keďže Japonsko úplne odmieta imigráciu, nedostatok pracovných miest riešia intenzívnejšou automatizáciou aj v sektoroch sociálnej pomoci. O umelej inteligencii vo význame vedcov zo Silicon Valley však hovoriť ešte nemôžeme. Na počiatku nevieme definovať všetky rozmery štvrtej priemyselnej revolúcie, na základe poznaného môžeme len zlomok predpokladať. Úlohou vedcov a výskumníkov je krok po kroku overovať jednotlivé predpoklady ekonomických a sociálnych vplyvov v dôsledku priemyslu 4.0. (PWC 2016)

## 2. CIEĽ A METODOLÓGIA

Hlavným cieľom predkladanej štúdie je zistiť vplyv prichádzajúcej štvrtej priemyselnej revolúcie na pracovnú silu migrujúcu za prácou do zahraničia.

Použitím teoretických všeobecných metód vedeckého poznania vytvára základ k skúmaniu závislostí vybraných ukazovateľov trhu práce a makroekonomických ukazovateľov odrážajúcich vplyv Industry 4.0 na pracovnú imigráciu v Slovenskej republike.

Na začiatku sa analyzuje vývoj základného makroekonomického ukazovateľa HDP v časových radoch od roku 2000 do roku 2018 na pozadí subjektov, ktorými je vytváraný. Čím vytvára obraz o možnostiach vplyvu štvrtej priemyselnej revolúcie na produkciu z makroekonomického pohľadu. Následne sa analyzujú ukazovatele trhu práce – ekonomicky aktívne obyvateľstvo, zamestnanosť, nezamestnanosť, voľné pracovné miesta – ako predpoklad k uvažovaniu o pracovnej sile prichádzajúcej do krajiny zo zahraničia. Korelačnou a regresnou analýzou skúma závislosť pracovnej imigrácie a inovačného indexu, ktorý odzrkadľuje stupeň priemyslu 4.0 v krajine. (Grmanová, 2014)

## 3. RIEŠENIE PROBLÉMU A VÝSLEDKY

Slovenská ekonomika je vysoko otvorenou ekonomikou so značným podielom priemyslu na vytvorenom HDP (v roku 2017 sa priemysel podieľal na HDP 28%, čo je nadpriemerne v porovnaní s inými vyspelými krajinami). Úzke zameranie priemyselnej výroby a vysoká závislosť na zahraničnom obchode je cestou k významnému poklesu jej konkurencieschopnosti v podmienkach štvrtej priemyselnej revolúcie. Zvyšujúca sa automatizácia v priemyselnej výrobe, znižujúca sa produktivita vzhľadom na mzdy ohrozujú mnohé pracovné miesta, predovšetkým ľudí s nízkou alebo strednou kvalifikáciou. Negatívum predstavuje odchod podnikov so zahraničným kapitálom, ktorých rentabilita sa zvyšujúcimi mzdami či doznením štátnych podpôr rapídne znižuje. V prípade výroby závislej na pracovnej sile operátorov, je pre podniky východiskom zavedenie vyššieho stupňa automatizácie do výroby alebo odchod zo Slovenska do krajín s nižšou mzdovou úrovňou, čím značne klesnú náklady na prácu. Pod vplyvom uvedených zmien je pre zachovanie udržateľného rastu slovenskej ekonomiky a udržanie konkurencieschopnosti krajiny nevyhnutné vytvoriť priaznivé prostredie s nastavením podmienok podpory tvorby inovácií a ich implementácie. Uvedené je dosiahnuteľné len prostredníctvom kvalitných ľudských zdrojov nie v zmysle vysokokvalifikovanej pracovnej sily, ale človeka tvoriaceho niečo úplne nové, čo tu ešte nebolo. Preto sa krajina musí sústrediť na školský systém podporujúci kreativitu jedinca, hľadaniu talentov a ich rozvoju. Následne sústrediť pozornosť štátu na podporu vytvárania nových pracovných miest nesúcich identitu tvorby inovácii a vytvorenie podmienok podporujúcich možnosti sebarealizácie jedinca v podnikoch či inštitúciách, ktoré by maximalizovali jeho potenciál.

Zdrojom získavania ľudského kapitálu, tak potrebného pre vytváranie pridanej hodnoty vedúcej k rastu HDP v podmienkach štvrtej priemyselnej revolúcie, predstavujú ľudské zdroje zo zahraničia. Zavedenie podmienok predstavujúcich pull faktory pre potenciálneho migranta sú nezanedbateľným faktorom. Je preto najvyšší čas zamyslieť sa nad vytváraním prostredia podporujúceho inovácie v ekonomike a na trhu práce v Slovenskej republike. Druhý scenár nesie so sebou ideu, že podniky zavádzajúce inteligentnú výrobu nebudú reagovať na mzdové rozdiely, naopak budú z rozvojových krajín sťahované späť do krajín vyspelých, ide o tzv. reshoringu, o ktorom hovorí UNCTAD (2019).

Trh práce Slovenskej republiky od vzniku samostatnej krajiny vykazoval nesúlad medzi ponukou práce a dopytom po práci. Dlhodobo krajina bojovala s vysokou mierou nezamestnanosti, pričom najviac nezamestnaných evidovaných na úradoch práce bolo v roku 1999 a 2001 (miera nezamestnanosti 19,2%). K výraznejšiemu znižovaniu nezamestnanosti prišlo až po roku 2004. Dôvody môžeme hľadať v zmenách metodiky evidovania nezamestnaných, legislatívne zmeny v evidencii nezamestnaných a sprísňujúce sa podmienky k evidencii na úradoch práce a zároveň významným faktorom sa stáva zvyšujúca sa pracovná migrácia v dôsledku vstupu SR do EÚ. Uvedené dokazujú štatistiky (Tabuľka 1), kde na jednej strane dochádza k znižovaniu nezamestnanosti, no zvyšovanie zamestnanosti nekopíruje nastolený trend. Ozdravenie ekonomiky po celosvetovej hospodárskej kríze sa pozitívne prejavuje na trhu práce krajiny od roku 2015, pričom v roku 2018 môžeme pozorovať historické minimum evidovaných nezamestnaných a zároveň pozitívne sa vyvíjajúci ukazovateľ zamestnanosti.

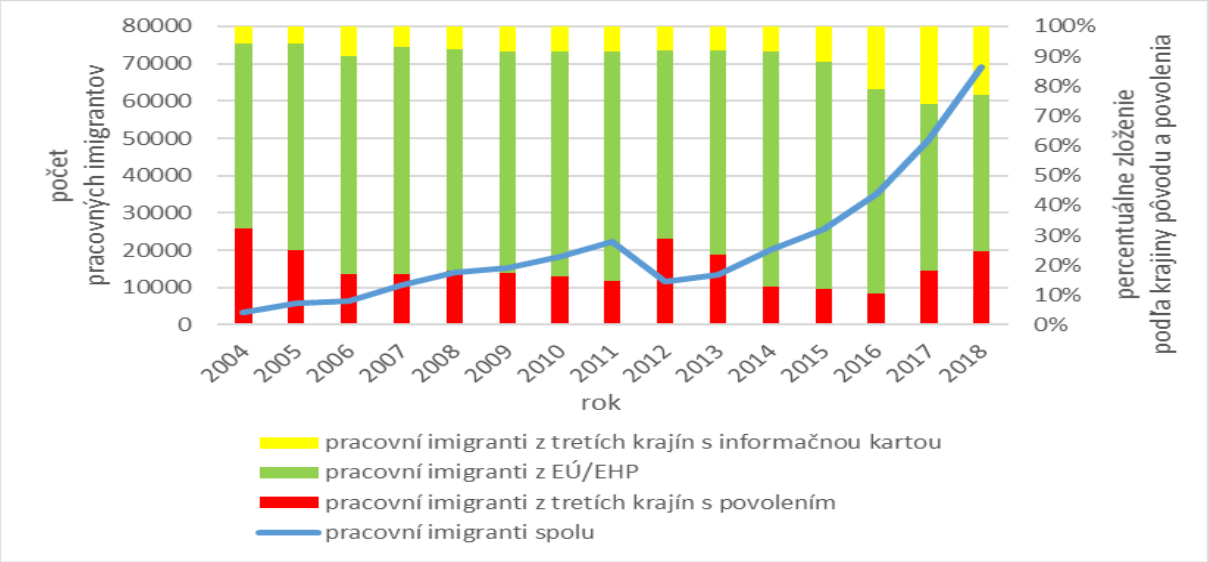
**Tabuľka 1: Vybrané ukazovatele trhu práce SR od roku 2000 do roku 2018**

| | ekonomicky aktívne obyv. spolu | pracujúci | miera zamestnanosti (%) | nezamestnaní | miera nezamestn. (%) | voľné pracovné miesta | miera VPM |
|---|---|---|---|---|---|---|---|
| **2000** | 2 608,2 | 2 101,7 | 56,5 | 485,2 | 18,6 | 6026 | 1,05552 |
| **2001** | 2 652,5 | 2 123,7 | 56,5 | 508,0 | 19,2 | 10086 | 1,67374 |
| **2002** | 2 628,2 | 2 127,0 | 56,7 | 486,9 | 18,5 | 17238 | 1,70910 |
| **2003** | 2 634,3 | 2 164,6 | 57,6 | 459,2 | 17,4 | 15511 | 0,89981 |
| **2004** | 2 658,6 | 2 170,4 | 56,9 | 480,7 | 18,1 | 14705 | 0,94803 |
| **2005** | 2 645,7 | 2 216,2 | 57,7 | 427,5 | 16,2 | 133607 | 9,08582 |
| **2006** | 2 654,8 | 2 301,4 | 59,4 | 353,4 | 13,3 | 23911 | 0,17896 |
| **2007** | 2 649,2 | 2 357,3 | 60,7 | 291,9 | 11,0 | 22533 | 0,94236 |
| **2008** | 2 691,2 | 2 433,8 | 62,3 | 257,5 | 9,6 | 11023 | 0,48919 |
| **2009** | 2 690,0 | 2 365,8 | 60,1 | 324,2 | 12,1 | 5027 | 0,45604 |
| **2010** | 2 706,5 | 2 317,5 | 58,8 | 389,0 | 14,4 | 7086 | 1,40958 |
| **2011** | 2 680,0 | 2 315,3 | 59,3 | 364,6 | 13,6 | 6530 | 0,92153 |
| **2012** | 2 706,5 | 2 329,0 | 59,7 | 377,5 | 14,0 | 3689 | 0,56493 |
| **2013** | 2 715,3 | 2 329,3 | 59,9 | 386,0 | 14,2 | 5434 | 1,47302 |
| **2014** | 2 721,8 | 2 363,0 | 61,0 | 358,7 | 13,2 | 9169 | 1,68733 |
| **2015** | 2 738,3 | 2 424,0 | 62,7 | 314,3 | 11,5 | 27612 | 3,01145 |
| **2016** | 2 758,1 | 2 492,1 | 64,9 | 266,0 | 9,7 | 35284 | 1,27785 |
| **2017** | 2 754,7 | 2 530,7 | 66,2 | 224,0 | 8,1 | 69375 | 1,96618 |
| **2018** | 2 746,3 | 2 566,7 | 67,6 | 179,5 | 6,6 | 73890 | 1,06508 |

Zdroj: Štatistický úrad SR

Hospodárstvo Slovenskej republiky zároveň generuje stále vyšší počet voľných pracovných miest, ktoré krajina nedokáže pokryť z vlastných zdrojov, pretože domáce práceschopné obyvateľstvo nemá záujem pracovať na vytvorených pracovných miestach a za ponúkanú mzdu. Udržateľnosť hospodárskeho rastu krajiny predpokladá zmiernenie nesúladu a uspokojenie dopytu po práci. Zdroje pracovnej sily predstavujú pracovníci zo zahraničia, pre ktorých je Slovenská republika zaujímavá z hľadiska pull faktorov v porovnaní s podmienkami v domovskej krajine.

**Obrázok 1: Vývoj pracovnej imigrácie podľa krajiny pôvodu a povolenia v Slovenskej republike od roku 2004 do roku 2018**




Zdroj: vlastné spracovanie podľa údajov ÚPSVaR, štatistiky - Zamestnávanie cudzincov

Slovenská republika bola dlhodobo len tranzitnou krajinou, čo kopírovalo ekonomický vývoj krajiny, keďže vybrané indikátory ekonomickej kondície sa odzrkadľujú v pull faktoroch pracovnej migrácie. Mierny nárast pracovnej imigrácie môžeme pozorovať do roku 2011, napriek tomu že hospodárska kríza sa v Európe prejavila o 2 roky skôr. No druhá fáza sa už prejavila výraznejším spôsobom na pracovníkoch prichádzajúcich do krajiny zo zahraničia. V skupine imigrantov z tretích krajín pozorujeme nárast záujmu o prácu u nás v roku 2004 a 2005, čo je ovplyvnené vstupom Slovenska do európskych štruktúr. Druhý výraznejší nárast u tejto skupiny imigrantov sa v štatistikách prejavuje v roku 2012 a v posledných dvoch rokoch. V skupine pracovných imigrantov z EÚ/EHP najvýraznejší pokles zaznamenávame od roku 2015, pod vplyvom stabilizácie ekonomík v celom európskom priestore, ale aj pokles záujmu zahraničných investorov o našu krajinu v konkurencii s krajinami V4 či zlepšujúcimi sa podmienkami v krajinách, ktoré rozšírili EÚ v posledných etapách.

Podľa dosiahnutého vzdelania je najviac pracovných imigrantov so stredoškolským vzdelaním či už analyzujeme štatisti tiky pracovnej imigrácie z tretích krajín alebo z EÚ/EHP (tabuľka 3). Stále vyšší počet pracovníkov zo zahraničia má však ukončené vysokoškolské vzdelanie, čo môžeme považovať za významné pozitívum, ak predpokladáme, že obsadzujú vysokokvalifikované pracovné miesta alebo pracovné miesta vyžadujúce si ľudský kapitál (tvorivý potenciál so schopnosťou produkovať inovácie).

**Tabuľka 3: Vývoj pracovnej imigrácie podľa vzdelania od roku 2012 do roku 2018**

| Pracovní imigranti z tretích krajín | | | | | | Pracovní imigranti z krajín EÚ/EHP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **rok** | **základné vzdelanie** | **stredoškolské vzdelanie** | | **VŠ vzdelanie** | **N/A** | **rok** | **základné vzdelanie** | **stredoškolské vzdelanie** | | **VŠ vzdelanie** | **N/A** |
| | | **neúplné** | **úplné** | | | | | **neúplné** | **úplné** | | |
| **2012** | 208 | 947 | 1011 | 1945 | 122 | **2012** | 617 | 2666 | 2202 | 1547 | 282 |
| **2013** | 225 | 872 | 968 | 1832 | 322 | **2013** | 606 | 3222 | 2853 | 1571 | 929 |
| **2014** | 281 | 815 | 911 | 2001 | 245 | **2014** | 960 | 5027 | 5498 | 3241 | 1076 |
| **2015** | 408 | 1336 | 1178 | 2473 | 714 | **2015** | 1281 | 6113 | 6495 | 3607 | 1932 |
| **2016** | 3134 | 2252 | 1773 | 2897 | 980 | **2016** | 1952 | 7779 | 7557 | 4526 | 2240 |
| **2017** | 5007 | 5541 | 4846 | 3986 | 2372 | **2017** | 2662 | 9321 | 7985 | 5144 | 2614 |
| **2018** | 4771 | 10078 | 9419 | 6742 | 1841 | **2018** | 3791 | 12565 | 9383 | 7268 | 3258 |

Zdroj: ÚPSVaR, štatistiky - Zamestnávanie cudzincov

Vo všeobecnosti platí, že čím vyššie kvalifikované pracovné miesto a čím vyššie kvalifikovaná pracovná sila, tým vyššiu pridanú hodnotu produkuje. Teda v procese tvorby inovácií ľudskými zdrojmi je vytváraná najvyššia pridaná hodnota.

Hodnotenie krajín z hľadiska inovatívnosti spracováva a sleduje Európska komisia prostredníctvom ukazovateľa „Inovačný index“, ktorý je sýtený hlavnými faktormi: ľudské zdroje, atraktívne výskumné systémy, prostredie priaznivé pre inovácie, financovanie a podpora, podnikové investície, inovátori, prepojenia, duševné aktíva, vplyv na zamestnanosť, vplyv na predaj. Inovačný index Slovenskej republiky (tabuľka 4) hodnotí stav krajiny v nových podmienkach štvrtej priemyselnej revolúcie. Identifikuje oblasti, na ktoré Slovensko potrebuje zamerať svoje úsilie, aby zlepšilo svoju inovačnú výkonnosť. V rámci posudzovania inovačnej výkonnosti EÚ môžeme konštatovať, že sa vyvíja stabilným tempom s prognózou ďalšieho zlepšovania inovačnej výkonnosti krajiny, no s významnými disparitami medzi jednotlivými členskými krajinami.

