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VPLYV INDUSTRY 4.0 NA TVORBU PRACOVNÝCH MIEST

*22. novembra 2018
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conference***

THE IMPACT OF INDUSTRY 4.0 ON JOB CREATION

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Tematické okruhy/Conference Topics

- 1) Innovation in terms of Industry 4.0
- 2) Social and Economic Context of Industry 4.0

Program

Streda / Wednesday - 22. November 2018:

Registration 9⁰⁰.10⁰⁰

Opening ceremony and plenary session 10³⁰.12⁰⁰

- *Adriana GREŇČÍKOVÁ*

Chairman of the Scientific Committee of the Conference, Alexander Dubček
University of Trenčín

Keynote speakers:

- *Martin MORHÁČ*

Director, SOVA Digitál, Inc.

- *Eva VANKOVÁ*

Human Resources Director, VETROPACK Nemšová, s.r.o. Nemšová

- *Alena VALJAŠKOVÁ*

Project manager, QUALED - Kvalifikácia a vzdelávanie, o.z.

Lunch 12⁰⁰.13⁰⁰

Conference workshops 13⁰⁰.17³⁰

Coffee break 15⁰⁰.15³⁰

Dinner 18⁰⁰.19⁰⁰

Closing of the conference 19⁰⁰.24⁰⁰

Section 1 - Innovation in terms of Industry 4.0

Chair: doc. PhDr. Jana Marie ŠAFRÁNKOVÁ, CSc.

- *Ivita FAITUSA*

THE OPPORTUNITIES TO IMPROVE INTERNAL AUDIT IN LATVIA
PUBLIC SECTOR

- **Dmytro ZUBOV - Nikolai SINIAK - Adriana GRENČÍKOVÁ**
IMPACT OF INDUSTRY 4.0 TECHNOLOGIES ON THE EMPLOYMENT OF THE PEOPLE WITH EYE PROBLEMS: A CASE STUDY ON THE SPATIAL COGNITION WITHIN INDUSTRIAL FACILITIES
- **Nikolai SINIAK - Sergey SHAVROV - Ninoslav MARINA - Karol KRAJČO**
EXAMINING THE FEASIBILITY OF INDUSTRY 4.0 FOR THE REAL ESTATE SECTOR WITH A LENS OF VALUE AND JOB CREATION
- **Evija RUSITE - Biruta SLOKA**
RANKINGS OF HIGHER EDUCATION INSTITUTIONS: ARE THEY INFLUENCE THEIR STRATEGICAL DEVELOPMENT
- **Laura KERŠULE - Biruta SLOKA - Iluta SKRUZKALNE**
EMPLOYEE MOTIVATORS IN TELECOMMUNICATION COMPANIES IN LATVIA
- **Zaneta SIMANAVICIENE - Andrius STANKEVICIUS - Arturas SIMANAVICIUS**
THE IMPACT OF INDUSTRY 4.0 ON ECONOMIC SECURITY
- **Biruta SLOKA - Sergejs VOLVENKINS - Kate CIPANE**
CHALLENGES FOR INTERNET SHOPS - RESULTS OF RECENT SURVEY OF CONSUMER'S IN LATVIA
- **Rusne JEGELAVICIUTE**
THE FOURTH INDUSTRIAL REVOLUTION IMPACT ON THE LABOUR MARKET
- **Ilze BULIGINA - Biruta SLOKA**
RECENT DEVELOPMENT TRENDS OF VOCATIONAL EDUCATION AND TRAINING IN LATVIA
- **Irina BRITVINA - Olga ERGUNOVA- Galina SAVCHUK**
SOCIAL AND PROFESSIONAL CHARACTERISTICS OF LABOR MIGRANTS AND LABOR MARKET DEMANDS IN A RUSSIAN MEGALOPOLIS
- **Vilma TUBUTIENE**
DILEMMAS OF EMPLOYEE PERFORMANCE APPRAISAL IN CIVIL SERVICES
- **Jana Marie ŠAFRANKOVÁ - Martin ŠIKÝŘ**
NEW TENDENCIES IN MANAGING PEOPLE IN SOCIETY 4.0

Section 2 - Social and economic context of Industry 4.0

Chair: prof. RNDR. Jaroslav Holomek, CSc

- **Vladimír BARTOŠEK - Marie JUROVÁ**
DIGITALIZATION OF LOGISTIC PROCESSES BY CUSTOMER SERVICES
- **Matej MASÁR - Mária HUDÁKOVÁ**
PROJECT RISK MANAGEMENT IN THE CONTEXT OF INDUSTRY 4.0
IN CONDITION OF MANUFACTURING ENTERPRISES IN SLOVAKIA
- **Marián AMBROZY - Eva HVIŽDOVÁ - Božena SOWA**
KNOWLEDGE COMPANY AS THE PICTURE OF "SOLLEN" IN TIME OF
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REPUBLIC FOR INDUSTRY 4.0
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- **Katarína HAVIERNIKOVÁ - Katarína KRÁĽOVÁ**
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AND INDUSTRY 4.0 IN CASE OF ENGAGEMENT INTO CLUSTER
COOPERATION ON EXAMPLE OF TECHNOLOGICAL SMES
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IMPACT OF LIVING CONDITIONS ON LABOR MOBILITY WITHIN
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Úvod

Medzinárodná vedecká konferencia „Vplyv Industry 4.0 na tvorbu pracovných miest“ nadväzuje na tradične poriadané konferencie 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. Martin Morháč predseda predstavenstva SOVA Digital a.s. 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 traditionally organized conferences 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 development, demography, and new technologies implementation in all areas of social life.

The plenary session will be held by the keynote speaker Ing. Martin Morháč - the Board of Directors Chairman of SOVA Digitál, Inc. 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.

ZNALOSTNÁ SPOLOČNOSŤ AKO OBRAZ "SOLLEN" V ČASE REVOLÚCIE 4.0

KNOWLEDGE COMPANY AS THE PICTURE OF "SOLLEN" IN TIME OF REVOLUTION 4.0

Marián AMBROZY¹

Eva HVIZDOVÁ²

Bożena SOWA³

Abstrakt: *Príspevok sa zaoberá vzťahom predstáv, kam by mala smerovať znalostná spoločnosť v zmysle optimálneho naplnenia vízie, k obrazu vzdelávania. Pokúšame sa v ňom o polemiku s Druckerovým pojmom znalostného pracovníka, kde sa zároveň zamýšľame nad možnosťami integračnej úlohy konkrétnych disciplín vedenia. Domnievame sa, že vedy samotné nemôžu preberať takú úlohu, a tak ju nemôže mať ani nejaký derivát informatiky, ani humanitná veda. Usilujeme sa poukázať na kľúčový charakter vzdelania v znalostnej ekonomike, pričom upozorňujeme na problém jeho fragmentarizácie a formalizácie. V empirickej časti príspevku vyhodnocujeme riadené rozhovory so špičkovými vedeckými osobnosťami, ktoré sú orientované na vzťahy vzdelávacej sústavy Slovenska, systému vied, marketingu a etiky vo vzdelávaní a vo vede sbudovaním znalostnej spoločnosti.*