**Tabuľka 4: Inovačný index s čiastkovými ukazovateľmi za roky 2011 až 2018**

| Indicator | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| 0. Summary Innovation Index | 63,28 | 67,13 | 68,92 | 65,26 | 67,04 | 69,3 | 66,51 | 69,10 |
| 1.1 Human resources | 101,04 | 68,46 | 77,99 | 77,76 | 84,54 | 83,37 | 83,65 | 86,10 |
| 1.1.1 New doctorate graduates | 230,77 | 130,77 | 169,23 | 169,54 | 178,21 | 157,59 | 146,71 | 138,55 |
| 1.1.2 Population completed tertiary education | 44,78 | 44,78 | 44,78 | 44,78 | 55,97 | 71,64 | 84,33 | 94,03 |
| 1.1.3 Lifelong learning | 31,25 | 31,25 | 21,88 | 20,83 | 20,83 | 20,83 | 18,75 | 23,96 |
| 1.2 Attractive research systems | 28,71 | 31,91 | 30,62 | 37,91 | 39,94 | 41,51 | 44,31 | 46,74 |
| 1.2.1 International scientific co-publications | 52,09 | 57,32 | 56,36 | 69,46 | 70,91 | 79,86 | 85,34 | 84,09 |
| 1.2.2 Scientific publications among top 10% most cited | 15,46 | 18,64 | 14,04 | 23,09 | 25,53 | 24,65 | 28,29 | 34,85 |
| 1.2.3 Foreign doctorate students | 33,97 | 35,82 | 39,53 | 40,16 | 41,95 | 42,45 | 42,15 | 40,53 |
| 1.3 Innovation-friendly environment | 63,39 | 63,39 | 61,28 | 64,70 | 73,17 | 68,67 | 84,72 | 90,91 |
| 1.3.1 Broadband penetration | 88,89 | 88,89 | 88,89 | 88,89 | 100,00 | 88,89 | 133,33 | 144,44 |
| 1.3.2 Opportunity-driven entrepreneurship | 46,02 | 46,02 | 42,48 | 48,22 | 54,89 | 54,89 | 51,60 | 54,45 |
| 2.1 Finance and support | 21,39 | 28,33 | 32,72 | 29,19 | 42,29 | 73,87 | 27,16 | 26,07 |
| 2.1.1 Public R&D expenditure | 30,90 | 42,11 | 53,31 | 47,71 | 68,25 | 122,41 | 38,37 | 40,24 |
| 2.1.2 Venture capital | 10,11 | 11,99 | 8,30 | 7,24 | 11,52 | 16,33 | 13,87 | 9,28 |
| 2.2 Firm investments | 84,92 | 81,74 | 84,00 | 74,34 | 76,91 | 72,48 | 68,07 | 79,74 |
| 2.2.1 Business R&D expenditure | 20,18 | 19,32 | 26,19 | 30,48 | 25,33 | 26,19 | 32,20 | 39,06 |
| 2.2.2 Non-R&D innovation expenditure | 101,46 | 93,24 | 93,24 | 110,18 | 110,18 | 84,71 | 84,71 | 105,39 |
| 2.2.3 Enterprises providing ICT training | 133,33 | 133,33 | 133,33 | 80,00 | 93,33 | 106,67 | 86,67 | 93,33 |
| 3.1 Innovators | 44,07 | 60,70 | 60,70 | 40,04 | 40,04 | 32,95 | 32,95 | 37,85 |
| 3.1.1 SMEs with product or process innovations | 41,13 | 64,55 | 64,55 | 36,11 | 36,11 | 32,62 | 32,62 | 42,85 |
| 3.1.2 SMEs with marketing or organisational innovations | 60,59 | 56,88 | 56,88 | 53,44 | 53,44 | 40,54 | 40,54 | 32,28 |
| 3.1.3 SMEs innovating in-house | 30,32 | 60,67 | 60,67 | 30,45 | 30,45 | 25,59 | 25,59 | 38,43 |
| 3.2 Linkages | 51,06 | 62,31 | 65,39 | 64,35 | 52,10 | 72,58 | 70,63 | 60,12 |
| 3.2.1 Innovative SMEs collaborating with others | 45,78 | 71,09 | 71,09 | 55,44 | 55,44 | 72,35 | 72,35 | 70,09 |
| 3.2.2 Public-private co-publications | 30,79 | 34,01 | 39,99 | 48,71 | 37,72 | 42,6 | 46,34 | 38,37 |
| 3.2.3 Private co-funding of public R&D expenditures | 63,65 | 68,08 | 72,15 | 77,60 | 55,85 | 85,66 | 79,82 | 62,18 |
| 3.3 Intellectual assets | 28,23 | 31,46 | 32,47 | 35,10 | 35,32 | 31,62 | 36,00 | 38,69 |
| 3.3.1 PCT patent applications | 9,92 | 12,24 | 13,53 | 10,77 | 16,43 | 11,41 | 13,80 | 16,32 |
| 3.3.2 Trademark applications | 49,19 | 54,82 | 52,02 | 56,76 | 61,69 | 66,22 | 68,44 | 66,65 |
| 3.3.3 Design applications | 30,01 | 32,22 | 36,06 | 42,54 | 33,29 | 24,22 | 32,42 | 38,95 |
| 4.1 Employment impacts | 117,74 | 117,74 | 116,12 | 113,43 | 115,05 | 108,82 | 115,29 | 113,33 |
| 4.1.1 Employment in knowledge-intensive activities | 60,26 | 60,26 | 56,41 | 50,00 | 53,85 | 50 | 55,13 | 62,82 |
| 4.1.2 Employment fast-growing enterprises of innovative sectors | 159,24 | 159,24 | 159,24 | 159,24 | 159,24 | 151,29 | 158,74 | 149,80 |
| 4.2 Sales impacts | 92,18 | 108,44 | 110,30 | 108,09 | 109,70 | 108,72 | 107,69 | 114,50 |
| 4.2.1 Medium and high-tech product exports | 119,08 | 123,02 | 128,25 | 131,99 | 136,55 | 139,8 | 136,27 | 138,74 |
| 4.2.2 Knowledge-intensive services exports | 35,93 | 35,93 | 35,93 | 35,93 | 35,90 | 33,95 | 34,63 | 41,89 |
| 4.2.3 Sales of new-to-market and new-to-firm product innovations | 124,99 | 174,55 | 174,55 | 162,73 | 162,73 | 157,84 | 157,84 | 169,29 |

Zdroj: Európska komisia, Európska hodnotiaca tabuľka inovácií 2019

Od roku 2011 sa inovačná výkonnosť Slovenskej republiky zvýšila o 5,82 percentuálnych bodov, pričom priemer EÚ predstavoval zvýšenie o 8,8. Nárast v EÚ bol spôsobený v dôsledku zvýšenia ukazovateľov noví absolventi doktorandského štúdia, spoločné medzinárodné vedecké publikácie a penetrácia širokopásmového pripojenia. Na Slovensku naopak ukazovateľ ľudské zdroje výrazne klesol v dôsledku poklesu podkategórie nových absolventov doktorandského štúdia pokles takmer o 40% a pokles nastal aj v podkategórii celoživotného vzdelávania o viac ako 7% bodov. Ďalší pokles nastal v časti Financie a podpora, kde mierne klesol rizikový kapitál a o 5,18% aj podnikové investície, ktoré predstavujú hlavné finančné zdroje pre tvorbu inovácií. V časti inovátori poklesol ukazovateľ MSP s organizačnými a marketingovými inováciami.

Regresnou analýzou sme zisťovali závislosť pracovných imigrantov na Slovensku a inovačného indexu Slovenskej republiky. Počet pracovných imigrantov je nezávislá premenná X, inovačný index závislá premenná Y, pretože predpokladáme, že vyšší počet pracovných imigrantov prispieva k zvyšovaniu inovačného indexu krajiny.

**Tabuľka 5: Korelačný koeficient, koeficient determinácie**

| ***Regression Statistics*** | |
|---|---|
| **Multiple R** | 0,444337 |
| **R Square** | 0,357435 |
| **Adjusted R Square** | 0,063674 |
| **Standard Error** | 2,018985 |
| **Observations** | 10 |

Zdroj: vlastné spracovanie autora

Korelačný koeficient (Multiple R) sa rovná 0,444 čo vyjadruje strednú tesnosť vzťahu medzi inovačným indexom a imigrovanou pracovnou silou. Koeficient determinácie (R Square) znamená, že sme modelom na 35,74% vysvetlili závislosti skúmaných premenných, zvyšok predstavuje nevysvetlenú variabilitu.

**Tabuľka 6: ANOVA**

| | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |
|---|---|---|---|---|---|
| **Regression** | 1 | 6,016746 | 6,016746 | 1,476031 | 0,027003 |
| **Residual** | 8 | 24,4578 | 4,076301 | | |
| **Total** | 9 | 30,47455 | | | |

Zdroj: vlastné spracovanie autora

Tabuľka obsahuje vysvetlenú (regression), nevysvetlenú (residual) a celkovú (total) variabilitu. SS je suma štvorcov, df stupeň voľnosti a MS priemer štvorcov. Na vyhodnotenie analýzy rozptylu slúžil F test. Significance F je menšia ako hladina významnosti α (0,027 <0,05). Model je na základe F-testu štatisticky významný a zvolený správne.

Tabuľka 7: Regresná analýza

| | ***Coefficients*** | ***Standard Error*** | ***t Stat*** | ***P-value*** | ***Lower 95%*** | ***Upper 95%*** | ***Lower 95,0%*** | ***Upper 95,0%*** |
|---|---|---|---|---|---|---|---|---|
| **Intercept** | 65,41437 | 1,536563 | 42,57188 | 1,12E-08 | 61,65453 | 69,1742 | 61,65453 | 69,1742 |
| **X Variable 1** | 0,000253 | 0,000208 | 1,21492 | 0,027003 | -0,00026 | 0,000763 | -0,00026 | 0,000763 |

Zdroj: vlastné spracovanie autora

Regresná funkcia má tvar y = 0,000253x + 65,41437. Z regresnej funkcie vyplýva, že ak by bol počet pracovných imigrantov nulový, inovačný index Slovenskej republiky by mal hodnotu 65,414 (hodnota Intercept – $b_0$). Pri raste pracovných imigrantov o jedného by inovačný index vzrástol o 0,000253 (hodnota X Variable 1). Hodnota P-value pre lokujúcu konštantu je $1{,}12*10^{-8}$ čo je <0,05 a pre regresný koeficient 0,027 čo je <0,05. Regresný koeficient aj lokujúca konštanta vyjadruje štatistickú významnosť zvolenej závislosti.

## 4. DISKUSIA

Výsledky štúdie ukazujú na výrazné zmeny na trhu práce v Slovenskej republike, ktoré sa prejavujú na zvyšovaní zamestnanosti a znižovaní nezamestnanosti, ktorá už nie je len výsledkom zmeny metodiky či odchodom voľnej pracovnej sily do zahraničia. Práve naopak, krajina sa v posledných rokoch stáva cieľovou pre pracovných imigrantov prichádzajúcich na jednej strane z krajín EÚ/EHP a na druhej strane z tretích krajín, pričom tempo rastu práve v druhej skupine raste značne rýchlejšie. Pracovným imigrantom prichádzajúcim na Slovensko za prácou je spravidla stredoškolsky vzdelaný človek v rozpätí 20 – 35 rokov. Zamestnanie nachádzajú na nízko kvalifikovaných pracovných pozíciách, príp. pracovných miestach vyžadujúcich stredoškolské vzdelanie s maturitou. Monochromatická výroba ale aj rutinne sa opakujúce procesy v administratíve v súkromnej sfére alebo vo verejnej správe, sa vplyvom priemyslu 4.0 stávajú predmetom automatizácie. Nízko kvalifikované pracovné miesta a miesta vyžadujúce si strednú kvalifikovanosť budú zanikať, čím dôjde k uvoľneniu väčšieho množstva pracovnej sily. Naopak pod vplyvom týchto procesov budú vznikať nové pracovné pozície spojené s obsluhou a údržbou výrobných automatov či robotov. Uvedené si bude vyžadovať zmenu v kompetenčných modeloch absolventov škôl. Ďalej sa výrazne zvýši dopyt po vzdelanej pracovnej sile disponujúcej kreativitou, ktorá bude schopná vytvárať inovácie. Tá bude zaujímavá nielen pre zamestnávateľov, ale bude dôležitým pull faktorom pre smerovanie zahraničných investícií do krajiny. Krajina, ktorá nemá dostatok ľudských zdrojov je pre zahraničných investorov nezaujímavá, čo môžeme vidieť v oslabovaní priamych zahraničných investícií na Slovensku, ale aj vo faktoroch inovačného indexu. Chýbajúce ľudské zdroje je možné získať migráciou zo zahraničia. Krajina sa jednoznačne musí zamerať na vytváranie podmienok, ktoré prilákajú kvalitný ľudský kapitál zo zahraničia na ťažko obsaditeľné pracovné miesta odborníkov. Nízko kvalifikovaní a stredne kvalifikovaní pracovní imigranti sú len dočasným riešením nesúladu na trhu práce na Slovensku a automatizáciou výroby sú najviac ohrozené.

## 5. ZÁVER

Charakteristiky priemyslu 4.0 ako novej prichádzajúcej revolúcie sa začínajú prejavovať v hospodárstve krajín. Rozsah dôsledkov je viditeľný na jednotlivých krajinách podľa stupňa rozvoja. V Slovenskej republike je nástup novej fázy veľmi pozvoľný, čo vyplýva z historického kontextu posledných 30 rokov. Priemyselné zameranie ekonomiky predstavuje do budúcnosti ohrozenie značného počtu pracovných miest zvyšovaním automatizácie výroby. Táto zmena nebude jednorazová, preto dáva krajine príležitosť pripraviť sa. Je dôležité systematicky začať pracovať na štrukturálnej prestavbe procesov a podpory inovácií v podnikateľom prostredí ale aj v oblasti verejnej správy. Napriek priemyselnej orientácii krajiny predovšetkým v oblasti automobilového priemyslu je potrebné sústrediť pozornosť tvorcov verejných politík, odbornú aj laickú verejnosť na vytváranie podmienok k tvorbe inovácií a podpore inovačnej výkonnosti krajiny, čo je možné docieliť len prostredníctvom ľudských zdrojov disponujúcich kvalitným ľudským kapitálom. Takýmito ľuďmi však krajina musí disponovať, čo predpokladá reformnú zmenu vzdelávacieho systému, vytvorenie

príťažlivých podmienok pre ľudské zdroje v krajine pôvodu a doplnenie nedostatku prilákaním tejto kategórie pracovnej sily zo zahraničia.

***Dodatok***

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# PRACOVNÁ IMIGRÁCIA V KRAJINACH V4 V KONTEXTE ROZVOJA INDUSTRY 4.0

## WORKING IMIGRATION IN THE V4 COUNTRIES IN INDUSTRY 4.0 DEVELOPMENT CONTEXT

***Sergej VOJTOVIČ*** [139]
***Magdaléna TUPÁ*** [140]
***Rolf KARBACH*** [141]

**Abstrakt:** *Štúdia pojednáva o zmenách na národných trhoch práce v krajinách V4 pod vplyvom štvrtej priemyselnej revolúcie v kontexte pracovnej imigrácie. V krajinách V4 sa stále priemyselná výroba podstatnou časťou podieľa na vytváranom HDP. Značnú časť voľných pracovných miest jednotlivých trhov práce predstavujú pracovné miesta s nízkou a strednou kvalifikáciou vyžadujúcou predovšetkým stredoškolské vzdelanie. Keďže dopyt nie je možné uspokojiť z domácich zdrojov, riešením je zamestnávanie pracovníkov zo zahraničia. Zmeny na trhu práce podliehajú zvyšujúcej sa automatizácii a robotizácii priemyselných podnikov, ktoré pracovnú silu nahrádzajú strojmi. Štúdia hľadá odpoveď na otázku, či sa predmetné zmeny prejavujú v dopyte po pracovnej sile prichádzajúcej zo zahraničia z hľadiska jej základných charakteristík. Použitím teoretických všeobecných metód vedeckého poznania vytvára základ k skúmaniu závislostí imigrovanej pracovnej sily s vybranými charakteristikami a makroekonomických ukazovateľov odrážajúcich vplyv priemyselnej revolúcie v krajinách V4.*

**Kľúčové slová:** *trh práce, pracovná imigrácia, Priemysel 4.0, krajiny V4, pracovná sila*

**Abstract:** *The study deals with changes in national labour markets in the V4 countries under the influence of the Fourth Industrial Revolution in the context of labour immigration. In the V4 countries, industrial production still accounts for a substantial part of GDP. A significant part of job vacancies in individual labour markets is low and medium-skilled jobs requiring primarily secondary education. As demand cannot be met from domestic sources, the solution is to employ foreign workers. Changes in the labour market are subject to the increasing automation and robotization of industrial enterprises, replacing the workforce with machines. The study seeks to answer the question of whether the changes in question are reflected in the demand for labour coming from abroad in terms of its basic characteristics. Using theoretical general methods of scientific knowledge, it forms the basis for examining the dependencies of an immigrant workforce with selected characteristics and macroeconomic indicators reflecting the impact of the industrial revolution in the V4 countries.*

**Keywords:** *the labor market, labour immigration, Industry 4.0, countries of V4 , workforce*

**JEL Classification*:*** *F22, J21, J23*

## 1. ÚVOD

Novým faktorom objavujúcim sa v kontexte priemyselnej revolúcie 4.0 je dynamický rozvoj disruptívnych technológií, ktoré veľmi rýchlo a zásadným spôsobom prekonávajú doteraz využívané technológie. (Christensenom, 2006) Nejde o pozvoľnú zmenu, ale o veľmi

[139]doc., DrSc., Trenčianska univerzita A. Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, 911 50 Trenčín, Slovenská republika, e-mail: sergej.vojtovič@tnuni.sk
[140] Ing., PhD.,Trenčianska univerzita A. Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, 911 50 Trenčín, Slovenská republika, e-mail: magdalena.tupa@tnuni.sk
[141] prof. Ing. Dr., PhD., Trenčianska univerzita A. Dubčeka v Trenčíne, Fakulta sociálno-ekonomických vzťahov, Študentská 3, 911 50 Trenčín, Slovenská republika, e-mail: rolf.karbach@fh-zwickau.de

radikálny krok. Podľa Toma Davenporta (1992) ide z hľadiska procesov o revolučnú zmenu, ktorej predchádzala evolučná fáza charakterizovaná postupným priebežným zdokonaľovaním. Tento technologický pokrok je príliš rýchly a spoločnosť nie je na takúto zmenu pripravená. Štvrtá priemyselná revolúcia nie je spätá len s technologickými zmenami v priemyselnej výrobe, ale aj s radikálnymi zmenami v službách, vo verejnej správe, v súkromnom živote a postupne jej dopady možno pozorovať aj v spoločnosti ako celku.