Kľúčové slová: *znalostná spoločnosť, znalostná ekonomika, vzdelávanie*

Abstract: *The paper deals with the relationship of ideas where the knowledge society should aim in terms of the optimal fulfillment of the vision, the image of education. We try to discuss the polemic with Drucker's concept of a knowledge worker, where we also contemplate the possibilities of the integration role of specific leadership disciplines. We believe that science itself can not take on such a role, and it can not have any derivative of informatics or human science. We strive to point to the key nature of education in the knowledge economy, drawing attention to the problem of fragmentation and formalization. In the empirical part of the contribution, we evaluate interviews with leading scientific personalities that are oriented to the relationships of the Slovak educational system, the science system, marketing and ethics in education and the leading of the knowledge society.*

Key words: *knowledge society, knowledge economy, education*

JEL Classification: A 23, O 34, I 23, I 24

1. ÚVOD

Znalostnú spoločnosť považuje Anton Blažej (Blažej 2012) za jeden z pilierov XXI. storočia. Jestvuje základný rozdiel medzi termínmi informácia, vedomosť a znalosť. Ako to pregnantne vyjadril Štefan Kassay (Kassay 2014), informácia môže jestvovať izolovane, vedomosť obsahuje súvislosti so štruktúrou poznatkov, znalosť zasa uchopuje aj aktívnu zložku, vedomostí v ich schopnosti akcie. Izolované informácie sa nedajú využiť bez poznania súvislostí. V informačnej spoločnosti jestvuje nebezpečenstvo fragmentarizácie poznania. Znalostná ekonomika by mala poznanie defragmentarizovať. Natíska sa súvislosť rozdielu medzi mechanickým a dialektickým myslením. Hoci rozoznávame znalosti tacitné, implicitné a explicitné, nás zaujímajú explicitné znalosti.

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Znalostná ekonomika intelektualizuje prácu. Pre poznanie platia epistemologické zákonitosti. Dôležité sú tu také súvislosti ako je teória pravdy, konzistentnosť systémov, Gödelove teorémy a tým daná nemožnosť konzistentnej súvislosti vied. Hilbertov program sa stal nedosnivaným snom. Termíny vágnosť a naivný logický izomorfizmus sa stali mementom voči prvoplánovému optimizmu prvej tretiny XX. storočia. Ďalším významným faktorom je paralelné jestvovanie plurality teórií. Napriek tomu jestvujú vo vede integračné zoskupenia, ako ukázal napr. Ján Bodnár (Bodnár 2005). Nejde však len o systematizáciu štruktúry vedomostí, ale aj o systematizovanie vzdelania. Pravda, *conditio sine qua non* je možnosť plne sa uplatniť na poli vedy v zmysle slobody vedeckého skúmania. Môžeme rozoznať dva druhy indikátorov znalostnej ekonomiky, charakteristiky alebo prejavy znalostnej ekonomiky a výkonnostné, resp. output ukazovatele, pričom ďalej možno rozoznávať delenie na indikátory založené na charakteristikách znalostnej ekonomiky a výkonnostné indikátory.

2. CIEĽ A METODOLÓGIA

Štúdia sa pokúša zistiť aktuálne názory popredných slovenských vedcov na aktuálne otázky spojené s problémom znalostnej ekonomiky a znalostnej spoločnosti, ako aj vyjadriť súvislosti medzi vzdelávaním, spoločnosťou a ekonomikou. Teoretická časť je venovaná reflexii súčasného stavu problematiky doma a v zahraničí. Usilujeme definovať pojem znalostnej spoločnosti a vymedziť ho oproti pojmu informačnej spoločnosti na základe dištinkcie medzi informáciou, znalosťou a vedomosťou. Informácie sú determinované nárastom zložitosti. Opierame sa pritom o názory mnohých významných odborníkov, ako Štefan Kassay, Anton Blažej, Jozef Kelemen, Ladislav Andrášik, Milan Hejný, Peter Drucker, Konrad Liessmann. Usilujeme sa o filozofickú reflexiu problematiky znalostnej spoločnosti. Usilujeme sa predovšetkým konfrontovať pojem znalostný pracovník, ktorého autorom je Drucker s reflexiou vedy u Martina Heideggera. V kontexte znalostnej ekonomiky sa práca zaoberá aj podnikaním a kompetenciami manažera. Pokúšame sa ukázať, že znalostná ekonomika funguje aj v systéme humanitných vied. Zároveň sme si dali za cieľ vysporiadať sa s poverou, že znalostná ekonomika je pre humanitné vedy likvidačná. Teoretická časť štúdie sa usiluje vyjadriť filozofické súvislosti medzi budovaním systému vied, vzdelávaním, spoločnosťou a ekonomikou. Autorom pojmu je známy rakúsky teoretik manažmentu Peter Drucker.

Cieľom empirickej časti štúdie bolo posúdiť, v akom štádiu je postavenie znalostnej ekonomiky na Slovensku v jej širšom diapazóne, na základe názorov odborníkov z viacerých vedných oblastí. K téme znalostná ekonomika a školstvo sme pripravili prieskum, ktorý bol urobený na základe desiatich otázok. Samotné otázky sme položili mnohým renomovaným odborníkom. Aj keď nie každý z oslovených sa cítil kompetentný odpovedať, rozhovor nám poskytlo deväť špičkových slovenských vedeckých osobností: prof. RNDr. Ján Košťálik, DrSc., prof. Ing. Ladislav Andrášik, DrSc., akad. prof. PhDr. Ing. Štefan Kassay, DrSc., akad. prof. Ing. Štefan Luby, DrSc., člen – korešpondent SAV, prof. Ing. Július Alexy, CSc., prof. Ing. Milan Šikula, DrSc., prof. Ing. Anna Šatanová, CSc., prof. PhDr. Rudolf Dupkala, CSc., prof. PhDr. Dalimír Hajko, DrSc.. Prieskum pozostával z otázok rôzneho zamerania, na ktoré odborníci z rôznych vedných disciplín odpovedali podľa svojich názorov a dispozícií.

3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

Znalosti sú považované za štvrtý výrobný faktor ekonomiky. Je to spojené i s javom, nazvaným informačná globalizácia. „Ide o schopnosť nachádzať, vytvárať, hromadiť, prenášať a využívať nové poznatky, čo treba považovať za rozhodujúce pre ďalší ekonomický, sociálny a kultúrny rozvoj každého štátu“ (Kuzmišin 2000, s. 18). Možno súhlasiť s konštatovaním, ktoré napísal Berawi: „Žijeme vo svete plnom hmatateľných a nehmatateľných údajov, kde niektorí ľudia môžu získať výhody z osobných informácií iných s

malými obmedzeniami a takmer žiadnym dohľadom“ (Berawi 2018, s. 430). Pokiaľ terminologicky analyzujeme termíny informácia, znalosť vedomosť, môžeme sa odraziť z dištinkcií termínov, ako ich chápe Štefan Kassay (Kassay 2014). Informácia môže byť daná osamotene a je vnímaná bez štrukturálnych súvislostí. Vedomosť znamená spojenie s interpretáciou a súvislosťami. Znalosť neznamená bohemistický ekvivalent termínu vedomosť, ale znamená to vedomosti v akcii, t. j. vedomosti v dimenzii akčnosti. Znalosť je súčasť kognitívnych schopností, poznatky v konglomeráte kompetencií, ktoré umožňujú ich použiteľnosť (Kelemen 2007).