Prvotne a s významným vplyvom ju budeme pozorovať na trhu práce. Pokles nezamestnanosti vo vyspelých krajinách so znižujúcou sa dynamikou rastu nominálnych miezd a zároveň znižujúcim sa podielom miezd na HDP, predstavuje kľúčovú makroekonomickú veličinu, ktorá hovorí o oslabujúcej sa pozícii faktoru práce voči kapitálu a silnejúcej rente. (Kordoš, Vojtovič, 2016). Medzinárodná organizácia práce hľadá faktory, ktoré za vývojom stoja – technologický pokrok, globalizácia obchodu, rozvoj financializácie a pokles sily odborov. Za najdôležitejší však považuje faktor financializácie, teda rozšíreniu vplyvu finančného sektora v ekonomike. (ILO, 2012). Naopak OECD deklaruje, že za uvedeným stojí technologická zmena a kapitálová akumulácia. (OECD, 2012; OECD 2018)

Disruptívne technológie v chápaní disruptívnych inovácií, pretože nie samotná technológia je prevratná, ale až implementácia v organizáciách (výrobných podnikoch, ale i podporných procesoch života v spoločnosti) predstavuje revolučné zmeny v procesoch označované ako priemysel 4.0 (UNCTAD). Tu sa dostávame k problému ohrozenia trhu práce s obrovskými dôsledkami, na ktorých sa jednotliví autori v skúmanej oblasti zhodujú, pričom v pohľade na príčiny, dôsledky a riešenia sa diametrálne rozchádzajú. Svetové ekonomické fórum predpokladá zánik 7 mil. pracovných miest do roku 2020 (Winick, 2018). Medzinárodná federácia robotiky svoju pozornosť sústredí na vznikajúce pracovné miesta ako odozvu na prebiehajúce procesy a odhaduje, že do roku 2021 vznikne 3,5 mil. nových pracovných miest. McKinsey uvádza, že do roku 2030 zanikne 400 až 800 mil. pracovných miest. (Švihlíková, 2014). PwC odhaduje, že len v USA do roku 2030 zanikne 60 mil. (PWC, 2016) a Oxfordská univerzita pracuje s časovým obmedzením do roku 2033, kde uvádza mínus 68 mil. pracovných miest v USA (Oxford Martin School, 2016). OECD hodnotí svoj geografický priestor, v ktorom podľa štúdie zanikne 9% pracovných miest. (OECD, 2018)

Keďže stojíme na začiatku tejto razantnej zmeny nevieme s presnosťou predpokladať dôsledky revolučných procesov a scenáre predikcií, ktoré vedú od najoptimistickejších po katastrofické. V spomínaných prognózach sa málo pozornosti venuje napríklad demografickej štruktúre obyvateľstva a jej vývoju na pozadí revolúcie či rôznorodý stupeň rozvoja v krajinách až po sociálne a kultúrne pozadie života obyvateľov v tej ktorej konkrétnej krajine. (Krajňáková, Vojtovič, 2017). V predkladanej štúdii svoju pozornosť venujeme zmenám na trhoch práce v krajinách V4 na pozadí štvrtej priemyselnej revolúcie v kontexte pracovnej imigrácie.

## 2. CIEĽ A METODOLÓGIA

Predkladaná štúdia hľadá odpoveď na otázku, ako sa mení trh práce práce pod vplyvom tých zmien, ktoré zahrnuté v koncepte Industry 4.0 a zároveň pod vplyvom migračných tokov pracovnej sily v ktrajinách V4. Súčasné zmeny v hospodárskom a spoločenskom rozvoji, o ktorých sa pojednáva v koncepte Priemyslu 4.0, ovplyvňujú zmeny v hospodárskej výrobe, v charaktere a náročnosti práce, v štruktúre pracovných miest a celkové aj zmeny na trhu práce. Je známe, že súčasťou týchto zmien na trhu práce aj faktorom, ktorý ich ovplyvňuje, je pracovná migrácia. V tejto súvislosti naskytuje otázka, či tie procesy, o ktorých sa pojednáva v koncepte Priemyslu 4.0, a v migračných tokoch pracovnej sily budú mať vplyv na trh práce v krajinách V4. Vychádzajúc z toho predkladaná štúdia sa zaoberá zistením zmien na trhu práce krajín V4 pod vplyvom imigračných tokov pracovnej sily v podmienkach rozvoja

Industry 4.0. Použitím teoretických všeobecných metód vedeckého poznania sa vytvára základ k skúmaniu závislostí medzi makroekonomickými ukazovateľmi a ukazovateľmi Industry 4.0 a intenzitou a rozsahom pracovnej migrácie v krajinách V4.

V štúdie sa zaoberá vybranými ukazovateľmi trhu práce: zamestnanosť, nezamestnanosť, voľné pracovné miesta. Pozitívny vývoj zamestnanosti v krajine a pokles nezamestnanosti v posledných rokoch spôsobuje, že dopyt po práci nedokáže pokryť ponuku práce a tak zostáva dlhodobo stále vyšší počet pracovných miest neobsadených. Domáce obyvateľstvo, ktoré nepracuje, nie je ochotné pracovať na ponúkaných miestach za ponúkanú mzdu, čo spôsobilo zmenu postoja tvorcov verejných politík k pracovnej imigrácií, ktorá je jedným z najrýchlejších a najdostupnejších zdrojov zmiernenia tlaku na domácom trhu práce. Preto sme do nášho skúmania zaradili ďalší z ukazovateľov – počet imigrantov v krajine. Výška mzdy je výsledkom ponuky práce a dopytu po práci. Do analýzy zahŕňame aj výšku príjmov, teda mzdu a ďalšie príjmy domácností. V štúdii skúmame závislosť týchto faktorov s vybranými ukazovateľmi priemyslu 4.0 – s inovačným indexom, s faktormi (ľudské zdroje, atraktívne výskumné systémy, prostredie priaznivé pre inovácie, financovanie a podpora, podnikové investície, novátori, prepojenia, duševné aktíva, vplyv na zamestnanosť, vplyv na predaj). Pre naše skúmanie vyberáme len ukazovateľ inovačný index a dielčí faktor ľudské zdroje. Získané štatistické údaje sa spracovávajú korelačnou analýzou. (Cohen, 1988)

## 3. VÝSLEDKY A DISKUSIA

Inovačný index Slovenskej republiky dosiahol v roku 2018 najvyššiu hodnotu v sledovanom období 69,10 percentuálneho bodu. Medziročný prepad nastal v roku 2014 a v roku 2016. Ak rok 2011 zoberieme ako východiskový, potom najvýraznejší pokles predstavoval faktor ľudské zdroje a novátori, menší vplyv na zamestnanosť a podnikové investície. Tieto faktory navzájom súvisia. Ak krajina nedisponuje ľudskými zdrojmi, ktoré disponujú ľudským kapitálom a svojou prácou vytvárajú inovácie, potom chýbajú inovátori rozbiehajúci svoje vlastné start-up-y stojace za novými pracovnými miestami, či zamestnanosťou. Rovnako ako investície do výskumu a vývoja inovácií majú význam len vtedy, ak máme k dispozícií kvalitné ľudské zdroje. Podnikové investície vytvárajú nové pracovné miesta a teda majú vplyv na zamestnanosť.

**Tabuľka 1: Ukazovateľ inovačný index Slovenskej republiky v rokoch 2011 až 2018**

| Indicator | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **0. Summary Innovation Index** | 63,28 | 67,13 | 68,92 | 65,26 | 67,04 | 69,3 | 66,51 | 69,10 |
| **1.1 Human resources** | 101,04 | 68,46 | 77,99 | 77,76 | 84,54 | 83,37 | 83,65 | 86,10 |
| **1.2 Attractive research systems** | 28,71 | 31,91 | 30,62 | 37,91 | 39,94 | 41,51 | 44,31 | 46,74 |
| **1.3 Innovation-friendly environment** | 63,39 | 63,39 | 61,28 | 64,70 | 73,17 | 68,67 | 84,72 | 90,91 |
| **2.1 Finance and support** | 21,39 | 28,33 | 32,72 | 29,19 | 42,29 | 73,87 | 27,16 | 26,07 |
| **2.2 Firm investments** | 84,92 | 81,74 | 84,00 | 74,34 | 76,91 | 72,48 | 68,07 | 79,74 |
| **3.1 Innovators** | 44,07 | 60,70 | 60,70 | 40,04 | 40,04 | 32,95 | 32,95 | 37,85 |
| **3.2 Linkages** | 51,06 | 62,31 | 65,39 | 64,35 | 52,10 | 72,58 | 70,63 | 60,12 |
| **3.3 Intellectual assets** | 28,23 | 31,46 | 32,47 | 35,10 | 35,32 | 31,62 | 36,00 | 38,69 |
| **4.1 Employment impacts** | 117,74 | 117,74 | 116,12 | 113,43 | 115,05 | 108,82 | 115,29 | 113,33 |
| **4.2 Sales impacts** | 92,18 | 108,44 | 110,30 | 108,09 | 109,70 | 108,72 | 107,69 | 114,50 |

Zdroj: European Commission (2019).

Inovačný index Českej republiky v sledovanom období bol v každom roku najvyšší z krajín V4. Pokles voči východiskovému roku zaznamenala len vo faktore financie a podpora, inovátori a vplyv na predaj. Krajina dosahuje rast v oblasti ľudských zdrojov, atraktivite výskumných systémov a vytváraní prostredia priaznivého pre inovácie, čo pozitívne vplýva na zamestnanosť.

**Tabuľka 2: Ukazovateľ inovačný index Českej republiky v rokoch 2011 až 2018**

| Indicator | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **0. Summary Innovation Index** | 85,86 | 81,36 | 82,71 | 83,14 | 84,53 | 82,72 | 86,07 | 89,40 |
| **1.1 Human resources** | 73,37 | 78,38 | 83,39 | 80,78 | 84,38 | 85,21 | 88,88 | 91,69 |
| **1.2 Attractive research systems** | 48,79 | 53,39 | 53,55 | 59,08 | 64,44 | 68,01 | 71,06 | 73,60 |
| **1.3 Innovation-friendly environment** | 84,30 | 84,30 | 90,41 | 96,14 | 91,64 | 100,64 | 114,15 | 118,65 |
| **2.1 Finance and support** | 84,57 | 66,50 | 68,98 | 75,49 | 74,68 | 74,06 | 49,97 | 51,12 |
| **2.2 Firm investments** | 104,59 | 94,25 | 97,08 | 102,92 | 102,77 | 109,23 | 112,93 | 112,58 |
| **3.1 Innovators** | 105,40 | 91,21 | 91,21 | 79,29 | 79,29 | 75,18 | 75,18 | 88,02 |
| **3.2 Linkages** | 71,45 | 69,67 | 67,01 | 76,73 | 79,04 | 75,96 | 81,11 | 87,35 |
| **3.3 Intellectual assets** | 50,69 | 58,40 | 59,21 | 54,07 | 55,22 | 52,18 | 62,41 | 62,08 |
| **4.1 Employment impacts** | 114,60 | 114,60 | 116,75 | 118,36 | 124,47 | 91,57 | 114,49 | 123,65 |
| **4.2 Sales impacts** | 105,39 | 96,06 | 96,58 | 93,83 | 94,00 | 97,91 | 99,72 | 95,79 |

Zdroj: European Commission (2019).

Inovačný index Poľska bol v pozorovanom období v každom roku najnižší v krajín V4, no jeho rast je najrýchlejší. V roku 2018 dosiahol úroveň 61,10%, v porovnaní s rokom 2011 vzrástol o takmer 8 percentuálnych bodov. V krajine sa stabilne zvyšujú takmer všetky faktory inovačného indexu okrem financovania a podpory, inovátorov a väzieb. O viac ako 150 bodov sa zvýšil faktor priateľské prostredie k inováciám, ktoré sa krajina snaží vytvárať pre podporu tvorby inovácií ľudskými zdrojmi (faktor so stabilným rastom) a podporou atraktivity výskumných systémov v krajine.

**Tabuľka 3: Ukazovateľ inovačný index Poľskej republiky v rokoch 2011 až 2018**

| Indicator | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **0. Summary Innovation Index** | 53,27 | 50,25 | 52,22 | 50,24 | 51,38 | 54,01 | 56,62 | 61,10 |
| **1.1 Human resources** | 67,86 | 67,86 | 70,37 | 70,45 | 69,76 | 70,78 | 71,84 | 70,37 |
| **1.2 Attractive research systems** | 17,24 | 17,82 | 19,88 | 22,17 | 24,63 | 28,34 | 31,53 | 34,62 |
| **1.3 Innovation-friendly environment** | 42,12 | 42,12 | 42,00 | 49,24 | 58,51 | 83,49 | 137,53 | 197,85 |
| **2.1 Finance and support** | 50,88 | 51,97 | 56,25 | 45,35 | 46,52 | 48,82 | 30,00 | 39,09 |
| **2.2 Firm investments** | 71,56 | 65,20 | 68,30 | 68,04 | 73,99 | 81,26 | 87,90 | 87,31 |
| **3.1 Innovators** | 29,39 | 20,77 | 20,77 | 13,36 | 13,36 | 7,71 | 7,71 | 14,95 |
| **3.2 Linkages** | 46,67 | 41,11 | 43,26 | 36,96 | 36,90 | 36,22 | 37,38 | 32,39 |
| **3.3 Intellectual assets** | 51,64 | 54,77 | 58,21 | 66,99 | 73,30 | 74,60 | 73,28 | 67,41 |
| **4.1 Employment impacts** | 91,06 | 92,14 | 94,83 | 94,29 | 81,90 | 86,57 | 90,28 | 96,52 |
| **4.2 Sales impacts** | 66,94 | 59,10 | 59,55 | 54,17 | 55,15 | 56,46 | 56,28 | 56,10 |

Zdroj: European Commission (2019).

Maďarsko len tesne zaostáva za Slovenskou republikou v pozorovanom inovačnom indexe. Len mierne, ale klesal v porovnaní s východiskovým rokom 2011 klesol faktor ľudské zdroje,

väzby a dopad na zamestnanosť. Naopak výrazne stúpol faktor budovania priateľského prostredia pre tvorbu inovácií či atraktívnosť výskumných zložiek, čo sa prejavilo aj na stúpaní podnikových investícií a raste inovačných centier. Vhodne nastavený proces rastu faktorov tvoriacich inovačný index predstavuje pozitívny predpoklad pre rozvoj krajiny.

**Tabuľka 4: Ukazovateľ inovačný index Maďarskej republiky v rokoch 2011 až 2018**

| Indicator | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **0. Summary Innovation Index** | 66,23 | 63,13 | 62,80 | 63,92 | 65,14 | 66,44 | 68,11 | 69,03 |
| **1.1 Human resources** | 56,98 | 56,98 | 59,48 | 57,11 | 59,38 | 56,49 | 54,58 | 53,66 |
| **1.2 Attractive research systems** | 37,06 | 41,52 | 40,91 | 46,72 | 42,68 | 42,97 | 51,82 | 55,93 |
| **1.3 Innovation-friendly environment** | 68,75 | 68,75 | 61,38 | 62,82 | 81,18 | 99,81 | 127,03 | 144,69 |
| **2.1 Finance and support** | 36,48 | 38,99 | 40,76 | 45,79 | 48,53 | 50,66 | 42,92 | 46,15 |
| **2.2 Firm investments** | 74,31 | 60,31 | 62,85 | 84,80 | 85,09 | 87,83 | 88,98 | 98,00 |
| **3.1 Innovators** | 28,87 | 25,79 | 25,79 | 26,36 | 26,36 | 19,41 | 19,41 | 30,88 |
| **3.2 Linkages** | 81,60 | 79,15 | 74,31 | 66,50 | 65,11 | 63,51 | 62,77 | 57,06 |
| **3.3 Intellectual assets** | 36,58 | 34,17 | 36,98 | 38,04 | 38,13 | 39,02 | 40,58 | 40,12 |
| **4.1 Employment impacts** | 127,05 | 128,67 | 125,98 | 128,13 | 127,95 | 124,8 | 127,41 | 124,19 |
| **4.2 Sales impacts** | 111,14 | 100,97 | 100,46 | 89,38 | 91,51 | 100,61 | 99,18 | 84,08 |

Zdroj: European Commission (2019).

K zisťovaniu závislosti inovačného indexu krajiny odrážajúceho stupeň vývoja priemyslu 4.0 sme si vybrali HDP ako hlavný makroekonomický ukazovateľ, hovoriaci o množstve vyrobených tovarov a služieb na území krajiny za rok. Vývoj tohto ukazovateľa v časovom rade vypovedá o kondícii hospodárstva krajiny. Na hodnotenie stavu trhu práce využívame zamestnanosť, nezamestnanosť a voľné pracovné miesta. Podľa ekonomických teórií práve nezamestnanosť a nedostatok pracovných miest v krajine pôvodu sú významnými pull faktormi v procese rozhodovania potenciálneho migranta (ŠÚ SR, ÚPSVaR). Ponuka práce a dopyt po práci na trhu práce určujú výšku miezd. Z empirických výskumov vyplýva, že najvýznamnejším motívom jednotlivca migrovať za prácou do zahraničia je práve mzdová úroveň (Vojtovič a kol., 2016). Uvedené makroekonomické ukazovatele sme podrobili korelačnej analýze.