Ak možnosti zotrvať len na prvoplánovej báze informácií môžeme vyčítať fragmentárnosť, potom sa jej pokúša vyhnúť práve koncepcia znalostnej spoločnosti. Môžeme sa oprieť o teoretické poznatky B. M. Kedrova, ktorý hovorí o integračných procesoch vo vede: cementácia, fundamentácia, pivotácia. Bodnár varuje pred redukcionizmom, napr. chémie a biológie na fyziku (Smart, Szent – Györgyi) (Bodnár 2005). Vytvárajú sa integračné útvary, ktoré sú väzbou dvoch – troch príbuznejších disciplín. Ak sa Bodnár pýta, či možno vednú oblasť ako celok pokladať za integračný útvar, jednu odpoveď ponúka práve Kedrov, keď vníma filozofiu ako generálnu vedu, v súvislosti s ponímaním filozofie v marxizme ako vedy. Treba upozorniť aj na príspevok L. Andrášika, ktorý hovorí, že z ekonómie vedomostí v užšom zmysle sa môžeme posunúť na vyššiu úroveň cez kvázinoogenézu, t. j. cez poznanie súvislostí, celostných vzťahov, neformálnych znalostí, čiže vedomosti v štruktúrnych súvislostiach s úsilím o prepojenie do určitého holistického obrazu (Andrášik 2007). Pravda, dôležitý je rýchly transfer vedomostí z univerzít do priemyslu, čím sa zaoberajú napr. Calvo a kol. (Calvo a kol. 2018).

Dovolíme si súhlasiť s Druckerom v tom, že žiadne vedy – a teda ani humanitné – nemôžu mať intergačnú úlohu v poznaní (Drucker 1993). Veda skutočne nemôže integrovať ostatné vedy, na to jednoducho nemá kompetencie. Všetky vedy sú rovnocenné, v tom nemožno Druckerovi oponovať. Veda ako celok je braná väčšinovo pozitívne. Zatiaľ čo ideologický scientizmus je dosť zriedkavý, to, čo sa predpokladá ako vedecká pravda, bežne slúži ako dôkaz pre širokú škálu názorových pozícií (Hemminger 2017). Môžeme s Druckerom viesť imaginárny dialóg, čo myslel „rozumenie vedám“? Ak ide len o poznanie v rámci všeobecných vedomostí, toto len zriedka môže produkovať nový poznatok, aj keď i porozumenie vedám môže byť mnohokrát nápomocné pri aplikácii poznatkov. Druckerov názor o tom, že slobodné umenia rozdeľujú, vôbec nezdieľame. Jeho pochopenie znalostného pracovníka, ktorý má porozumenie vedám, musíme doplniť v súvislosti s Heideggerovým varovaním (Heidegger 2013) pred fachidiotizmom ako dôsledkom prílišnej špecializácie. „Vznik historicity v dvadsiatom storočí a zvýšenie dôležitosti histórie a filozofie vedy je kľúčovým vedľajším produktom Heideggerovej práce“ (Nobre, Duarte a Jacquinet 2018, s. 187). Utrafený je názor, ktorý zastáva filozof Slomski „je správne brať do úvahy interdisciplinárnu prácu, pretože riešenie problému vyžaduje, aby sme sa zaoberali tou istou otázkou z rôznych uhlov pohľadu a na v tom istom čase si vyžaduje špecifické znalosti v oblastiach, ktoré nie sú spojené“ (Slomski 2018, s. 67). Druckerov obraz znalostného pracovníka musíme doplniť minimálne v dvoch pripomienkach: a) potrební sú aj špecialisti, ktorí sa pohybujú v dvoch, niekedy troch odboroch na špičkovej úrovni a vtedy môžu produkovať nové poznatky, b) je potrebné vyvarovať sa negatívnym trendom v prevádzkovom charaktere vedy v zmysle ovplyvňovania obsahu vedeckého skúmania nakladateľmi a rôznymi lobistickými skupinami, ktoré sa usilujú verejnosti vštepiť určité názory a obrazy. Kassay ukázal, že Druckerovi „znalostní pracovníci“ budú patriť technike a nie prírode (Kassay 2014). Heideggerova kritika niektorých rysov vedeckej prevádzky je takmer zhodná s Kassayovou a je korelatívom predstáv rakúskeho teoretika Druckera.

Niektorí teoretici upozorňujú aj na určitú ideologickú indoktrináciu v ekonomických vedách. Kellecioglu tvrdí, že „ekonómovia stojaci na dominantnej názorovej pozícii (viac ako nesúhlasiaci ekonómovia) majú kombináciu naivitu a nečestnosti o úrovni ich objektívnosti. Ešte dôležitejšie je, že nejasné normy bránia transformácii pretože vytvárajú ilúziu

nestrannosti a vedeckých štandardov, čo sťažuje podporu prípadu alternatív“ (Kellecioglu 2017, s. 20). Spomínaný autor sa nazdáva, že ekonomika je viacej než iné vedy, najmä prírodné vedy, ovplyvňovaná normami.

„Štvrtá priemyselná revolúcia je založená na koncepcii inteligentnej továrne. Široké továrne majú úplne nový prístup k výrobe“ (Crnjac, Veza a Banduka 2017, s. 21). Niektorí autori vidia integratívnu úlohu výpočtovej techniky v rámci priemyselnej revolúcie 4. 0. Podstatou vízie priemyslu 4. 0 je všadeprítomné interné prepojenie vecí, ľudí a strojov. Charakteristickou črtou odvetvia 4.0 je rozhodujúca úloha účinnosti organizácie na výmenu informácií (Kolesnichenko, Radyukova a Pakhomov 2019, s. 73). Ako upozorňuje Munkácsi (Munkácsi 2018), spotrebiteľia si na internete vymieňajú informácie a skúsenosti s produktmi. Virtuálny svet a fyzické objekty v reálnom svet spolupracujú za účelom optimalizácie plánovania taktiky ďalších výrobných krokov. „Výpočtová technika bola jednou z najplodnejších oblastí integrácie, členenia a zosúladenia široké spektrum disciplinárnych vstupov, od humanitných vied k tvrdým vedám“ (Nobre, Duarte a Jacquinet 2017, s. 188). Internet ako robustný nástroj určite disponuje potenciálom v oblasti stimulácie znalostnej ekonomiky, podporuje rozširovanie inovácií, budovanie znalostnej základne osobností ako aj rozvoj technologických oblastí (Bogoviz a kol. 2019, s. 44). Na akademickú otázku, či sú informačné systémy vedou, odpovedajú napr. Dennis, Valacich a Brown, že jednoznačne áno nakoľko „čerpajú a vytvárajú poznatky v podobe mnohých rôznych disciplín vrátane psychológie, sociológie, matematiky, ekonómie, informatiky a inžinierstva“ (Dennis, Valacich a Brown 2018, s. 211). Integratívnu úlohu zohráva filozofia, ktorá vedou nie je. Filozofiu za vedu považujú niektorí fenomenológovia inšpirovaní Husserlom, ktorí ju vnímajú ako prísnu vedu o podstatách, ktorá pracuje metódou fenomenologickej a eidetickej redukcie. Heidegger pritom hovorí, že filozofia je metateóriou vedy (a filozofia ako taká zotráva na filozofických fakultách len s ohľadom na historické tradície), Wittgenstein zasa upozorňuje, že filozofiu možno dať nad alebo pod konglomerát vied, že samotná disciplína vedou nie je, a teda nemôže sa k vedám priradiť ako jedna z nich. Keďže reflektívna úloha metodológie vedy, filozofie vedy, do istej miery aj logiky a epistemológie, môže o vede systematicky pojednávať, integratívnu úlohu vidíme práve vo filozofii ako v disciplíne, ktorá vedu môže reflektovať na všeobecnej úrovni ako jej možná metateória. Zároveň by tým bola vypočítaná oprávnená výčitka Druckera, podľa ktorej humanitné vedy nemôžu mať integračnú úlohu, keďže všetky vedy sú rovnocenné.

Kritické pripomienky k téme znalostnej spoločnosti má i Liessmann (Liessmann 2009). Myslí si, že výskumný potenciál môže degradovať na zónu ekonomického ohodnotenia. Pripomína, že niektorým reformátorom univerzít nejde o všeobecné vzdelanie, že napokon nie je cieľom ani vzdelanie ani poznanie pravdy. Rovnako filozof Adorno kriticky pristupuje k otázke vzdelanosti, vypichuje fenomén polovzdelanosti (Adorno 1959). Stále však prevláda technologický optimizmus, ktorý spochybňujú alternatívne predstavy (Strand a kol. 2018, s. 1849). Najpesimistickejší scenár je ten, ktorý predpokladá implementáciu skrytých hrozieb pre koncepciu priemyslu 4. 0 v procese jeho praktickej implementácie, keďže jej dôsledkami sú nerovnováha a kríza ekonomických systémov a pravdepodobne globálnej ekonomiky vcelku (Ragulina a kol. 2019, s. 232).

Jestvujú i štúdie, ktoré pripomínajú vzťah zoštíhlenej (lean) výroby a nových technológií, skrývajúcich sa pod termín priemysel 4. 0. Metternich a kol. (Metternich a kol. 2017) hovoria že napriek čiastočným rozporom zoštíhlená výroba (lean productivity) je považovaná za predpoklad pre účelnú digitalizáciu. V inteligentnej výrobe, ktorá je budovaná na základe zoštíhlenej výroby, bude leader rozhodovať aj podľa informácií a nielen podľa skúseností (Crnjac, Veza a Banduka 2017, s. 24). Informačný systém je prepojený s produktom. „Nová priemyselná revolúcia vytvorí podmienky, v ktorých je odvetvie udržateľné, kde sú zamestnanci kvalifikovaní a postupujú vo vzdelávaní, takže sú schopní podporiť optimalizáciu vo všetkých segmentoch priemyslu“ (Crnjac, Veza a Banduka 2017, s. 29). Spomínaní autori poukazujú na úspešnú realizáciu krokov priemyslu 4. 0 v niektorých

nemeckých firmách (Bosch a i). V tejto súvislosti spomeňme, čo konštatuje Suchodolov, že „priemysel 4.0 je novým vektorom rozvoja priemyslu, ktorý je prezentovaný len v niektorých rozvinutých krajinách a má malý podiel na ich reálnom sektore - avšak v budúcnosti to môže viesť k postupnej modernizácii ostatných priemyselných odvetví“ (Suchodolov 2019, s. 3). Napríklad ako Lobova a jej spolupracovníci uvádzajú vo svojich záveroch, výsledkom výskumu sú vedecké dôkazy o skutočnosti, že napriek nedávnomu objaveniu koncepcie Industry 4.0 sa už nahromadili úspešné skúsenosti s jeho praktickou implementáciou v krajinách sveta. Rozvinuté krajiny už začali vytvárať odvetvie Industry 4.0, pretože majú potrebné zdroje a sociálne platformy. Komplexná analýza prognostických údajov podľa príkladu USA, Veľkej Británie, Nemecka a Japonska ukazuje vysokú účinnosť z hľadiska stimulovania rozvoja znalostnej ekonomiky“ (Lobova a kol. 2018, s. 121). Spracovanie výsledkov kritéria hodnotenia dôsledkov priemyselnej revolúcie 21. storočia predpokladá tradičné zváženie výsledného ukazovateľa - koeficientu odhadu efektívnosti priemyselnej revolúcie XXI. storočia (Ragulina a kol. 2019, s. 243). Výskumníčka Popkova (Popkova 2019) sa nazdáva, že budovania znalostnej ekonomiky v počiatočnej fáze je platformou na začatie podnikateľskej činnosti v priemyselnom odvetví 4.0. Autori Bzhalava a Cantner zastávajú názor, ktorý podporil vlastným výskumom, podľa ktorého „vysoký stupeň otvorenosti inovácií je spôsobený skôr nedostatkom vedomostí ako cieľmi minimalizácie rizika nákladov“ (Bzhalava a Cantner 2018, s. 245).

Autor Gruzkov navrhuje model "kognitívneho človeka", ktorý je považovaný za jeden zo základných výsledkov vzniku "ekonomického človeka" pod vplyvom vedeckého a technologického pokroku a inovačného rozvoja hospodárstva a spoločnosti ako celku (Gruzkov 2019, s. 235). Aj keď „rozhodovanie predstavuje jednu zo základných manažérskych aktivít“ (Jankelová, Mišúnová Hudáková, Mišún 2013, s. 737), na druhej strane treba poznamenať, že človek sa nerozhoduje stále racionálne a nerobí stále iba racionálne rozhodnutia, a aj v ekonomickej oblasti robia rozhodnutia, ktoré nie vždy korešpondujú s ich vlastnými záujmami (Neto a Neto 2018). Aj v tejto súvislosti je s kreovaním znalostnej spoločnosti a ekonomiky kľúčovou úlohou vzdelávanie, s čím sú spojené i odporúčania realizovať v praxi niektoré perspektívne pedagogické a didaktické prístupy. Ide v nich aj o zbavenie sa formalizmu vo vzdelávaní a nahradením povrchného prístupu k vzdelávaniu hĺbkovým. Ako poukazujú Hejný a Kuřina (Hejný a Kuřina 2009), je potrebné so žiakom prejsť z úrovne individuálneho modelu na univerzálny model, pričom je nutné oživenie určitého vzoru cez abstrakčný zdvih. Za najzákladnejší nedostatok vzdelávania považuje Milan Hejný formalizmus. Treba rozoznávať hĺbkový a povrchový prístup k vzdelávaniu ako aj univerzálny model vo vzdelávaní ako varieta s vyššou prestížou a integrovanejšou štruktúrou než je izolovaný model. Zatraktívniť vzdelávanie môže hra, ako na to poukazujú Gazdi a kol. (Gazdi a kol. 2018), ktorí sa opierajú o okamžitú spätnú väzbu výkonnosti v hre, čo ich robí ideálnymi kandidátmi na vzdelávacie účely.