**Tabuľka 5: Korelačná matica imigrácie a vybraných ukazovateľov v SR***

| | Imigranti | HDP | Zamest-nanosť | Nezamest-nanosť | Príjmy | Voľné PM | Inovačný Index | Ľudské zdroje |
|---|---|---|---|---|---|---|---|---|
| **Imigranti** | x | | | | | | | |
| **HDP** | 0,96499 | x | | | | | | |
| **Zamestnanosť** | 0,81772 | 0,86009 | x | | | | | |
| **Nezamestnanosť** | -0,76371 | -0,87062 | -0,95128 | x | | | | |
| **Príjmy** | 0,97679 | 0,98753 | -0,77367 | -0,77367 | x | | | |
| **Voľné PM** | 0,44165 | 0,61879 | 0,84226 | -0,91323 | 0,34746 | x | | |
| **Inovačný index** | 0,33551 | 0,52427 | 0,47817 | -0,43608 | 0,38672 | 0,29301 | x | |
| **Ľudské zdroje** | 0,02049 | 0,07737 | 0,12702 | -0,18004 | -0,07647 | 0,12346 | -0,46021 | x |

Zdroj: Dáta: Eurostat, výpočet autorov.
* hladina významnosti $\alpha = 0,05$

Korelačná matica závislostí vybraných ukazovateľov a imigrácie v skúmaných rokoch pre Slovenskú republiku (tabuľka 5) odhaľuje veľmi silnú pozitívnu závislosť so zamestnanosťou aj voľnými

pracovnými miestami a takmer dokonalú negatívnu závislosť s nezamestnanosťou. Závislosť imigrantov a inovačného indexu dosahuje hodnotu 0,336 čo je stredná závislosť. V porovnaní s ľudským kapitálom je to takmer nulová závislosť. Uvedené sa zhoduje so stavom posledných rokov, kedy sa zvyšuje prílev imigrantov z tretích krajín a najviac imigrantov má dosiahnuté len stredoškolské vzdelanie (v znaku bez maturity a následne s maturitou). Priame zahraničné investície v krajine klesajú a pozvoľna klesá aj podiel imigrantov z krajín EÚ/EHP s dosiahnutým vysokoškolským vzdelaním. V zhoršujúcich sa podmienkach vedy a výskumu na Slovensku či podpore tvorby inovácií je výsledok korelácie vysvetliteľný.

**Tabuľka 6 Korelačná matica imigrácie a vybraných ukazovateľov v Českej republike***

| | Imigranti | HDP | Zamestna-nosť | Nezamest-nanosť | Príjmy | Voľné PM | Inovačný index | Ľudské zdroje |
|---|---|---|---|---|---|---|---|---|
| **Imigranti** | x | | | | | | | |
| **HDP** | 0,93177 | x | | | | | | |
| **Zamestnanosť** | 0,65245 | 0,81177 | x | | | | | |
| **Nezamestnanosť** | -0,68336 | -0,86484 | -0,90351 | x | | | | |
| **Príjmy** | 0,90281 | 0,97238 | 0,83941 | -0,80166 | x | | | |
| **Voľné PM** | 0,89597 | 0,94814 | 0,87967 | -0,94858 | 0,73607 | x | | |
| **Inovačný index** | -0,01597 | 0,73331 | 0,58039 | -0,69173 | 0,32419 | 0,78604 | x | |
| **Ľudské zdroje** | 0,61557 | 0,86128 | 0,93813 | -0,85494 | 0,87890 | 0,86977 | 0,49463 | x |

Zdroj: Dáta: Eurostat, výpočet autorov.
*hladina významnosti α = 0,05

V Českej republike je vývoj korelácií úplne odlišný (tabuľka 6) a ukazovatele trhu práce vykazujú stredne silnú korelačnú závislosť na imigrantoch, ktorí do krajiny prichádzajú. Takmer dokonalá korelačná závislosť imigrantov je s ukazovateľmi HDP, príjmami v krajine a voľnými pracovnými miestami. Vyplýva to z hospodárskej kondície krajiny, rast HDP spôsobuje tvorbu nových pracovných miest a zvyšovanie mzdovej hladiny v krajine. Tento vývoj vplýva ako pull faktory na pracovnú imigráciu do krajiny. Inovačný index však nevykazuje takmer žiadnu závislosť, avšak vo faktore ľudské zdroje sa prejavil príchod vysokokvalifikovanej pracovnej sily a ľudských zdrojov do krajiny za lepšími podmienkami hlavne zo Slovenskej republiky či krajín V4. Česká republika sa stala cieľovou destináciou aj skupiny vedcov a výskumných pracovníkov pracujúcich na medzinárodných projektoch.

**Tabuľka 7 Korelačná matica imigrácie a vybraných ukazovateľov v Maďarskej republike***

| | Imigranti | HDP | Zamestna-nosť | Nezamest-nanosť | Príjmy | Voľné PM | Inovačný index | Ľudské zdroje |
|---|---|---|---|---|---|---|---|---|
| **Imigranti** | x | | | | | | | |
| **HDP** | 0,79745 | x | | | | | | |
| **Zamestnanosť** | 0,91644 | 0,91644 | x | | | | | |
| **Nezamestnanosť** | -0,33223 | -0,33223 | -0,33223 | x | | | | |
| **Príjmy** | 0,83595 | 0,83595 | 0,83595 | 0,83595 | x | | | |
| **Voľné PM** | 0,83954 | 0,85300 | 0,83954 | 0,83954 | 0,83954 | x | | |
| **Inovačný index** | 0,51219 | 0,86537 | 0,71934 | -0,73412 | 0,62470 | 0,85296 | x | |
| **Ľudské zdroje** | -0,32051 | -0,71238 | -0,56545 | 0,56384 | -0,37802 | -0,74756 | -0,80933 | x |

Zdroj: Dáta: Eurostat, výpočet autorov.
*hladina významnosti α = 0,05

V Maďarskej republike vidieť takmer dokonalú závislosť medzi imigrantmi a zamestnanosťou a len stredne silnú negatívnu závislosť s nezamestnanosťou. Výška príjmov

a počet voľných pracovných miest sú faktory, ktoré vplývajú na príchod imigrantov do krajiny. Inovačný index je tiež v intervale strednej závislosti, pričom súvislosť s ľudskými zdrojmi je mierne negatívna, to znamená, že čím viac imigrantov do krajiny prichádza tým menej ľudských zdrojov má krajina k dispozícii.

**Tabuľka 8. Korelačná matica imigrácie a vybraných ukazovateľov v Poľskej republike***

| | **Imigranti** | **HDP** | **Zamestna-nosť** | **Nezamest-nanosť** | **Príjmy** | **Voľné PM** | **Inovačný index** | **Ľudské zdroje** |
|---|---|---|---|---|---|---|---|---|
| **Imigranti** | x | | | | | | | |
| **HDP** | 0,90138 | x | | | | | | |
| **Zamestnanosť** | 0,84261 | 0,96639 | x | | | | | |
| **Nezamestnanosť** | -0,72970 | -0,90217 | -0,95857 | x | | | | |
| **Príjmy** | 0,92627 | 0,99077 | 0,94818 | -0,85815 | x | | | |
| **Voľné PM** | -0,02599 | 0,82605 | 0,85707 | -0,81040 | 0,55317 | x | | |
| **Inovačný index** | 0,32354 | 0,84796 | 0,75384 | -0,78281 | 0,48953 | 0,90494 | x | |
| **Ľudské zdroje** | 0,48444 | 0,68940 | 0,77582 | -0,72648 | 0,81602 | 0,59965 | 0,41873 | x |

Zdroj: Dáta: Eurostat. Výpočet autorov.
* hladina významnosti $\alpha = 0,05$

Ako vyplýva s tabuľky 8 v Poľsku existuje takmer dokonalá závislosť medzi počtom imigrantov a HDP, ktorý je v krajine vytvorený, daný stav odráža skutočnosť, že do krajiny prúdi veľké množstvo imigrantov z tretích krajín. Výrazne sa podieľajú aj na zamestnanosti v krajine, čo je spôsobené aj rastúcim emigračným trendom Poliakov za prácou do zahraničia, čím sa v krajine vytvára ešte väčší nesúlad na trhu práce. Vo vzťahu s inovačným indexom je závislosť stredne negatívna, no pri faktore ľudské zdroje stredne pozitívna. Čo znamená, že s prichádzajúcimi imigrantmi do krajiny prichádzajú aj ľudské zdroje, predovšetkým z tretích krajín, ktoré sú motivované príjmami.

## 4. ZÁVER

Krajiny V4 sa svojou migračnou politikou orientovali antiimigračne, čo vychádzalo z historických, kultúrnych a politických súvislostí. Napriek integračným procesom, ktorým skúmané krajiny prešli počas posledných troch desaťročí, sa postoj k imigrantom nezmenil. Uvoľnenie migračnej politiky spôsobil až hospodársky rast posledných rokov, ktorý sa prejavil zvyšovaním HDP, zamestnanosti, znižovanie nezamestnanosti nebolo dosiahnuté už len zmenou metodiky či prístupu k nezamestnaným alebo emigráciou pracovnej sily z krajiny. V hospodárstve krajín V4 začalo vznikať väčšie množstvo pracovných miest, ktoré nebolo možné obsadiť pracovnou silou z domácich zdrojov. Tento nesúlad na trhoch práce krajín V4 podnietil zvyšovanie tlaku na tvorcov verejných politík k čiastočnému uvoľneniu a liberalizácii pracovných trhov vo vzťahu k pracovným migrantom, predovšetkým na pracovné miesta, ktoré boli dlhodobo neobsadené domácou pracovnou silou. Tlak na zvyšovanie hladiny miezd v krajinách sa stal účinným pull faktorom pre potenciálnych pracovných migrantov z krajín južnej Európy, ktorých prístup na trhy práce v krajinách V4 bol zjednodušený z dôvodu členstva v Európskej únii ale aj pre pracovných migrantov z tretích krajín, predovšetkým z východnej Európy, napriek mnohým administratívnym prekážkam, ktoré predražili získavanie pracovnej sily z týchto zdrojov.

Dôležité sa javí skúmať nastolený trend vo vzťahu k disruptívnym inováciám (ako ukazovateľu hovoriaceho o úrovni štvrtej priemyselnej revolúcie). V našej štúdii sú prezentované na úrovni inovačného indexu krajín V4 sýtených jednotlivými faktormi.

Z výsledkov vidíme, že krajina s najvyšším inovačným indexom – Česká republika vykazuje v sledovaní závislosti daného ukazovateľa s počtom imigrantov v krajine triviálnu korelačnú závislosť. V Maďarsku bola korelačná závislosť uvedených ukazovateľov medzi krajinami V4 je najvyššia - 0,51219, čo predstavuje stredný korelačný vzťah. Stredná korelačná závislosť medzi ukazovateľmi existuje v Poľsku a na Slovensku. Zaujímavým výsledkom je, že v Českej republike vykazuje vysokú závislosť faktor ľudské zdroje (sýtiaci ukazovateľ inovačného indexu) a imigrantov, v Poľsku je to stredná hodnota korelácie. Výsledky sú v súlade s nastavením hospodárstva v jednotlivých krajinách V4. Česká republika je krajinou s najstabilnejším hospodárskym rastom, najvyšším podielom finančných prostriedkov z HDP investovaných do vedy a výskumu, vysokým podielom vysokoškolsky vzdelaného obyvateľstva a podporou vysokých škôl vo vzdelávaní cudzincov, pričom krajina vytvára vhodné podmienky na ďalšie pracovné uplatnenie zahraničných absolventov.

Situácia Slovenskej republiky je diametrálne odlišná. Hospodársky rast síce krajina dosahuje, ale je založený predovšetkým na priemyselnej výrobe s nízkou pridanou hodnotou. Krajina dlhodobo bojovala s vysokou nezamestnanosťou. Dnes je v hospodárstve vysoký počet neobsadených pracovných miest, ktoré nie je možné uspokojiť z domácich zdrojov. Krajina zmiernila administratívne prekážky zamestnávania pracovníkov zo zahraničia. Ide však predovšetkým o nízko kvalifikovanú a kvalifikovanú pracovnú silu. Dopyt po vysokokvalifikovaných pracovníkoch a ľudských zdrojoch je relatívne stabilný. Pre krajinu je potrebná podpora pri vytváraní vysokokvalifikovaných pracovných miest a pracovných miest pre ľudské zdroje vytvárajúce inovácie. Inovácie predstavujú východisko pre udržanie hospodárskeho rastu v krajine v podmienkach priemyslu 4.0, ktorý vytláča z procesu priemyselnej výroby ale aj z rutinných prác administratívy nízko kvalifikovanú a kvalifikovanú pracovnú silu.

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# THE INFLUENCE OF THE OFFICE WELLBEING ON USERS`AGILITY IN PROPERTY DEVELOPMENT AS A PART OF INTERNAL MARKETING APPROACH

***Linda VAŠKOVÁ***[142]

**Abstract:** *Digitalization is playing an important role in daily activities in many industries including property development. Traditional office is being transformed and quality of workplace is becoming an important issue in terms of productivity. The demand on the market is for high quality premises as well as technologies in the background with smart systems that strengthen the value for users. The aim of the paper is to identify the impact and importance of the office wellbeing on users' agility in property development industry, as an important component of internal marketing. In the first part we deal with theoretical background and explanation of terminology focused on smart systems. In the next part we describe methodology and data which are being used to analyze the stage of the impact of the office wellbeing on productivity and motivation of employee's base on the case study. The key indicators behind the development of high-quality office spaces which impact productivity of users have been identified: lighting, temperature, air quality, security, rest rooms. The last part of the paper focuses on the case presentation and identification of the impact stage.*

**Key words:** *Indoor Environmental Quality, Internal Marketing, Occupant Experience, Property Development Industry, Smart Buildings, Working Environment*

**JEL Classification:** *M 31, M 54, O 33, J 81*

## 1. INTRODUCTION

Ensuring employees have adequate working space and conditions is of paramount of modern internal marketing. As part of an internal marketing strategy, employees are treated as internal customers who must be provided with optimal conditions, resources, motivation and convinced of a company's vision and worth. The goal of internal marketing is to align every aspect of a company's internal operations to ensure they are as capable as possible of providing value to customers. Nowadays there is a trend in property development industry to make smart offices - healthy offices. Research done by CBRE (2019a) is pointing out that a right combination of technology and healthy working environment leads to improvements in terms of motivation and effectivity of office users. As part of Wellness Together, a research project carried out by Sapio Research (2017), the survey provides evidence of a strong correlation between productivity, creativity and profitability on one side and employee working conditions including light, air, noise, health, culture, design, movement and the quality of furniture on the other. The survey provides strong correlations between people feeling good about their workplace and a positive outcome for the business. The study highlights the importance of healthy and comfortable working conditions for the overall well-being of company performance through staff satisfaction. According to Jamrozik and col. (2018) companies that have good environmental conditions at their workplace and have supportive and flexible working practices have proven to be more productive, innovative, and profitable. It has been shown, that physical working environment influences productivity of its users.

Due to digitalization and technological development used in property development, smart technologies communicate together in order to analyze and optimize all aspects of the

[142] Ing., University of Economics in Bratislava, Dolnozemská cesta 1, 852 35 Bratislava, Slovak republic, e-mail: linda.vaskova@gmail.com

workplace. Technology improves the way how the office is being used, but it can lead as well to improvement in employee performance and their well-being. Technology behind the office smart systems can help people to get fitter, faster and more efficient. Trend also leads to the fact, that apps which are used for tracking technologies will play a significant role in the workplace management.

### *1.1 Employees wellbeing*

#### 1.1.2 Working environment as a component of internal marketing

Ideally, internal marketing should be seen as being the integrated internal management of all those activities that directly and indirectly support the satisfaction of customer requirements (Watkis, 2018). Work wellness is a dominant topic nowadays in terms of the working environment which directly affects the happiness and performance of employees, and through them, the level and quality of customer interactions. The discussion and issues dealt with are about creating cultures and environments that are conducive to commercial success. In order to achieve true wellbeing in working place all components that can impact mental and physical health need to be considered – from building structure, fitout, through company cultures to the physical furniture and fittings which employees need in order to work efficiently and effectively.

Right combinations of many factors, that will be unique to every organization, supported by right combination of technologies can lead to creation of working environment, where users will enhance their motivation and productivity. A research Wellness Together (2017) is pointing out some key findings:

- *Wellbeing and Productivity:* Companies which have good environmental conditions at their workplace and have flexible working practices are more productive, innovative and profitable. Higher profitability is also associated with companies that have greater agility and flexible working practices. Companies that give employees' confidence that they can influence their own conditions are more profitable. Engagement is to be consider as very important for physical and mental wellbeing of employees. Generally, employees working in companies with inflexible working practices, with fewer digital collaborative tools and lower levels of staff consultation are facing lower physical and mental wellbeing.

- *Workplace design:* Working flexibly is an important factor influencing workers motivation. Variety in how and from where the one work, whether it's the ability to work from home or outside the workplace, or having an office layout that offers a variety of spaces and configurations with options of rest rooms, as well as collaborative spaces. Workplace design has proven impact on staff retention. Based on results 48% of employees think that the workplace design has a notable impact on their decision to stay with an employer. More than half of the respondents require own desk with storage space.

- *Environmental conditions:* In order to enhance the productivity and avoid dips in concentration it is very important to have the office designed in the way with the access to daylight, with the ability to open windows and adjust a temperature. Healthy office conditions and the access to outdoor space are key priorities for an improvement in workplace environment.

#### 1.1.3 Key factors influencing employee's performance – air, light, temperature

Project carried out by Sapio Research (2017) demonstrates that productivity, creativity and even profitability can be affected by employee working conditions. According to the findings, six macro trends impacting employees are movement, lighting, personal storage, noise levels,

air quality, and their own sense of empowerment. Based on the survey done by Savills (2019), focused on workers expectations, the impact of the workplace on workers' mental and physical health was shown.

According to the Interface's global human spaces report (2015), wellbeing and productivity levels increase by 13% in work environments containing natural elements. The importance of creating the right conditions for meetings in order to boost productivity should be the crucial part of the focus. Good quality ventilation and air movement are one of the most important characteristics of a healthy office. The survey processed by Sapio (2017) showed it to be one of the biggest differentiating factors of the most productive and innovative or creative companies. By improving fresh air supply in offices and meeting rooms productivity of workers will increase about 20% (Sharp, 2018).

According to Sharp (2018), good lighting can improve performance by 15%. Reduced contact with natural light can cause fatigue, headaches and even sleeping disorders. Unappropriated temperatures, together with increased atmospheric CO2 levels are causing tiredness, what has consequently an influence on productivity. The relationship between temperature and the typical office work performance indicates that performance declines by 2% for each degree above 25°C and by 4.7% for each degree below 21°C (WGBC,2014).

Smart buildings can greatly improve employee comfort and consequently employee performance. Smart technology can also have a positive impact on health. The right combination of technology and design in buildings can truly enhance the physical wellbeing of their occupants. Due to connected sensors of ventilation and temperature control systems is possible to identify how many people are in each meeting room and how the space is being used in order to adjust the optimal air quality. Sensors allow to adjust the temperature in meeting rooms by connection with heating and cooling system. Smart lighting systems can adjust the colors and brightness levels to imitate sunlight, thus adapting to biological rhythms associated with environmental changes. Advancements in collaboration technologies, in cooperation with the capabilities offered by Internet of Things (IoT) and cloud platforms can help businesses to get better value from the workplace.

### *1.2 Smart Office Systems*

Smart offices are becoming more relevant as IoT devices invade more to our productive workspaces. Smart systems are now dedicated to make every modern establishment both energy and management efficient. Traditional models of offices are being replaced by other more agile and dynamic models that foster collaboration and knowledge sharing in terms of improving the efficiency of workers and buildings. Modern work method has changed the way in which office spaces are designed, organized and distributed. It has led to more companies choosing smart buildings to bring the workforce together supported by modern technologies. Trend is leading to offices, in which technology is available for users to improve their experience and optimize productivity. A vast number of processes are automated and controlled by Internet of Things (IoT), big data and intelligent Building Management Systems (iBMS) in smart buildings: lighting systems, heating, communications or multimedia systems, etc. According to Aamidor (2018) intelligent building technologies (IBTs) are networked hardware and software solutions that can optimize buildings' operational efficiency, improve environmental and energy performance, enhance human comfort, health and productivity and elevate building safety and security for the benefit of building owners, operators and occupants.

All objects in smart buildings are connected via internet (from light bulbs, coffee machines, to office chairs that analyze posture) what facilitate work and improve the quality of the

employee experience. They also enable activity data to be collected and analyzed about how the workplace is being used, what enables companies in further optimization of the work environment.

The real-time performance of these technologies provides a clear picture of how the space is being used, how it can be optimized and what may break in the future. These data are easy to be managed and controlled from distance, by a remote (mobile) device operating on a network set up in IoT technology (Plangeras, Psannis, Stergiou, Wang, Gupta, 2018). Out of many trends in property development management, one of the most important is focus on alignment between building efficiency and user experience through use of enabling technology. High user experience is than leading to higher motivation of employees, higher productivity, engagement and commitment (CBRE, 2019b). To ameliorate the energy efficiency requirements, buildings are becoming smarter by the incorporation of intelligent supervision and control systems. Data captured by these sensors can be interpreted, processed and analyzed by rule-based computation methods of biological inspiration for predicting the future behavior of the building in a knowledge-based interpretable human-like manner (Rodriguez - Mier, Mucientes, Bugarín, 2019).

## 2. PROBLEM FORMULATION AND METHODOLOGY

By reviewing available sources of data and information like scientific publications, journals and researches were, based on their comparison, selected the most relevant ones. In order to fulfil objectives of this this paper and formulate the conclusion, various research methods have been used. The most important ones are the method of abstraction, analysis, synthesis, induction and deduction. At the same time, numerous empirical methods have been applied, particularly the method of comparison, that was used to compare results between available researches. The qualitative research was conducted in order to obtain relevant data to formulate the conclusion.

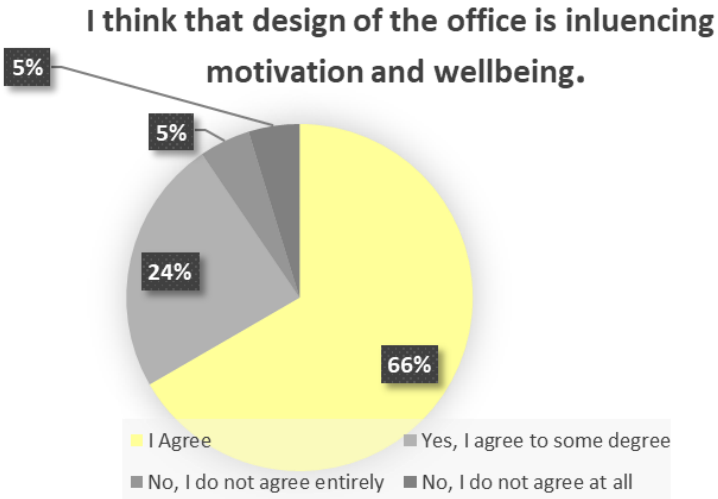
## 3. DATA COLLECTION AND RESULTS

In order to prove or disprove results from studies about importance of wellbeing in the office in terms of productivity, qualitative research was conducted, focusing on in-depth interviews with employees working for companies with inflexible working practices, with fewer digital collaborative tools, lower levels of staff consultation and working in not modern environment with old furniture. Respondents were working in two different companies. Both companies are small and mid-size with number of staff less than 50. The research was consulted and approved by management, as both companies were before the renovation. In order to gain a general opinion firstly, we proceeded with an anonymous survey, where 48 randomly chosen employees were approached, with 42 received responses. Later, 10 employees participated in the in-depth interviews. The survey was conducted in order to identify the gaps in motivation and suggest the way of its improvement. Due to lack of information about internal processes we can prove the importance of workspace impact on motivation of its users without direct correlation to customers' satisfaction and productivity of the company. In order to receive proper data about the employee's behavior, a follow up research in a company actively using smart office systems will be conducted, with results presented in another paper.

As a part of the survey we focused on five areas influencing wellbeing of users in terms of office workplace – access to the daylight and lightening conditions in the office, temperature and ability to adjust the temperature, ventilation and air circulation, own space of workers and collaborative spaces, meeting rooms.

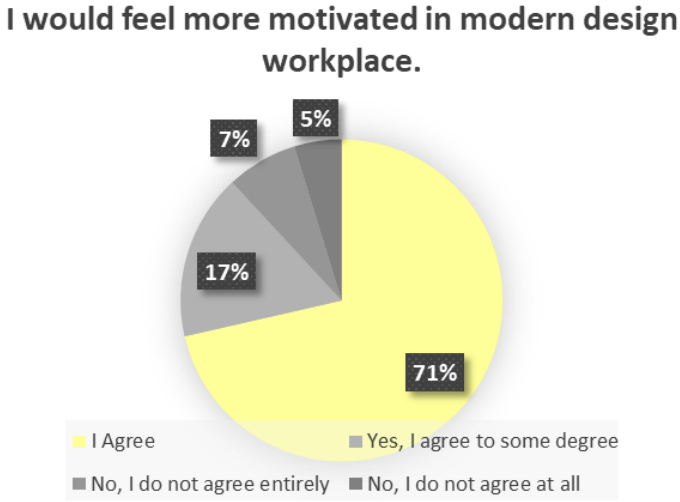
Base on the received answers the biggest concern of employees was quality of air circulation, temperature adjustment and the quality of lightening. More than 80% of respondents answered that they would feel more motivated if office environment would be renovated, against 20% who will prefer to work from home. More than 70% respondents feel most productive in morning hours, while they feel tired in the afternoon. From respondents 66% think that office design is influencing the motivation and productivity, while 64% is not feeling satisfied with current design and conditions and 33% don`t feel productive in current working conditions. Majority of respondents – 71% believe, that they would feel more motivated in more modern workplace. More than half of the respondents are not satisfied with air circulation, possibilities in adjustment of the temperature in the office and quality of the lighting.

**Figure 1: Influence of the office design on motivation and wellbeing**



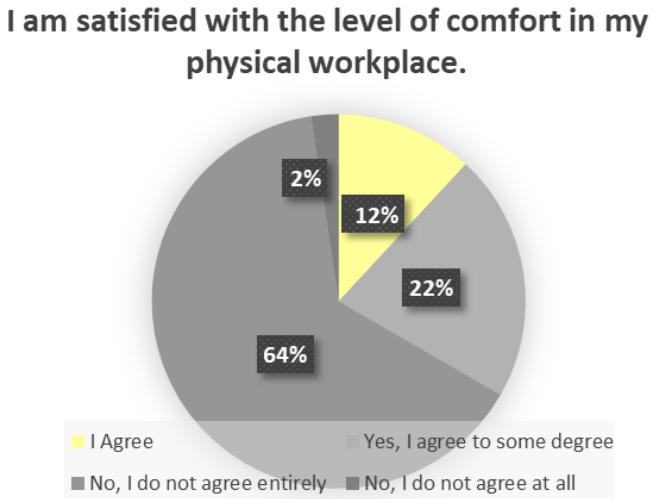

Source: Own processing

**Figure 2: Motivation in modern design workplace**




Source: Own processing

**Figure 3: Level of satisfaction in the workplace**




Source: Own processing

Respondents for in-depth interviews were chosen from respondents participated in surveys. We approached 10 people in age range between 30 – 45 years old, working on different positions in gender proportion 5 male and 5 females. Discussions took around 45 minutes with each of them, where we asked them questions with focus on areas:

Office design: According to responses employees office design is sufficient, even if it is old fashioned and not modern. Respondents agreed in terms that they will feel more comfortable and would find it more interesting to work in modern design office, however as far as the office is clean and they have a own working place and storage (which find all respondents as very important) it is sufficient for work they do.

Collaborative spaces, meeting rooms and private areas: There were discrepancies in responses in terms of collaborative spaces and meeting rooms to compare the question regard office design. While respondents agreed in terms of office design that office is not modern, but sufficient, they would prefer to have more collaborative spaces and more modern meeting rooms. Majority of responders agreed, that they will like to have more spaces for collaboration and bigger kitchen corner, where they can either have a rest, collaborate with colleagues or relax. Base on observation it is important to point out, that there were any options for collaboration in the office or possible breaks.

Quality of air circulation, lightening system and ability in temperature adjustment: According to respondents, lightening and ventilation system was the biggest concerns between respondents. Base on received answers we can assume, that respondents agreed on fact, that these factors can have a huge influence on their productivity especially in the second part of working day. Respondents agreed on fact, that office space is too dark and lightening system is causing gabs in concertation, the temperature is too high especially in afternoon hours and during the warm days due to lack of air circulation. The offices don't have sufficient access to fresh air and air-condition installed.

Motivation and productivity: Respondents were in majority happy with their job position and responsibilities and they feel motivated. However, in terms of productivity they would feel more productive in case that they will have more option in terms of flexibility. Respondents feel more productive in morning hours, as they find it difficult to concentrate whole working day. All respondents were claiming, that the lightening system and air circulation is not sufficient and it is possible, that it may influence they ability to concentrate. Majority agreed that they would be probably more productive in case of changes in terms of installing

different lightening system and air-condition. Majority of respondents - especially ladies, claimed, that they are struggling with often headaches due to bad conditions in the office.

Job retention: Interesting fact was, that all respondents would probably accept a new job offer in the hypothetical case that they will receive the job offer with the same responsibilities, same salary, in same location with better workplace conditions in terms of modern design, fresh air access and lightening. All of the respondents agreed on fact, that workplace design and conditions in the office have an important influence for they workplace wellbeing, physical and psychical condition. We can assume that workplace wellbeing has an impact on job retention.

Most important factors influencing motivation: We asked our respondents what would be the most important factors for their ideal workplace in a case of getting the basics. The answers were lighting and air quality, cleanliness, comfort of working, which are like a basic requirement for office workers and we would expect these as standard in a workplace. Going beyond the basics, the most important factors to respondent's consideration was length of commute to work to be of high importance, followed by the quality of technology in the office and having a quiet space for focused work. Above the standard they will like to have a parking place close to the office.

Optimal level of temperature, lightening or $CO_2$, in order to keep optimal working conditions, can be constantly measured or adjusted by installation of smart office system. Due to connection with ventilation, heating, cooling and lightening system will be optimal working conditions kept on optimal level. Optimal working conditions are inevitable to keep employees concentrated and productive. In conclusion it is important to point out, that there are many factors influencing the wellbeing of employees (like job position, responsibilities, career path, salary, bonuses, relations with management and colleagues, etc.), where office design and wellbeing form significant part of them. It is important for every company to find a balance between all of aspects to keep employees motivated and productive.

## 4. CONCLUSION

As the effect of new ideas, technological innovation, modern marketing management initiatives focusing on internal marketing and the entrance of new generations into the workforce, preferences for workplaces were changed. Traditional models of workplace design focused on cost reduction are being superseded by dynamic, agile models that aim to increase productivity, collaboration and wellbeing. Indoor environmental conditions in the office space and meeting rooms have a proven impact on the performance. The quality of temperature, air and lighting affect scientifically health, wellbeing, mood alertness, motivation and consequently the performance. Studies have repeatedly shown that uncomfortable conditions can affect concentration, creativity, mental arithmetic and consequently business results. Smart systems used in smart buildings allow to understand users' needs and behavior with the aim of enhancing well-being and productivity while saving operational costs and increasing building efficiency. This article is pointing out that combination of technology and healthy working environment results in happier, more productive and more effective employees. Base on the case study we proved the importance of the office environment on employee's motivation and wellbeing and we presented the impact and importance of wellbeing in working place on users' agility and hence to their productivity.

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# DIGITAL REVOLUTION AND LABOR MARKET

***Jarmila VIDOVÁ***[143]

**Abstract:** *The digital revolution significantly changes labor requirements. The economic objectives and their fulfillment also require new possibilities of exploitation, promotion of production efficiency, optimization of the pressure on competition using technological innovations. The paper will focus on the identification of the need for changes in the education system with an emphasis on further education and lifelong learning of employees. Employee education is a process that cannot be underestimated and needs to be constantly improved, as Industry 4.0 may have different dynamics, but the education area needs to adapt immediately, because training requires long periods of time. Otherwise, this may negatively affect the labor market, as replacing human labor with machines and, at the same time, eliminating jobs will result in an overall increase in unemployment.*

**Key words:** *investment, technological innovations, labor market*

**JEL Classification:** *J20, O33, Q20*

## 1. INTRODUCTION

In every development period we encounter changes that bring new challenges and at the same time demands on the ability of the workforce to participate effectively in the work process. We are currently in the middle of the Fourth Industrial Revolution, also called the Digital Revolution. It is characterized by the rapid development of technologies with a short time to adapt. Compared to previous industrial revolutions, Industry 4.0 extends into every area and gives rise to technical discoveries in the areas of artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3D printing, nanotechnologies, bio-technologies.

The Fourth Industrial Revolution has the potential to increase world income levels and improve the quality of life of the world's population. New technologies and progress have led to major changes for many countries, such as: In the past 30 years, India's population living in poverty has decreased from 60% to 22%, while in China over 600 million people have lost poverty over the same period.