V slovenskom geografickom priestore síce došlo k nárastu percentuálneho podielu vysokoškolsky vzdelaného obyvateľstva, ale daný údaj nie je výpovednou hodnotou. Úroveň absolventov sa líši, napr. aj štúdiá výskumníkov z Nemecka ukazuje rôznorodú úroveň ekonomických vedomostí študentov na začiatku ich vysokoolškolského štúdia (Happ, Zlatkin – Troitschanskaia a Förster 2018). Otázka je spojená s kvalitou vzdelávania, čo je špecifický problém. Znalostná spoločnosť napriek tomu má spojitosť s didakticko – pedagogickým rozmerom. „Zrýchlená digitalizácia modernej spoločnosti zvyšuje dopyt po inžinieroch s kreatívnym myslením, ktorý vedie k rozvoju novej filozofie vzdelávania - inteligentné vzdelávanie“ (Makarova a kol. 2018) V tejto súvislosti teoretici pedagogiky prišli s mnohými koncepciami ako Vysoko efektívne učenie (K. Olsenová), konštruktivistický prístup, bádateľsky orientované vyučovanie. Fragmentarizácia vo vzdelávaní pritom ostáva problémom, úlohou znalostnej ekonomiky je práve defragmentarizácia poznania. Treba vytvárať využiteľné integrované systémy poznatkov. V tejto súvislosti je dobré pripomenúť jestvovanie projektov ako face to face univerzita a virtuálna univerzita. „Osobná a virtuálna

univerzita sú modely, ktoré musia byť ďalej rozvinuté, aby naďalej existovali a vyvíjali na univerzite 4,0 s učiteľmi, ktorí modelujú svoj štýl učenia podľa pedagogicko-emocionálnych požiadaviek” (Cataldi, Dominighini 2018, s. 1). Koncepcia podnikateľskej univerzity, má za cieľ podporiť prenos vedeckých poznatkov do spoločností a podporiť sociálno-ekonomický rozvoj (Dalmarco, Hulsink a Blois 2018). Na druhej strane, autori Hauge, Pinheiro a Zyzak sa domnievajú, že napr. v Nórsku majú inštitúcie vysokoškolského vzdelávania a kreatívno – kultúrny priemysel určité štrukturálne a kognitívno-kultúrne prekážky, ktoré zabraňujú vzájomnej spolupráci (Hauge, Pinheiro a Zyzak 2018). Naopak, za pozitívny činiteľ v oblasti produkcie vedeckých pracovníkov pokladajú výskumníci Tartari, Di Lorenzo a Campbell mobilitu (Tartari, Di Lorenzo a Campbell 2018). Kaya a kol. (Kaya a kol. 2018) sa usilujú okrem iného premeniť teoretické poznatky o tom, ako veda pôsobí v spoločnosti do praktických aplikácií pre výučbu a učenie prírodovedných predmetov.

Ďalej nasledujú analýzy odpovedí deviatich renomovaných vedeckých pracovníkov, ktoré vypracovali na základe položených otázok, ktoré sa týkali oblastí vzťahu znalostnej ekonomiky a humanitných vied, znalostnej ekonomiky a environmentu, hodnoty vzdelania v domácom prostredí (bývalé Československo), vzťahu vzdelávacieho systému a systému vied, reliability výsledkov vedy, aktuálneho status quo v oblasti budovania znalostnej spoločnosti, vzťahu investícií a vytvárania znalostnej spoločnosti, ako aj úlohy etiky a marketingu v znalostnej ekonomike.

K prvej otázke, ktorá znela nasledovne: „Niektorí tvrdia, že znalostná ekonomika je pre humanitné vedy likvidačná. Je to podľa Vás neopodstatnená povera, alebo fakt“. Odborníci v tejto otázke sa zhodli, že je to nezmysel v kontexte likvidácie humanitných vied a vnímajú túto problematiku skôr ako pozitívny dopad smerom k rýchlejšiemu ekonomickému rastu a kreativity v sebarealizácii podnikateľských subjektov.

„Odborníci sa zhodli, že humanitné vedy sú *conditio sine qua non* znalostnej ekonomiky“.

Druhá otázka smerovala ku korelácii znalostnej ekonomiky a environmentálnych dopadov, na ktorú odborníci vyjadrili názor, že korelácie sú neodmysliteľné, avšak niektorí autori vyčítali reálne podceňovanie environmentálnej politiky, väčšina respondentov vníma korelácie ako pozitívne v prospech životného prostredia. Spomínané podceňovania životného prostredia považujú za jav idúci proti človeku, pričom kontext sa odvíja aj regionálne. Impaktom je integrácia človeka do prejavujúcich sa zmien. Neustály rast nemôže byť dlhodobou udržateľný. Odborníci sa síce zhodli na koreláciách avšak niektorí konštatujú podceňovanie problematiky environmentálnej politiky, čo je na zváženie. Niektorí sa domnievajú, že vzhľadom na dlhodobosť procesov environmentálnych dopadov je predpoveď výsledku korelácie obtiažna až nepredikovateľná.

V tretej otázke sme sa pýtali, že do akej miery súčasné slovenské (české) školstvo produkuje vzdelaných ľudí ako plnohodnotný základ znalostnej spoločnosti a do akej miery je to len akási hra na vzdelanie? Odborníci sa vyjadrili s zmysle nekompatibility vzdelania u niektorých profesorov na kľúčových pozíciách; kriticky pohľad sa blíži k druhej možnosti v otázke č. 4, žiada to vytvoriť plnohodnotnú databázu znalostnej spoločnosti, na ktorej je treba stavať zásadnú organizačnú reformu, v ktorej by sa mala premietnuť aktuálna pluralita hodnôt. Odborníci konštatujú zaostávanie českého i slovenského školstva za vývojom znalostnej ekonomiky vo svete, Česi sú pritom kompaktnejší. Znalostná ekonomika nie je správne uplatňovaná v praxi, nie je to len čierno – biele a je potrebné realizovať nápravné opatrenia. Neduhom je kredencializmus – získavanie titulov nekrytých znalosťami. Väčšina odborníkov sa zhodla na výrazných nedostatkoch slovenského a českého školstva, avšak niektorí upozorňujú na jestvujúce kvalitné pracoviská a vidia v budúcnosti potencialitu pozitívneho obratu.