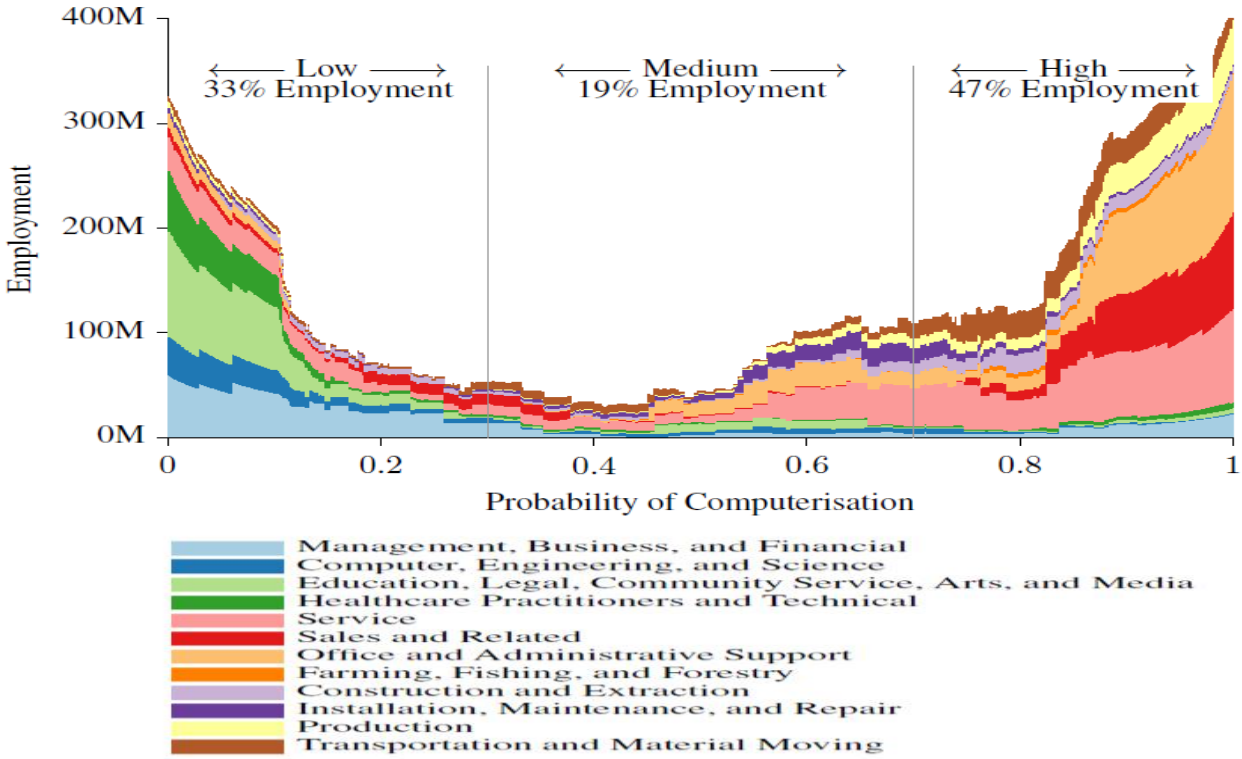
## 2. PROBLEM FORMULATION AND METHODOLOGY

The digital revolution can be considered a digital transformation, which is actually a change in workflows, roles or products or services as a result of the adoption and implementation of digital technologies by the enterprise or its operating environment. Bloomberga (2018) The development of digital technologies does not only bring positive effects. According to Rogers (2016), one of the drawbacks is that their development has disrupted the functioning of business entities, established processes and rules in different business sectors. According to Karimi & Walter (2015), the development of digital technologies has had a significant impact on several sectors, such as the newspaper sector, which is currently increasingly read online (previously paper-only), listening to and streaming music online via mobile or computer instead of cassettes or CDs, sale of goods by companies over the internet instead of physical stores. The problems we are currently worried about with the Fourth Industrial Revolution have arisen in connection with each industrial revolution. The most serious concern is technological unemployment, but as Schumpeter (1962) pointed out, without inventing ideas,

[143] Ing., PhD., MBA., Department of Economic policy, Faculty of National Economy, University of Economics in Bratislava, Dolnozesmká cesat 1, 851 04 Bratislava,Slovak Republic, e-mail: vdiova@euba.sk

economic development would not be strong, but rather social problems. An important fact is also the acceptance of change in society. Carl Benedikt Frey and Michael A. Osborne (2013) in their work "The future of employment: how susceptibile are jobs to cumputerisation?" report that about 47% of jobs in the US are at risk as progress enables computing to quickly replace work on a wide range of unusual tasks. Figure 1 shows the professions which will be significantly affected by developmental changes, which will not be so affected, and also those that will be difficult to replace. (Frey - Osborn, 2013).

**Figure 1: Likelihood of the impact of computerization on jobs**




Source: Frey, C. B. - Osborn, A. M. (2013)

Most routine operations (both manual and non-manual) will be automated to some extent. The introduction of new technologies can be seen in three ways. 1st direction Work automation. It is the replacement of human labor by robots in production and logistics (eg collaborative robots, autonomous trucks in warehouses and automated internal logistics of the plant). 2. Direct Digitization of production and associated processes using sensors and the ability to collect data on all levels of plant and corporate governance (Internet of Things, Big Data, Additive Manufacturing and 3D Printing). 3. Work through online platforms. All three ways of using new technologies mean a decrease in employees in stereotyped positions and increased demand for highly qualified complex positions.

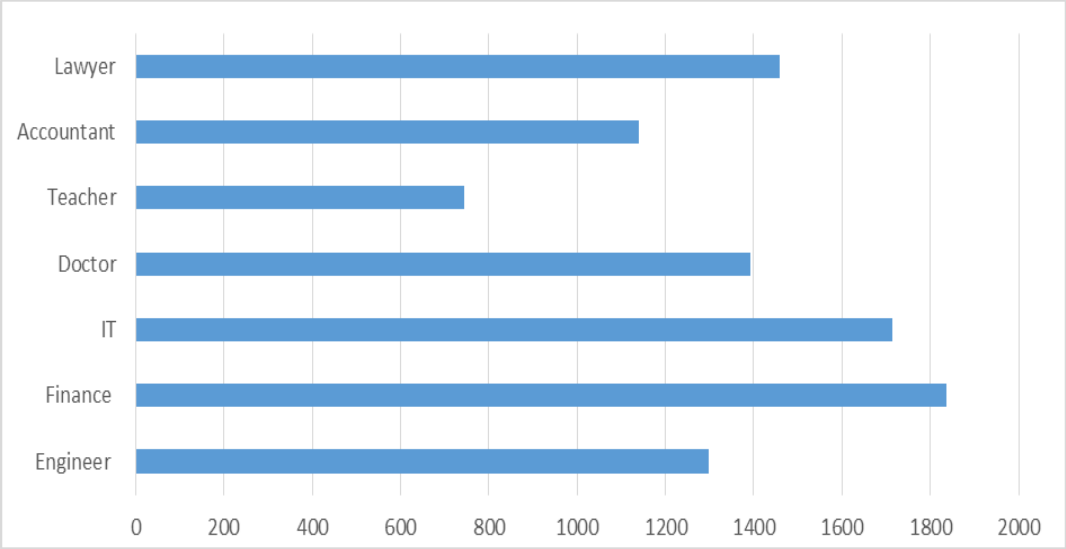
## 3. PROBLEM SOLUTION / RESULTS / DISCUSSION

One of the prerequisites for making adaptation easier and for people to do their work more sophisticated is to be constantly educated. Low-skilled employees with low digital skills are at risk. They are also employees who carry out routine work, clerical work, numerical data processing, general and auxiliary administrative workers, transport and logistics workers, service, sales, construction, etc.

Some of these positions are already substitutable by technology, but are still surviving in the labor market due to the large disparity between labor costs and automation costs. However, replacing people with technology will not take place simultaneously and continuously. At least threatened are professions which, due to their social, organizational, physical, creative or intellectual requirements, will not be able to be replaced by automation or digitalisation in the foreseeable future. These are managerial positions, jobs in education, health, and social services. Especially database and network specialists, ICT executives, analysts and developers of software or computer applications will be requested. These positions have the greatest positive potential in the world of digitization and automation. In addition, there are more and more educated people who may be more attractive to employers. Specialists are especially needed to program, maintain and set up robots.

Economists Erik Brynjolfsson and Andrew McAfee in The Second Machine Age pointed out that the revolution could bring greater differences between people, especially by disrupting the labor market. In addition, the replacement of human labor by a robot will lead to an increase in the share of capital in income and, conversely, to a decrease in the share of labor. The decisive factor for the success of companies will be the quality of workers, which will be a prerequisite that with higher skills they will also have higher pay for their work. (figure 2)

**Figure 2: Salaries by job position (€)**




Source: data-based OECD Education at Glance 2017.

Education gaps in the United States declined between 1915 and 1980, and the pay gap in education and overall wage inequality increased significantly in many countries since the 1980s (Goldin - Katz, 2009, Krueger, 1993). We also need to focus on the role of managers in the new environment, as they will have to develop new strategies so that businesses do not lag behind in development and become innovative. As with the new challenges of managers, conditions must be created for employees to be constantly trained and able to be part of the processes.

According to Aryee et al. (2012), Muceldili et al. (2013) or Birasnava (2014) is currently the most discussed leadership style so called transformational leadership on the need to respond to the introduction of new technologies and practices. Authentic leadership and transactional leadership in knowledge, learning and innovation are also needed. Industry 4.0 requires more willingness to learn and innovate from managers, employees, but also business owners. In

recent years, the so-called the concept of knowledge-based leadership, which is a combination of transformational and transactional leadership.

The essence of this type of leadership is the emphasis on learning and innovation, complemented by innovative role modeling, knowledge dissemination, decision support, delegation, consultation and mentoring. (Donate and de Pablo, 2015) Managers can therefore improve their innovativeness and the ability to learn to design appropriate human resource development strategies, as human resources are crucial to a competitive advantage in the knowledge economy(Kordos, 2019; Kordos, 2018). For success it is therefore necessary to carry out permanent managerial training and educational activities for employees directly in the company or in educational centers or universities in order to avoid increasing unemployment.

**Table 1: Comparison of society, industry and education across the 19th and 20th centuries, and the aspirational vision for the 21st century**

| | **19th century** | **20th century** | **Vision for 21st century** |
|---|---|---|---|
| **World events** | Civil wars, racial segregation, colonialism and imperialism | World Wars I and II, independence of nation states, Cold War | Interdependence among national states, decentralisation of power, terrorist attacks, nationalism |
| **Technological innovations** | Electricity, telephone | Internet | Cyber physical technology (social media, AI, 3-D printing, robotics) |
| **Main industry types and business climates** | Oil industry, textile industry<br>Mass production by machine<br>Focus on profit making | Computers, electronics, financing<br>Shift from manual to machines – automation<br>Tailored production of goods and services for individual consumers<br>Corporate social responsibility (CSR) | Social media, Internet of things, big data, digitalisation, post-truth (fake news)<br>Shared economy, social entrepreneurship<br>Consumers take part in the production of goods and services<br>Focus on value making, sense making<br>Corporate shift to creating shared value (CSV) and considering to contribute towards the U.N. Sustainable Development Goals (SDG) |
| **Work organisation in education and changes in compulsory schooling** | Universal public schooling (primary and secondary education) | Emerging divergence of schooling (e.g. private, home schooling),<br>Competition among schools | Emerging networks/partnerships of schools<br>Emerging collaboration among schools<br>Emerging collaboration between schools and communities at all levels, meta-, meso-, micro, capturing education system as part of a larger eco-system. |
| **Curriculum** | Prepare for labour market; education for jobs<br>Academic disciplines only (mathematics, language)<br>Static, linear and standardised | Prepare for independence; education for individual fulfilment<br>Widened scope (added physical education, other domains);<br>Still static, linear and standardised | Preparing for interdependence; education for citizenship<br>Balanced scope (breadth and depth)<br>Non-linear, dynamic, flexible curricula; focus on more personalised learning |

Source: OECD Future of Education and Skills 2030. https://www.oecd.org/education/2030-project/about/E2030%20Introduction_FINAL.pdf

For the take-up of digital technologies, it is necessary to build up institutional capacity in the field of digital management and to continuously improve the quality of higher education in order to the interaction between education and practice has been created. More opportunities to acquire real-world skills that are relevant to prospective job opportunities should be available to students already in elementary school, where they are acquainted with basic technologies, soft skills. High school and university studies should be a continuation of improving knowledge for the future profession.

### *3.1 Educational readiness for the digital revolution in the Slovak Republic*

In the Slovak Republic, only 40% of enterprises operating in the electrical industry have implemented new technologies, and only 8% of businesses have and are implementing their own Industry 4.0 business implementation strategy. (Industry 4UM, 2017). The reason for the slow introduction of technology is the lack of manpower digital skills. Due to the increasing demand for employees in the context of continuous education, new technologies, processes or methods have the same requirements for the education system and educators.

The European Commission monitors the digital competitiveness of Member States according to the digital economy and society index. Slovakia ranked 21st among the 28 EU Member States in the European Commission's Digital Economy and Society Index (DESI) for 2019.

In the Slovak Republic, good results were achieved in the area of human capital. The share of the population with basic and advanced digital skills is higher than the EU average. Internet connectivity, the use of Internet services and in particular the provision of digital public services have also been improved. Nevertheless, the overall score of Slovakia in all dimensions remains above the EU average and the country has deteriorated by one place in the EU ranking. In Slovakia, there is an increase in fast and ultra-fast broadband coverage, and the number of Slovaks who have never used the Internet is falling. More and more people use online shops to buy and sell goods and services in Slovakia, almost three-quarters of them are involved in social networks. Slovakia is also doing well in the Open Data Indicator and is improving the provision of digital public services to businesses.

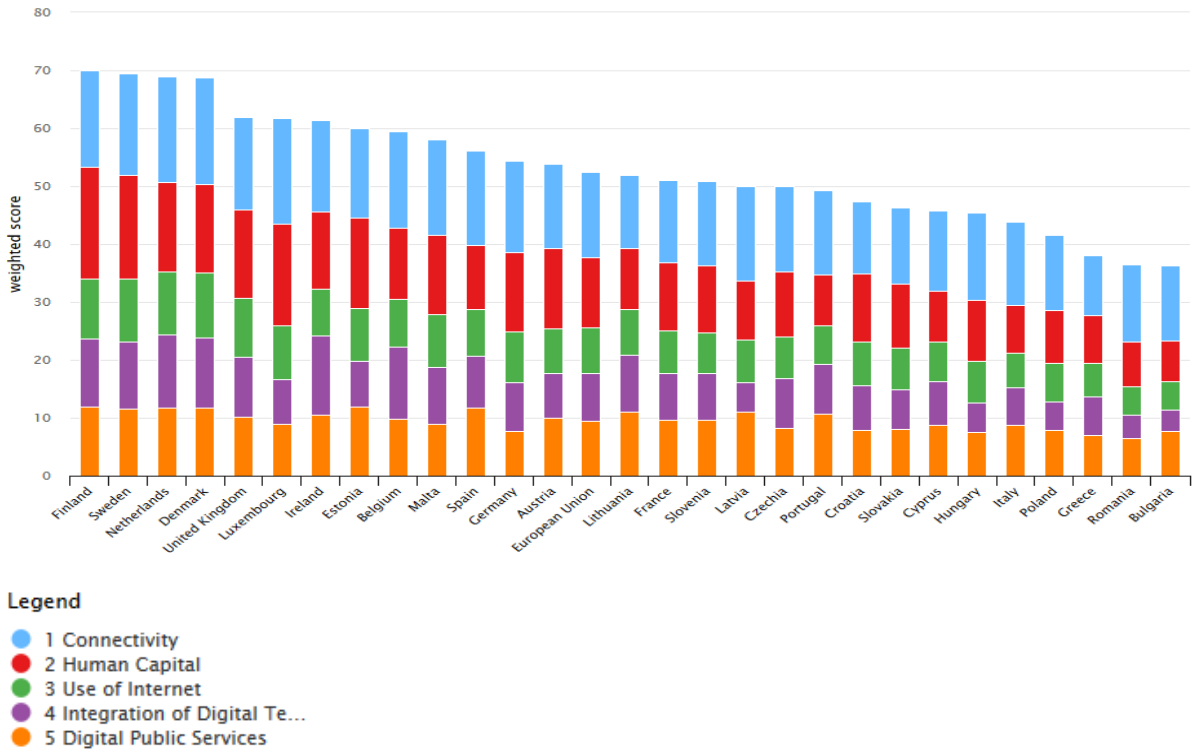
The ability to solve problems in a high-tech environment is defined in the PIAAC study as the ability to use digital devices, means of communication and networks to gather and assess information, communicate with others and perform practical tasks (the ability to use ICT equipment). However, the aim is not to test isolated literacy in the use of ICT devices and applications, but to assess adults' ability to use these resources in an efficient and purposeful way to gather, process, assess and analyze information. (OECD Skills Outlook 2013)

Slovakia is one of the countries where one quarter of the adult population is completely computer illiterate. This group of people in the contemporary world can be identified with a group of people who in the 1950s could not read and write, which of course is a huge handicap.

The digital transformation brings many opportunities that face the greatest risk of society being unprepared for the future. If education is to underpin the growth and integration of individual EU Member States, a key task is to prepare citizens to make the most of the opportunities offered and to face the challenges of a dynamic, globalized and interconnected world. In 2018, the Digital Learning Action Plan was introduced, based on two statements. The first statement is called. "The new EU Higher Education Program" and the second "School development and excellence: the key to an excellent start to life". The above-mentioned action plan aims to help greater mobility and digitization, to provide the right

combination soft skills, but especially emphasizes digital skills. According to the Action Plan, it is necessary to strengthen resilience in an era of rapid technological change.

**Figure 3: digital Economy and Society Index (DESI 2019)**




Source: Digital Economy and Society Index (DESI) for 2019. https://digital-agenda-data.eu/charts/desi-components#chart={%22indicator%22:%22desi%22,%22breakdown-group%22:%22desi%22,%22unit-measure%22:%22pc_desi%22,%22time-period%22:%222014%22}

Slovakia does not have a separate strategy aimed solely at enhancing digital skills. Nevertheless, this issue, including 'education and the labor market', is addressed in the National Intelligent Industry Action Plan adopted in October 2018 as part of one of its 5 pillars.

## 4. CONCLUSION

The introduction of new technologies is a prerequisite for future economic development while maintaining competitiveness. At the same time, pressure is placed on the individual, who is required to be more accountable, more efficient. In the paper, we looked at the impact of industry 4.0 on the labor market, with an emphasis on the need to expand educational activities at all levels of education in order to avoid rising unemployment and to allow workers to perform other jobs for which demand will increase. The digital revolution will affect all areas of economic and social life, aspects of human life, for which we need to prepare now.

The problem to be solved is to increase the number of digitization specialists, in particular by creating study branches with a higher level of interconnection with practice. It is important to focus on the in-house training of employees, which is the most effective business investment for the digital transformation.

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# CROWDWORKING: JOBS IN THE AGE OF DIGITIZATION AND PLATFORM ECONOMY

***Jarmila WEFERSOVÁ*[144]**

**Abstract:** *Industry 4.0 means a comprehensive digitization, which will bring both advantages and disadvantages for humans. The role of people in the working world and the nature and structure of work will change dramatically as work 4.0 develops. In future, humans will work hand in hand with robots and computer system and the direct presence of humans will hardly be necessary. The work becomes part of life and both areas of life become blurred. An important and growing area in this overall scenario is the sharing economy or platform economy, which has created a new type of work and (co-)workers, namely crowdworking and crowdworkers. They receive their work orders through digital employment platforms that are booming and barely covered by statistics. This paper attempts to provide a structural assessment of these digital crowdworking platforms and the situation of crowdworkers.*

**Key words:** *industry 4.0, digitization, platform economy, crowd working platforms*

**JEL Classification:** *A13, A14, F66*

## 1. INTRODUCTION

The term Industry 4.0 is omnipresent. The industrial revolution is in full swing. In the course of the Industrial Revolution, not only the production processes and production lines are changing, but also the role of humans. Industry 4.0 or Work 4.0 is characterized by digitization and automation. Both employers and employees face these changes in the labor market with shared opinions. The world of work is changing significantly as a result of Industry 4.0.

Digitization and automation make it easier for people to work or take over the work completely. Since digitization is accompanied by a strong network, it makes work more location-independent. Not only creative and IT professions will no longer require a presence in the workplace. Even the production worker can monitor and control production using a laptop with internet access, wherever he is. Assembly line workers run the risk of getting into difficult or only temporary jobs.

## 2. GOAL AND METHODS

The aim of the article is to characterize the relatively new phenomenon of the sharing economy and its consequences for labor market and service providers. So far, little is known about crowdworkers and how they work. Until now, there is no statistical coverage of platform companies that are active in Europe.

Using the example of Germany and Austria, the article analyzes the dissemination of platform work in Austria. The Vienna Chamber of Labor supported a research project by the University of Hertfordshire and Ipsos MORI in collaboration with the Foundation for European Progressive Studies (FEPS) and UNI-Europa. In this article the results of this research are analyzed and explained by own considerations, furthermore supplemented by information from secondary sources. The theoretical information is from foreign publications and electronic sources. The results of secondary research are presented in the form of a table.

[144] Ing.PhD., Comenius University Bratislava, Faculty of Management, Department of Economics and Finance Odbojárov 10, P.O. BOX 95,820 05 Bratislava 25, Slovakia

## 3. STRUCTURES

### *3.1 Sharing economy, platform economy and their business model*

As already mentioned above, Industry 4.0 means a comprehensive digitization with all its consequences for the human living environment as well. Whether it will bring more benefits than disadvantages for humans or a reasonable balance arises can be hardly predictable yet.[145] Worldwide digital communication and data exchange are already taking place today, forming the foundations for the so-called sharing or platform economy. These internet platforms are also changing the access to the labor market and the forms of employment.

Mediation platforms for the connection between the mass of potential job seekers, service providers (the crowd) and the consumers of services, i.e. employers, are so-called crowdworking platforms. They give companies the opportunity to use human work potential more flexibly in terms of time and space. There are new challenges for the workers, such as the increase of time and place flexible working. The concept of employee and the terms of business and company are dissolved.

The consequences of these developments have been apparent since the 1980s. Germany can serve as an example for this development, after all, the strongest economic power in the European Union. Since the 1980s self-employment has increased in Germany. The increase up to 2012 is mainly due to the increase in solo self-employment, - half of the self-employed is in the form of solo self-employment. In 2015, the Federal Statistical Office lists 4.34 million self-employed persons, of whom one quarter is only in appearance self-employed (Ernst & Young GmbH 2015).

The importance of platform economics is constantly growing, and the contracts are awarded to freelancers on internet platforms (crowdworking). Professor Jan Marco Leimeister from the University of Kassel presents perhaps the most comprehensive classification scheme for crowdsourcing and crowd work. For example, he distinguishes between ‘internal’ and ‘external’ crowd work - depending on whether on-demand employees are employed or not employed by the platform operator. The latter category is then further subdivided into a series of ‘archetypes’, i.e. subcategories such as ‘microtasks’ (defined as “tasks of a predominantly simple and repetitive nature”) or ‘market platforms’ (for “the assignment of longer-term and more complex tasks to the general public”).

This understanding of crowd work as a purely digital form of on-demand work, where tasks can be done anywhere from the computer, is usually countered by gig work - a form of work that, mediated via a platform, is done offline, such as food distribution or cleaning. The space in which this wide field can be organized is almost unlimited.

Whether the tasks in question should be done online or offline is one possible differentiator, but not the only one found in science. It is also possible to differentiate between task-specific platforms (such as Uber or Deliveroo) and those for general services (such as Helpling or TaskRabbit), or who sets the price for the individual tasks (in some cases this is the platform, in others the consumer or even the employee himself). In reality however the business models of the platforms mesh and overlap. They show a number of significant similarities, in particular the use of algorithmic rating mechanisms.[146]

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[145] Wefers, J., ( 2019) *Kollaborative Wirtschaft. Sharing Economy*. Wolters Kluwer, p. 81. ISBN 978-80-7598-364-0

[146] Durward, D., Blohm, I. Leimeister, M.J., Principal Forms of Crowdsourcing and Crowd Work, in: Werner Wobbe, Bova, E. und Dragomirescu-Gaina, C. (Herausgeber) *The Digital Economy And The Single Market* (FEPS 2016) 46-7,48

Heiling, M., Kuba, S. (2017), Die Ökonomie der Plattform, in: Lutz, D. Risak, M. (Herausgeber), *Arbeit in der Gig-Economy*: *Rechtsfragen neuer Arbeitsformen in Crowd and Cloud* (OGB Verlag) 28, 33-4.8

### *3.2 Crowdworking platforms*

Crowdworking platforms, as intermediaries, coordinate and manage paid work and often control the entire work system, including participants, information and technology. Lastly, there were around 2,300 crowd work platforms worldwide, including 65 in Germany (Klebe, Frankfurter Rundschau, May 2016) with around 700,000 clickworkers on clickworker.com. The crowdworking industry, with its 112 million crowdworkers, was expected to generate $ 25 billion in revenues from the platforms by 2020 (World Bank Study, Klebe, FR 2016).[147]

A majority of crowdworkers have no state pension and unemployment insurance, 56% of them, - 34% of full-time crowdworkers -, no health insurance (Leimeister et al., 2016), and 48% no old-age provision (Leimeister et al., 2016). In principle this professional group has no participation rights. As a rule, these self-employed people work in poor working conditions, and their pay often does not even reach minimum wages. The average income for a crowdworker with a main job is 1500 € / month, with a side job 326 €, while over half of the crowdworkers have a university degree (Leimeister et al., 2016).

The working life of crowdworkers is burdened by constant accessibility, need of a home office, work on call, work on call with unpaid waiting times (often zero-hour contracts), shift work. Many of them work regularly in the evenings and/or at night or have regular weekend work or regular Sundays or public holidays work.[148] The problem with the whole working time forms is, that the right to give instructions with regard to the place and partly also with regard to the extent of the working time lies on the side of the client. Frequently, the call workers do not have an agreed minimum number of hours (Schult/Tobsch SOEPpapers 485/2012) and in the contract terms such as e.g. "Working hours depend on the operational needs" used. Some service providers are trying to set up their own self-employment through online freelancer platforms.

## 4. FACTS AND FINDINGS

Digital job placement platforms are booming around the world. While there is hardly any global statistical coverage of them, it can be said, at least for Slovakia, that most online platforms are registered. For example, some of the best-known domestic platforms are Douč ma.sk (private tutoring), Jaspravím (I do it), Supersused (superneighbor) and Domélia.[149]

This paper attempts to provide a structural assessment of job placement platforms. The jobs range from simple to complicated, from photo captions to translations and software solutions, and much more. Freelancer work as graphic designers, architects, bloggers, interpreters, programmers or various other marketing and IT specialists, i.e. they are professionals, who work daily, are constantly evolving and work on projects in a specific area, but only temporarily. Temporary employment of freelancers is beneficial for companies, the advantage is higher work efficiency and low costs.

### *4.1 Online-freelancer-platforms in Germany*

Freelancers have to acquire orders. And startups often look for project-based employees. Although work platforms or so-called job portals, do not offer jobs, they convey projects and orders. The following platforms can be found on a partial list of the most important freelancer & project platforms in Germany (as of 2019):

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[147] Crowdwork-erfordert-zusaetzliche-regeln. Available at: http://www.fr.de/politik/meinung/gastbeitraege/gastbeitrag-crowdwork-erfordert-zusaetzliche-regeln-a-352537

[148] Bundestag. Available at: http://dip21.bundestag.de/dip21/btd/18/094/1809499.pdf

[149] https://publications.europa.eu/en/publication-detail/-/publication/0cc9aab6-7501-11e8-9483-01aa75ed71a1/language-en

**Upwork -** qualification spectrum: developers, creatives, editors, virtual assistants and marketing, sales and customer service professionals

**freelance.de -** main focus: IT and SAP projects

**Smartjob** - the first international matching app for iOS and Android that brings together freelancers and clients directly.

**Twago -** companies can display and offer projects with requirement profile, budget frame and deadline for freelancers free of charge

**GULP Personaldienstleister -** for specialists in IT, engineering and finance, also permanent positions are offered

**Freelancermap** - Tenders on which freelancers from the IT and technology sector can directly apply.

**Freelancer -** candidates and applicants competing with each other[150]

**MASTER Hora -** portal for specialists and executives over 50[151]

More and more work and freelancer platforms provide agencies, companies and startups with project-oriented cooperation with freelancers. In Germany alone, there are nearly five million freelancers and around one in three human resources managers wants to work with them more frequently in the future.

But in the end, the main question is often not solved: How do freelancers get jobs that actually match their qualifications, requirements and salary expectations?[152]

### *4.2 Main findings in Austria / Structures of employment agencies*

An interesting study on the use of online freelancer platforms in Austria shows the following figures:

- 5% of adults say they do crowd work 'at least weekly' ('frequent crowdworkers')
- 9% of adults say they do crowd work 'at least monthly' ('intermittent crowdworkers')
- 18% of adults say they do crowd work 'at least annually' ('occasional crowdworkers')
- 23% said they had have ever succeeded in finding work through these platforms ('experimental crowdworkers' or 'dabblers')
- 36% say they have looked for paid work via online platforms ('would be crowdworkers' or 'platform tourists')
- 36% say they have been customers for crowd work.[153]

The analysis includes the following- in Austria accessible - platforms:

- Employment agencies for cleaners / Helpling.at and bookatiger.com/at,
- Intermediary of parcel delivery services / CheckRobin.com,
- Platform for craftsmen / MyHammer.at,
- Crowdworking platform / Clickworker.com/de,
- Placement platform for typing / Lass-andere-schreiben.de.

[150] https://awblog.at/digitale-arbeitsvermittlungsplattformen/

[151] https://www.google.com/search?q=masterhora&sourceid=ie7&rls=com.microsoft:sk:IE-Address&ie=&oe=#spf=1568113470190

[152] Altmann, P. (2/2019). https://www.gruenderkueche.de/fachartikel/top-projektboersen-und-jobportale-fuer-freelancer-auftraege-und-projekte/

[153] https://www.arbeiterkammer.at/infopool/wien/Praesentation_Ursula_Huws.pdf

| | |
|---|---|
| Ownership structure | Highly capitalized owners or venture capitalists<br>Helpling – Rocket-Internet - German company -, Mangrove Capital Partners, Phenomen Ventures, Point Nine Capital<br>Clickworker – Klaus Wecken, European investment companie<br>CheckRobin – - prominent co-owners: Attila Dogudan Privatstiftung, Hans Schmid (Steffl) media entrepreneur and department store owner<br>MyHammer – MyHammer Holding AG with shares of well-known publishing groups: Die Zeit, Rowolth, Kiepenheuer-Witsch |
| Self-presentation - naming of the platforms | Negation of customer property, even intermediary property<br>Privatization of roles: "users" and "participants"<br>Helpling – „marketplace "<br>Book a tiger – „online brokerage portal“<br>lass-andere-schreiben – „technical platform "<br>Clickworker – „workplace“ |
| Contract terms and remuneration | Helpling, Book a tiger, clickworker - Fixed salary and standards for service provision<br>clickworker – performance monitoring<br>No information on remuneration on Sundays or public holidays<br>Contradiction to the concept of "marketplace" or “intermediary of self-employed” |
| Customer evaluation of work performance | Evaluation will be included in further awarding of contracts.<br>No possibility to evaluate the clients |
| Application of desirable social goals | Labor and social standards<br>Development of new concepts and categories parallel to technical progress<br>Awareness that mediated work is precarious work that does not cover the existence needs |
| Rights that do not apply to many jobbers on platforms | Collective minimum wage, supplements for night or holiday work, overtime pay, social insurance, unemployment benefits, holiday pay and more |

## 5. CONCLUSIONS

Digitization will bring both advantages and disadvantages for humans and you cannot predict the balance between them. There are new challenges for the workers, such as the increase of time and place flexible working. The work penetrates more and more into private life and leisure and these different areas of life blur together. New forms of employment such as crowdworking, being self-employed, digital day laborers mean a further segmentation of labor markets and an increase in precarious employment. [154]

If and when as a consequence of labor market flexibility the wage spreads increase, atypical employment becomes more important and the low-paid sector expands, the long-term social consequences of this development for incomes during and after a gainful employment phase would be less serious, if higher career opportunities would limit such employment.[155] The networked world of work creates the digital "worker" who needs a competent, strong representation of interests through digital transformation. The service provider will need tailor-made tertiary vocational education, which also includes his rights in relation to valid and approved labor law.

[154] Wefers, J., ( 2019) *Kollaborative Wirtschaft. Sharing Economy*. Wolters Kluwer S. 82. ISBN 978-80-7598-364-0

[155] Seifert, H., Struck, O. 2009. *Arbeitsmarkt und Sozialpolitik*. VS Verlag für Sozialwissenschaften. S.61. ISBN 978-3-531-16304-8

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[7] Crowdwork-erfordert-zusaetzliche-regeln. (2019). [online]. [cit.2019-09-13]. Available at: http://www.fr.de/politik/meinung/gastbeitraege/gastbeitrag-crowdwork-erfordert-zusaetzliche-regeln-a-352537

# THE IMPACT OF INDUSTRY 4.0 ON THE LABOUR MARKET IN RUSSIA

***Nikolay ZAKHAROV*[156]**
***Andrey KUZNETSOV*[157]**
***Marina PERFILYEVA*[158]**

**Abstract:** *This paper examines the influence of scientific and technological progress on the labour market in Russia under Industry 4.0. The purpose statement is to determine the possible impact of Industry 4.0 on the productive forces of the Russian economy and propose options to offset the consequences of a possible lay-off in the labour market. The authors analyzed the historical, cultural, and socio-economic conditions for the functioning of the domestic economy and examined the current gender and age structure of employment. This led to the conclusion about the additional opportunities that the next industrial revolution provides for society, its achievements being properly used, and does not portend catastrophic consequences (as some researchers try to present this), but on the contrary, creates the conditions for freeing up time for harmonious development of society. The conducted survey and sociological studies revealed the main trends in the development of the Russian labor market, which allows us to identify a tendency toward a decrease in the employment of people at work and a desire to increase off-work time. However, the majority of respondents note that this will not affect the performance and efficiency of the functions performed. The paper considers variants of solving social problems under a sharp reduction in workers in production as a result of the introduction of artificial intelligence, the Internet of things, and neural networks, which involve redistribution of working hours in those areas where this will not create any difficulties and is not dictated by technological processes. In general, the conclusion suggests itself that with a change in production relations, socio-economic relations in society must also change (adapt).*

**Key words:** *conditions for the harmonious development of society; features of the Russian labor market; reduction in the number of people employed in the economy; the situation in the labor market, socio-economic consequences.*

**JEL Classification:** *E24, F63,F66, G38, J78*

There are many different opinions among scientists regarding changes in the structure and capacity of the labor market during the next industrial revolution, and this is quite understandable. Everything unknown gives rise to the most daring and even fantastic images of a future society, in which artificial intelligence, the Internet of things, and neural networks will dominate. As a result, production, and this is perhaps the most widespread opinion, will be carried out with a minimum number of people, which will inevitably lead to unemployment and all the negative social phenomena resulting from this. This opinion is shared, in particular, by Sandrine Kergroach: “We are living on the threshold of the next production revolution. Ongoing transformations in industry and production activities are unprecedented in terms of their scale and impact. Emerging technological developments are likely to bring widespread automation and irreversible shifts in the structure of jobs, raising major challenges on labor markets and for policymakers responsible for promoting the necessary skills and employment”[1]. Other leading research centers, such as the University of Oxford, uphold to a similar position. Its scientists suppose 47% of workers in America risk losing their jobs due to automation. Or McKinsey’s conclusion, whose position is that 30% of 60% of all jobs can technically be automated. The World Bank estimates two-thirds of jobs in

[156] Prof., PhD., Saint Petersburg State University of Economics, 21 Sadovaya str., Saint-Petersburg, 191023, Russia, email: znl29@mail.ru
[157] Prof., PhD., Kalashnikov Izhevsk State Technical University, 7 Studencheskaya str., Izhevsk, 426069, Russia, email: alkuznetsov_63@mail.ru
[158] Prof., PhD., Saint-Petersburg University of the Humanities and Social Sciences, 15 Fuchika str., Saint-Petersburg, 192238, Russia, email: pmb05@list.ru

developing countries can be automated. Only the numbers differ, but the positions are the same. In our opinion, scientific and technological progress does not lead to any social tension. On the contrary, we, as humanity, have a unique chance to create a constructive and harmonious society due to developed productive forces. The time that the humanity can free up for self-development, for raising children, for spending with their loved ones and relatives, will certainly contribute to the emergence of a person of a new formation.