„Domnievate sa, že kurikulá všeobecnovzdelávacích i odborných škôl by mali - v zhode s profiláciou absolventa - kopírovať jestvujúci systém vied, alebo je v kurikulách prípustné sa od predmetného modelu aj značne odchyľovať, a to aj v prípade, že odchýlka nie je nutná vzhľadom na profiláciu absolventa?“ Táto otázka bola položená v poradí ako **štvrtá**.

Respondenti zastávajú i vzájomne kontroverzné názory. Podľa odpovedí by profilácia mala byť prvoradá, avšak je možná aj odchýlka od predmetného modelu. Humanitné vedy treba viac prepojiť s prírodnými a technickými vedami. Odchýlky sa môžu vyskytnúť v súlade s duálnym vzdelávaním na odborných vysokých školách so špecifikami v odvetví, pre ktoré sa mladí ľudia pripravujú. Synergia systému vied má aj vývojovo pôsobiť na profiláciu absolventov. Podľa iných respondentov je odchýlka kurikula od systému vied nemožná, kurikula musia sledovať vývoj vied. Iní sa nazdávajú, že kurikulum je možné i meniť, mnohí cítia potrebu zmien oproti jestvujúcemu stavu. *Zaznamenali sme rozpory medzi respondentmi, kým niektorí nepripúšťajú odchýlku kurikula od systému vied, iní zasa naopak hovoria, že odchýlka je nevyhnutná v súvislosti so zmenami ako aj v súlade s duálnym vzdelávaním.*

Piata otázka znela: „Myslíte si, že vedci sa vo väčšine usilujú svojimi vedeckými výsledkami v čo najvyššej miere tieto výsledky a predpoklady empiricky overovať/falzifikovať, alebo skôr vytvárajú vedecké teórie, ktoré nie sú stále a dostatočne overované a falzifikované?“ Niektorí respondenti sa domnievajú, že na otázku sa nedá jednoznačne odpovedať, iní si myslia, že je potrebné udržiavať kontakt s empirickou realitou. Respondenti upozorňujú aj na fakt, že všetko nie je verifikovateľné a subjektivistické dôvody ukazujú i zámerné pridržiavanie sa chybných teórií a fakzifikujú sa aj ideológie. Situácia je podľa nich rozdielna aj podľa krajín, na Slovensku sa často rodia neverifikovateľné teórie, zmeny prináša nová infraštruktúra z fondou EÚ. Kompetencie vedcov, teoretikov a výskumníkov musa byť patrične, proporcionálne rozdelené. *Rozpor vnímame v názoroch na zodpovedateľnosť otázky. Väčšina respondentov sa prikláňa k potrebnosti verifikácie resp. falzifikácie, aby bol zabezpečený reálny postup vedeckého poznania.*

Otázka šiesta: „Do akej miery sú považované štrukturálne a organizačné zmeny v spoločnosti za postačujúce na vybudovanie skutočnej znalostnej spoločnosti?“ Respondenti považujú jestvujúce zmeny za nepostačujúce, nedostatočné, ba kontraproduktívne na vybudovania skutočnej znalostnej spoločnosti, nakoľko naša spoločnosť nemá organizačné zmeny chápania cieľového poňatia znalostnej ekonomiky – je to otvorený proces. Tieto zmeny majú nesporný východiskový význam v kontexte špecifických reforiem, avšak pri dostatočnom solidnom vedeckom základe. Realizácia zmien záleží od definovania štrukturálnych a organizačných zmien, ktoré v konečnom dôsledku môžu zlepšiť aktuálnu situáciu, pri ich správnom nastavení. *Všetci respondenti si uvedomujú nutnosť zmien vzhľadom na nedostatočnom jestvujúceho stavu v súlade s vývojom znalostnej spoločnosti vo svetovom meradle.*

Otázka siedma: „Ako sa podľa Vás prejavili zmeny v oblasti riadenia ľudských zdrojov v spojitosti so znalostnou spoločnosťou (priority podnikov a trendy v oblasti ľudských zdrojov)?“ Na túto otázku respondenti odpovedali vo viacerých prípadoch, že na ňu nevedia relevantne odpovedať. Riadenie ľudských zdrojov je dôležité na každom poste, vo vyspelých spoločenských sa orientuje na osobný prístup, ľudské zdroje sa chápu ako konkurenčná výhoda. Problematiku je potrebné ešte viac preskúmať, nakoľko všetko závisí od miery uplatnenia znalosti jedinca v spoločnosti. Riadenie berie málo do úvahy potreby prípravy ľudí na nové podmienky znalostnej ekonomiky. *Riadenie ľudských zdrojov predstavuje v znalostnej ekonomike dôležitý indikátor, ktorému sa nevenuje dostatočná pozornosť na všetkých úrovniach ekonomického života spoločnosti.*

V otázke číslo osem, sme chceli vedieť, že do akej miery respondenti považujú vynaloženie investícií do vzdelávania v rámci SR (resp. ČR) za účinné, utrafené. Viacerí považujú investície za nedostatočné, neúčelne a neutrafene využívané a niektorí respondenti nevedeli na položenú otázku odpovedať. Pre poctivé vzdelávanie opýtaní považujú investície za potrebné. Vyžadujú posúdiť mieru vplyvu investícií na osobný rast pracovníkov. Slovensko považujú za tretiu ligu inovátorov, ktoré dáva na vedu pomerne málo, čo je príčina jeho zaostávania za vyspelými krajinami. *Investície do vzdelávania sú veľmi žiadané, súčasná miera je nepostačujúca, neúčelne a neutrafene nasmerovaná. Bez zvýšenia investícií do*

vzdelávania a ich účelného nasmerovania nie je možná zmena smerom k vyrovnaníu sklzu za vyspelými krajinami.

„Do akej miery je otázka etiky a morálky podstatná vo vzťahu k znalostnej ekonomike“? táto otázka bola respondentom položená v poradí ako **deviata**. Treba vychádzať z rešpektovanej hierarchie hodnôt a z osobnostných dispozícií jednotlivých vedeckých pracovníkov. Etika je prvoradá aj ako etika vedy, musí humanizovať ekonomiku, jestvuje nutnosť zodpovednosti a čestnosti vo vede a reálnej znalostnej ekonomike. Etika je dôležitá i preto lebo predošlá hospodárska kríza bola kvalitatívne iná ako doterajšie, bola to kríza civilizácie. Podľa jedného z respondentov nedisponujeme zodpovedajúcim systémom hodnôt novej civilizácie. *Etika a morálka sa nedá oddeliť od ekonomiky a rovnako aj od žiadnej inej vedy.*