Obviously, the conditions and rate of change in different socio-economic formations vary significantly. The factors of influence include the level of development of scientific and technological progress, climatic conditions, national traditions, lifestyle, etc. Let's consider the example of Russia. Today, Russian women work on an equal footing with men and almost do not concede to them as labor resources. Of course, there are professions in which women predominate, for example, teachers, doctors, social workers, catering, etc. Currently, there are 35,034 thousand working women and 37,108 thousand men in the Russian economy, i.e. the percentage ratio is 49 to 51. We can talk as much as we like about the gender approach, about women's rights to work, about the ever-increasing influence of women in society, but the truth is that a woman, in the vast majority of cases, is *forced to work*! This is evidenced by numerous opinion polls. As a result of the ongoing process of "disintegration of the institution of the family," a woman, as a rule, is forced to support not only herself, but also her children, and in some cases even her husband. The reality is that there are more and more successful working women and women entrepreneurs, but combining career and family life is very difficult. Isn't it the reason why, according to the 2010 census, there were more than 5 million Russian women with children and only 60 thousand of them had been never married. The percentage of unregistered marriages is not so large, and it does not significantly affect the general trend of divorces [5], [6].

Another aspect is job satisfaction. More than 2/3 of employed Russian women are not satisfied with their work. Studies show that the dissatisfaction of women is in many respects manifested by being considered the "weaker sex" by their colleagues and especially by their management, which is expressed as unjustified nit-picking and harassment. Moreover, it is a woman, as a rule, who has the lion's share of household chores and raising children, which does not give her strength, but contributes to fatigue and irritability [2].

Of course, there are some women who cannot imagine themselves unemployed and prefer to hire domestic workers and nannies but would never become a housewife. However, they are not a significant percentage. Thus, under the conditions when the productive forces are in less demand, it is more logical to redistribute the roles as follows: men work and women, as a rule, create comfort in the home and raise children. At the same time, men should have a sufficient level of income, and women should participate in socially significant work, i.e. various kinds of committees, interest clubs, etc. History has already seen that and it suited many.

A survey of workers in Russia shows that the majority (58%) speak in favor of reducing the working day by 2-3 hours. This is typical for megacities, where you have to spend 3-4 hours a day on the road taking into account traffic jams. Thus, "… 29% say that, without prejudice to work, they could perform their current responsibilities in 6 hours. 5 hours would be enough for 13%, 7 hours — for 7%. 9% could halve their working day. 3% believe they could manage their work even faster than that. Every tenth respondent cannot have a shorter working day because has to be present at work for all 8 hours. 16% think that they will not be able to manage their work faster than a standard 8-hour work day" [3].

Therefore, another approach can be applied: reduction of working time and transition to a 4-hour working day. In this case, the need for workers will double, and this is exactly the indicator that is being predicted by leading institutes. Moreover, this will help to maintain

gender equality, the same status for men and women and, what is not unimportant, to free up time for self-improvement and self-development, for example, for sports.

In addition, in the context of Russian reality, where a quarter of the population live in rural areas and the population density is 8.5 people/square kilometer, it wouldn't be practical to implement the industry 4.0 achievements everywhere in the coming decades. It would be in industrial centers, and it is the prospect of near future, but in the most territory of Russia this process will stretch over several years.

The conclusion suggests itself: the impact of the new industrial revolution on the labor market will differ in urban and rural areas in terms of its rate and nature in different countries. In those territories where this progress comes, the compensatory variants suggested in this paper should be considered. And, of course, we need to get ready for the fact that the development of productive forces will entail changes in the socio-economic structure of society.

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# THE DILEMMA OF JOB CREATION AND LOSS BEFORE OF INDUSTRY 4.0

***Nickolay ZAKHAROV***[159]
***Irina BRITVINA*** [160]
***Andrey KUZNETSOV***[161]

**Abstract:** *This article is dedicated to the emerging controversy ahead of Industry 4.0. – On the one hand, the loss of jobs, the disappearance of entire cohorts of professions, and on the other hand, the emergence of new professions and new jobs. This situation gives an advantage, first of all, to young people who are inclined toward learning and innovation, but it deprives people who are not able to improve and change their professional skills in a modern fast-paced world. The situation is complicated by the fact that there is no system for optimizing modern forms of labor and modern work ethics. Industry 4.0 requires new time-appropriate systems: training and retraining, labor optimization, work ethics.*

**Key words**: *Labor, Management; Employee, Business relations, Job creation, Job loss, Industry 4.0, Object of competition in the global market, Foreign students, New Information Technologies.*

**JEL Classification:** J60, J61

## 1. INTRODUCTION

At the turn of the XX / XXI centuries, dramatic social and economic changes took place in the world that led to Industry 3.0. In a relatively short period, the mode of industrial production was transformed beyond recognition. Robotization has covered all the leading industries. A conveyor worker has become an operator of automatic production systems. The main object of competition in the global market has changed. The main thing now is the competition for the acquisition of technology markets. - This is currently the battlefield of leading companies (although this does not abolish competition for raw materials and for markets for goods). The system of relations in production teams, working groups has acquired new forms [8]. The workplace itself has become different. - For now, this is a computer desk. But, perhaps, in the near future, new mobile technologies will allow a person to work without reference to any kind of workplace [3], or maybe to an office. And this will require a change in personnel management. Today, the first forms of new models of personnel management in companies related to the field of digital technologies already exist. [3]. All this inspires us with optimistic hopes that we associate with the advent of Industry 4.0.

## 2. PROBLEM FORMULATION AND METHODOLOGY

In the near future, we can expect that robots will replace humans in everyday life and in production. And human labor will turn into a fascinating hobby. Therefore, the problem of jobs will disappear, as everyone will do what they love. A person will no longer worry that he might lose his job. And a person's life, deprived of everyday routine, and the prohibitions

[159] Full-time professor, doctor of sociology sciences. Professor of chair Sociology and personnel management Saint-Petersburg State University of Economics. 191023, Russia, Saint-Petersburg, 21, Sadovaya str., +79119605850, znl29@mail.ru
[160] Doctor of sociology sciences. professor, Ural Federal University, Mira St., 19, Ekaterinburg, 620002, Russia, +79021558734. e-mail: Irina.britvina@urfu.ru
[161] Full-time professor, doctor of economic sciences. Professor of chair Economics and Management, Vice-Rector Kalashnikov Izhevsk State Technical University. Russia Izhevsk 426069, Studencheskaya 7, bld 1, +79128563026, akuz63@mail.ru1

imposed by the features of industrial society, will acquire the character of genuine freedom. We can hope that Industry 4.0 will bring us prosperity and prosperity. Or as the Russian poet F.I. Tyutchev: «Blessed are they who sojourned here In this world's fateful hours» [7].

This is an optimistic view. However, there is a pessimistic view. The great Chinese thinker Confucius is imputed with aphorism: «May you live in interesting times». In his opinion, there is no more difficult period than the era of change. And modern science-fiction writers warn of a “rebellion of robots”, the transformation of a person into a part of a machine, or, in general, of the degradation of a person who is deprived of the opportunity to work fully — straining physically and mentally. Among black forecasts, the most attention for HR specialists deserves the opinion that automation deprives a person of jobs.

That is the problem. These are the two sides future Industry 4.0.

It is necessary to look at achievements and problem points systematically, holistically, without extremes of optimism and pessimism. The advantage of the systemic method is that it allows you to consider the object in all its internal relationships and in its relation to the external environment. The systemic method avoids the extremes of determinism. A systematic look opens up the possibility of seeing an object not only in two colors - white-black, but also in the whole variety of shades. From this point of view, we consider of the dilemma of job creation and loss before of Industry 4.0.

Currently, in the most advanced industries, all the same monotonous physical operations are replaced by robotic manipulators. And the work that tens and even hundreds of people performed on the conveyor is now carried out by one operator controlling a complex set of automatic mechanisms [5]. It is safe to say that in the near future the work of the worker will be replaced by the work of the operator, i.e. an employee either managing mechanisms or controlling their work. Therefore, it can be argued that the flagships of industry entered the era of Industry 4.0.

No less dramatic changes have occurred in the world market. Back in the 19th century, the main object of competition was resources. And therefore, competition in the world market between individual firms, major concerns and states as a whole was aimed at possessing world resources. What vividly and convincingly wrote more Lenin V. in his famous essay «Imperialism, the Highest Stage of Capitalism» [4].

It is this orientation of the world market that led to two world wars. And the world wars themselves proved to be an incentive for the collapse of the colonial system. In turn, the collapse of the colonial system led to a radical transformation of the world market. Competition for commodity markets has replaced competition for commodity markets. Now there was no need to conquer countries with resources. There was no need to spend money on the maintenance of “foreign legions”, “expeditionary corps”, “limited contingents” and other special military forces providing raw materials for the metropolises. Raw materials could be bought by laying the price for them in goods sold on controlled markets. Japanese concerns were the first to realize this, having begun to conquer sales markets with quality goods from the 50s. Twentieth century. High-quality goods have changed the global economy, creating a new type of global competition - competition for markets. High-quality goods have changed industry, urging them to bring production technologies to perfection. High-quality goods also changed the nature of management, ensuring the widespread introduction of quality management technology from the second half of the twentieth century. But most importantly, he changed the nature of consumption, creating a new society - a consumer society. [1].

These features of the second half of the twentieth century: advanced production technologies, quality management and a consumer society, will themselves be incentives for a new transformation of world competition. This transformation is ongoing. - Instead of competition

for markets for goods, competition for markets for technology has come. The essence of this competition is that now the enterprise does not need to fight for the end consumer. Now we need to fight for the consumer-manufacturer, or for the one who will acquire the technology of the enterprise.

The struggle for technology markets has fundamentally changed the nature of global competition. [2]. Now there is no need to conquer resource-rich territories. Now there is no need to capture sales markets and attract consumers with quality goods. Now you need to sell the technology. But only a specialist can sell the technology. A specialist needs to be trained. Therefore, in our time, the competition for the sale of technologies is won by those companies in countries where they train specialists in these technologies [5]. The turn of the XX / XXI centuries was marked by a struggle to attract foreign students to universities.

For example, a specialist - a foreign student, trained at the College of Engineering at the University of Illinois and practiced at Ford, will have excellent command of English spoken (since he studied in the USA), will be fluent in American engineering, will be well versed in Ford's automotive technology . Returning to his homeland, he naturally would prefer American technology Ford.

Competition for international students in the global market is a key point of the dilemma of job creation and loss before of Industry 4.0. There are several problems here. One of them is that graduates who graduated from one foreign university, returning to their homeland, become adherents of production technologies and culture of the country where they studied. And this leads to an inevitable conflict with representatives of the national industrial school. And the higher the country has a technological level, the higher its technological attractiveness in the world market, the less likely it is for graduates returning from abroad to find a job.

Another problem arising from the conditions of the modern market and the development of industrial technologies. The development of automation and robotization necessarily leads to a reduction in the total volume of jobs. And the struggle between countries for technology markets turns into a struggle to attract foreign students. International students do not pose a threat to the domestic national labor market. Having graduated from the university, they are obliged to return to their homeland. Therefore, countries and universities are fighting to attract as many international students as possible. But returning to their homeland, graduates become unemployed. The number of unemployed graduates returning to their homeland is increasing from year to year [5,9]. This is less true for graduates of prestigious foreign universities who occupy first places in the rankings. But the growth in the number of unemployed graduates, former foreign students, other universities is growing steadily [5]. Thus, jobs are getting smaller. And the number of unemployed graduates is increasing.

The third problem in the modern world is a large cohort of educated young people who have not found work. As the "demon of the world revolution" said L.D. Trotsky: "Youth is a barometer of revolution" [6]. Recognizing Trotsky's point in this, one should expect an increase in the prerequisites for global socio-political upheavals.

In general, it must be recognized that modern society is not ready to fully utilize the potential of highly educated young people who own modern technology. It is noteworthy that graduates with an education associated with traditional industrial professions find it easier to find work or create their own enterprises. A culinary college graduate can open his own bakery. A specialist in automotive fuel is working at a gas station. This indicates that in the modern world, in many developed countries, an infrastructure has been developed to support and develop small and medium-sized enterprises. But it applies only to traditional industrial professions.

Specialists of new information technologies are quite a different matter. Some of them, possessing the necessary knowledge, but having graduated from universities that are not prestigious, having not found work that is useful for society, find themselves occupying themselves in the "profession" of protest (for example, the movement of "yellow vests" in France) or in the ranks of terrorists. It should be recognized that today there is no social infrastructure using the potential of a cohort of young people with knowledge of information technology. The existing infrastructure for supporting self-employment of the population, small and medium-sized businesses is focused only on traditional industrial professions. Thus, the systemic method allowed us to identify three key problems of the dilemma of job creation and loss before of Industry 4.0:

1. The conflict in the labor market between graduates of national and foreign universities.
2. There are fewer jobs, and more graduates.
3. The modern infrastructure of business development is focused on traditional industrial professions, and not new information professions.

## 3. PROBLEM SOLUTION

To date, there are three known models for overcoming the identified problems. Two of them are valid to date. We will call one model American, the other Eastern European. Not so long ago there was a third - let's call it socialist. The main indicator of the American model is that there are high tuition fees at US universities. - This is on the one hand. On the other hand, this is a high social comfort, which the university itself and, in general, American society, can represent. All this should attract rich students and restrict access to the poor. Wealthy students are those who have the means to study in the USA. So, they have the means to open their own business in their homeland.

Ideally, the American model does not create a burden on the US labor market. At the same time, it stimulates the advancement of American technology in other countries. And it should be assumed that this model does not create a burden on labor markets in countries where graduates return. Since graduates themselves must create new jobs in their homeland. But this is only ideal. The credit system breaks this ideal, attracting poor students to education, which are incomparably more than rich. It is these students who, having lost their education or received an education, join the ranks of protesters and terrorists.

The Eastern European model is “free” education. The model is typical not only for a number of European countries, including Slovakia, the Czech Republic, Germany, and a number of others. The selection of capable applicants to the university. No tuition fees, either partial or low fees. As well as the possibility of long-term training. A typical case when a student of Germany can study at a university for 10-12 years. During his studies, he can change the direction of preparation, take a vacation. Most often, such a student can graduate from a university after 30 years, while having found a job for years of study. The advantages of this model. The burden on the labor market has been reduced. It is easier for the state to pay tuition than to pay unemployment benefits. But this applies only to national, not foreign students. This model is a solution to problems only for your country. The third model. Forgotten for today. It was used until the end of the 80s of the twentieth century, in countries called socialist at that time. Feature of this model. Education is free. Guaranteed employment of graduates after graduation.

The general principle of the functioning of the socialist model. Organizations submit applications to central authorities involved in the distribution of graduates. Usually, an enterprise applied to its branch ministry, otherwise it sent it to the ministry of education. The

university confirmed the application. After that, an order approved by the Government came out, binding on both enterprises that submitted applications and universities that confirmed the application.

The negative sides of this model were obvious at that time. The main drawback is the bureaucracy, which led to the failure of this model. Another disadvantage is the forced distribution of graduates. But the undoubted advantage of the socialist model was the guaranteed employment of graduates.

Is the “socialist" model applicable in our time? It should be noted that it is technically possible to recreate this model. Using state-of-the-art funds or with voluntary funds, they can create a modern, non-bureaucratic analogue of the socialist distribution model of graduates.

So, it is technically possible to create an analogue of the socialist model. But at present, it cannot be argued that such a need has been formed economically. However, in the former socialist countries there is an ambivalent attitude towards this model. And in other European countries - a misunderstanding of this model. All this indicates that in our time this model is unacceptable and psychologically. Thus, that we are given the considered models. How do they decide the dilemma of job creation and loss before of Industry 4.0.

The socialist model has ceased to exist and is unlikely to be resuscitated, which means that in the near future it cannot be considered as a means of solving our dilemma. The East European model is an excellent solution for the national labor market. But at its core, this model postpones the solution to the dilemma, and does not solve it. The American model is currently the most sought after. But its peculiarity is that it externally demonstrates a solution to the dilemma, but, in fact, stimulates the transformation of the dilemma into a crisis. In this regard, it can be argued that at present there are no effective means to solve the dilemma in question. But this does not mean that there are no ways to solve it.

The authors see such a path in the creation of a certain complex, which should include: firstly, an analogue of the infrastructure to support self-employment, small and medium-sized businesses in the field of new technologies; secondly, a certain analogue of the socialist distribution of graduates, built on modern information systems.

The general scheme of such a complex can be represented as follows. First of all, using social networks, a bank of enterprise problems is created that can be solved using new technologies. At the same time, enterprises set awards for solving these problems. You must understand that these can be relatively simple problems, the solution of which is not interesting or difficult for the personnel of enterprises. And naturally, these problems are not a state or commercial secret. Participants to solve such problems form a portfolio on their pages in social networks that reflects the thesaurus of the problems solved.

The next important point is the creation of an assessment center, under the auspices of the state or an authoritative charitable foundation, the first task of which is to create clusters of nomination ratings for participants. The second task will be to raise funds for the awards of participants. And the third task is to create a PR system, which will be based on a prize draw, which is necessary for further promotion of the evaluation center.

The proposed solution to the dilemma is only a very crude idea. But it should be noted that in the modern world, when a new object of competition has formed on the world market, those countries that will succeed in creating a modern infrastructure to support self-employment and small business in the field of new technologies will win.

## 4. CONCLUSION

Thus, it should be noted that as a result of Industry 3.0, the nature of production and the main object of competition in the world market have changed. All this has created the dilemma of job creation and loss, which threatens to escalate into a crisis ahead of Industry 4.0. Existing resolution models for the dilemma of job creation and loss were created and successfully applied under Industry 1.0 and Industry 2.0. There is an urgent need to create a model suitable for Industry 4.0, which, taking into account past experience, should be based on new technologies.

We emphasize once again that in the modern world those countries that will succeed in creating a modern infrastructure to support self-employment and small business in the field of new technologies will benefit.

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