„Akú rolu zohráva marketing a jeho nástroje v kontexte znalostnej ekonomiky, nakoľko niektorí významní ekonómovia mu nepripisujú význam (považujú ho za „pavedu“). Na túto v poradí **poslednú** otázku respondenti odpovedali rôzne, ich názory nie sú kompatibilné. Viacerí zastávajú názor, že marketing nie je veda, dokonca ho považuje jeden z opýtaných za praktickú činnosť, ktorá má však v znalostnej ekonomike svoje opodstatnenie. Jeden z respondentov ho považuje za prekonaný cielenou komunikáciou. Ostatní respondenti marketing považujú za vedeckú metódu, ktorá je však zneužitelná a v budúcnosti bude mať iný rozmer, pričom zohráva vysokú rolu pri zabezpečení znalostnej ekonomiky a ktorý je potrebné ešte viac posilniť. Marketing v kontexte znalostnej ekonomiky je absolútne legitímny pri splnení elementárnych kritérií teoretickej vednej disciplíny. Marketingový prístup bez zodpovedajúceho ekonomického rastu považuje jeden z respondentov za kontraproduktívny. *Marketing a jeho inštrumentárium je neoddeliteľnou súčasťou rozvoja znalostnej ekonomiky aj napriek názorovým nezhodám respondentov. Komunikácia ako základný komunikačný nástroj má dôležitú funkciu z pohľadu rozvoja znalostnej spoločnosti.*

4. ZÁVER

V príspevku sme ukázali, že vízia znalostnej spoločnosti je založená na úsilí vyhnúť sa fragmentarizácii poznatkov, kredencializmu a formalizmu. Predmetná perspektíva predpokladá okrem rozlišovania znalostí od vedomostí najmä upravením pomeru všeobecného a špeciálneho v rámci kurikula učebných a študijných programov optimalizovať vzdelávací proces. Pokúsili sme sa argumentačne podložiť, že integračnú úlohu vo vzdelávaní nemajú nijaké z vied, v tomto zmysle odmietame myšlienku, že ju majú informatické alebo humanitné vedy. Domnievame sa, že vo vzdelávaní má takú úlohu filozofia, ktorá vedou nie je. Usilovali sme sa kriticky prehodnotiť i Druckerovu predstavu znalostného pracovníka. Zamýšľali sme sa aj nad vzťahom zoštiehlenej výroby a priemyslu 4. 0. Rovnako sme reflektovali na koncepcie ekonomického a kognitívneho človeka, a to aj vzhľadom na niektoré iracionálne vplyvy na rozhodovanie človeka. Stanovili sme za cieľ aj za cieľ zistiť názory významných slovenských vedeckých osobností na podstatu znalostnej spoločnosti a realizáciu uplatňovania znalostnej ekonomiky v našom geografickom kontexte, čo bolo vykonané.

Dodatok

Tento príspevok bol vytvorený v rámci projektu Tradičné ľudovomelecké remeslá v kontexte kreatívneho priemyslu IG-KEMM-02/2017-3.3.9.

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ANTI-CRISIS MANAGEMENT OF ECONOMICS IN THE CONTEXT OF DECENTRALISATION

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Abstract: *Under the present-day conditions of economic system development, the initial sign of crisis phenomena is ineffective management. It is suggested to find tools for getting out of crisis to stabilize the state of the economy. One of the tools applied in Ukraine is decentralisation reform aimed at developing the territories and overcoming the decline in production, reducing the budget deficit at different levels, reducing the overall exports of raw stuff, materials and energy, introducing innovations, improving the quality of life, increasing the demand for goods and services, and so on. A conceptual scheme has been developed, with the included step-by-step analytical study of the national economy and the economy of territorial units, prediction and forecasting of the crisis, development of a national anti-crisis strategy and a regional approach, elaboration of the actions for its provisions in anti-crisis programs (plans), economic development strategies and control over their implementation at all levels. The situation of anti-crisis management of economy under the conditions of decentralisation is considered with the help of simulation. The result of a simulated example is the decision to apply anti-crisis measures to overcome crisis phenomena. Cluster analysis was used to identify the most critical areas in the country. On the basis of this analysis, it was suggested to use an algorithm of grouping territorial entities according to the level of improvement in the anti-crisis management by the national economy of Ukraine under the conditions of decentralisation. According to the results of the conducted research, a methodology for improving the anti-crisis management of the national economy under the conditions of decentralisation has been developed. It is suggested to ensure the correct assessment via determining the effectiveness of using the potential of the territory, which allowed to develop an anti-crisis strategy and differentiated approach to the creation of plans for the development of various types of territorial systems allocated in accordance with the identification of the crisis state of the territories, that enables promising development on the basis of sustainability in the context of introducing decentralisation.*

Keywords: *anti-crisis management, anti-crisis strategy, decentralisation, economy, crisis, territorial entity*

JEL Classification: *H11, H70, H79*

1. INTRODUCTION

The history of development of the world economy is complemented by gradual and complex growth, which is almost always accompanied with small- and large-scale crises that extend to the countries and states. The approaching crisis is always manifested in a complicated and hazardous state that threatens the existence of any country. A peculiar feature of the crisis emergence is its unplanned nature and undesirable consequences.

Under the current conditions of economic development, ineffective management and governance serves as an initial indication for the development of the crisis. It violates the ability of self-regulation as a result of negative impact of the external environment or ill-judged management of the internal environment. Lack of managers' experience in counteracting the internal crisis flashes has a significant impact on the result.

A modern concept of anti-crisis management is heterogeneous and multifaceted. In general, anti-crisis management acts as a constituent part of the overall managerial mechanism of the state, aimed at preventing and overcoming the crisis. In the process of crisis

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research, a program of anti-crisis measures is developed. To create and select the instruments for the crisis management, it is necessary to be aware of the reasons for its occurrence, nature of the crisis and its type.

One of the tools is the decentralisation reform that is currently implemented in Ukraine. Nevertheless, systematic, natural, obvious, difficult and protracted crisis processes have taken place in the economic, social and political spheres of life in the country for many years. To improve the situation, anti-crisis management and regulation with the introduction of anti-crisis strategies should be applied. Decentralisation reform is aimed at bringing the country out of crisis by activating population in the regions; it is a process of redistribution of functions, powers, people or things between the governing bodies [4].

2. PROBLEM FORMULATION AND METHODOLOGY

The main problem in Ukraine is ineffective management of the national economy, which led to galloping inflation, large-scale labour migration, a significant decline in the standards of living of the citizens, political instability and socio-economic inequality of the regions. The study of the mentioned problems allowed using the experience of modelling as the main method of cognition for the analysis of complex phenomena and processes that take place in the national economy under the conditions of decentralisation. This methodology is based on the methods of analogy, the theory of similarity, and the theory of experiment data processing. The method of cluster analysis is used to determine the magnitude of the manifestation of crisis phenomena in the regions and the choice of anti-crisis strategy. To determine the results of the implemented proposals, a methodology for improving anti-crisis management is used.

The aim of the article is to study the manifestation of crisis phenomena, to assess the impact on the development of regions in Ukraine, and to improve the anti-crisis management of the economy in a context of decentralisation.

3. PROBLEM SOLUTION / RESULTS / DISCUSSION

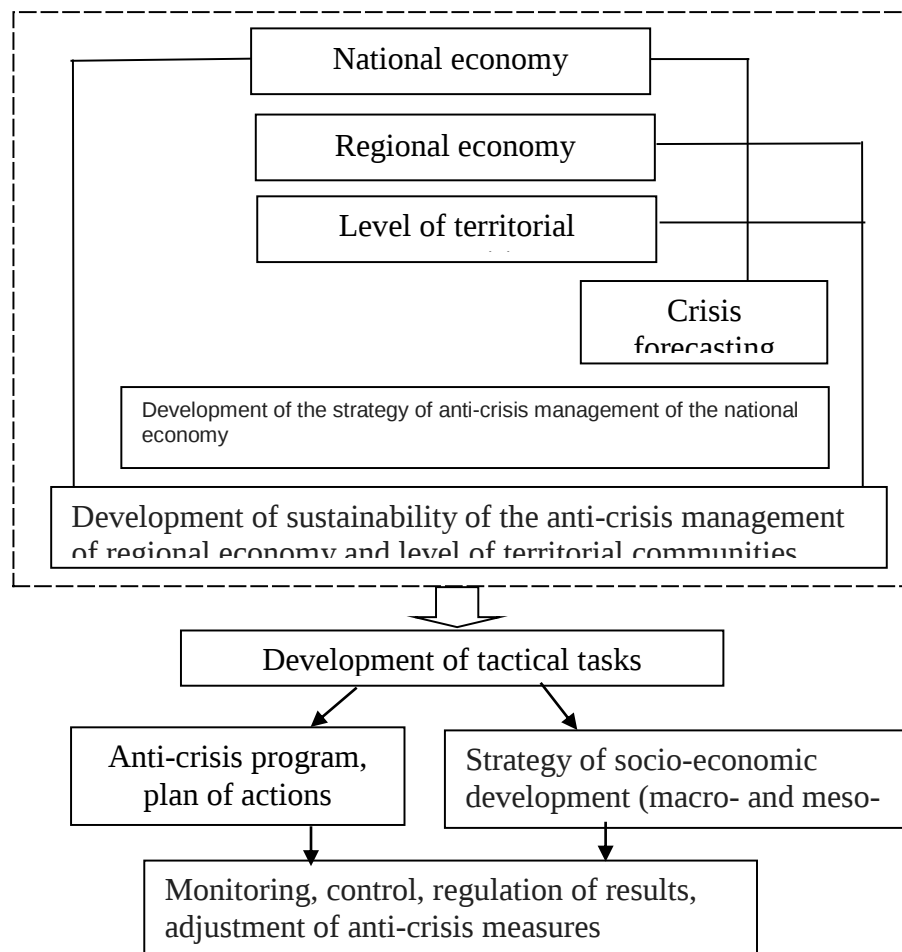
To overcome the crisis, it is necessary to activate the approaches to anti-crisis management and to strengthen state interference in such problematic aspects of the economy as the uniformity of development; decline in production; chronic budget deficit and financial indebtedness; predominant export of raw products, materials and energy resources; low level of technology; high infant mortality rate; shorter life expectancy; general decrease in the quality of life; falling demand for goods and services; a significant proportion of the public sector in the economy.

For positive developments, we suggest a conceptual framework that implies a step-by-step analytical study of the national economy and the economy of territorial units, anticipating and predicting the crisis, developing a national anti-crisis strategy and a regional approach, developing its actions in anti-crisis programs (plans), and strategies for economic development, as well as monitoring of its execution at all levels (Fig. 1).

In order to solve the mentioned problems, one needs to consider in detail the approach to choosing anti-crisis regulatory tools, with the focus on forecasting, modelling and creating anti-crisis programs and plans.

Considering the anti-crisis management of economy under the conditions of decentralisation, it should be noted that the subject of management takes into account planning of possible dangers of the crisis, analysis of its symptoms, specifying the measures taken to mitigate negative effects of the crisis and forecast the factors for subsequent development. The system of measures and instruments is aimed at simultaneous achievement of improvement of the standards of living the population has, rational use of financial resources, effective management of national economy and local finances in the process of changing the approaches to redistribution of powers between the authorities.

Figure 1: Conceptual scheme of the anti-crisis management mechanism of the national economy under the conditions of decentralisation



Source: developed by the author.

Moreover, the purpose of anti-crisis management of the economy comprises anticipation, prevention and counteraction of the spread of crisis phenomena in the economy due to efficient allocation of powers among the governing bodies in decentralisation. At the same time, development, forecasting and implementation of anti-crisis measures aimed at neutralising the most dangerous factors that intensively influence economic processes and lead to a crisis situation are relevant.

Further studies will be conducted using simulation based on the principles of similarity and mathematical analogy. Analysing similar phenomena, it is possible to refer to the definition of available characteristics or parameters by mere recalculation, based on direct proportional dependence. This recalculation is analogous to the determination of initial values of the selected figures due to the separation of similarity of processes with the use of a dimension theory and justification of the methodology for obtaining the modelling results.

In researches, related to the crisis phenomena in the economy under the conditions of decentralisation, it is appropriate to use dimensionless quantities, since their values do not depend on the choice of the system of disparate units. The rationale for this argument is the so-called Buckingham Pi-theorem, according to which the relationship between n dimensional values, independent of choosing the system of measuring units, can be given in the form of $n-k$ dimensionless combinations of dimensional quantities, where k is the number of independent dimensions [1, p. 45].

The final stage of anti-crisis management of the economy under the conditions of decentralisation is decision-making on overcoming the development of crisis phenomena and crises. In the proposed study, the development of objects at macro- and meso-levels is suggested to be considered from the point of view of the national economy development as a whole. In this regard, we consider it appropriate to analyse the location of objects using cluster analysis. In this case, the clusters of territorial entities of the country, which should be constructed on the basis of available statistical data, serve as the objects of analysis, specifying the three-tier component of constancy.

By selecting the most similar elements, the distribution of the selected set (in our case, of the territorial entities) into clusters is performed. Cluster analysis, as a multidimensional statistical procedure, based on the collection of information on the sampling of objects, allows them to be grouped into relatively homogeneous groups using several attributes simultaneously. This methodology is fully suitable for modelling the anti-crisis management of territories in a decentralised environment, which simultaneously takes into account disparate indicators. For this purpose, relevant indicators that characterize a degree of similarity for all classification parameters are engaged [3].

To solve the problems of the study, it is suggested to use the methods of multidimensional classification: hierarchical agglomeration methods and k-medium method. Hierarchical algorithms build a system of embedded partitions; i.e., at the output of the algorithm, the cluster tree is represented with the root as the whole sample and the leaves as the smallest clusters. Non-hierarchical algorithms build only one breakdown of objects into clusters [2, p. 48-50].

The k-medium method is aimed at identifying the grouping in the data. The input set is divided into k-groups, while minimizing the function that defines the distance as the sum of squared errors (SSE):

$$SSE = \sum_{j=1}^k \sum_{i=1}^n \|x_i - c_j\|^2. \quad (1)$$

After this, it is time for iterative optimisation of the quality of such a division, which allows reducing the impact of serious risks at the early stages of anti-crisis management and minimizing the costs of eliminating crises and crisis phenomena.

Thus, k-partitioning allows dividing a set of data from n objects into a set of k-clusters for which the following sequence exists:

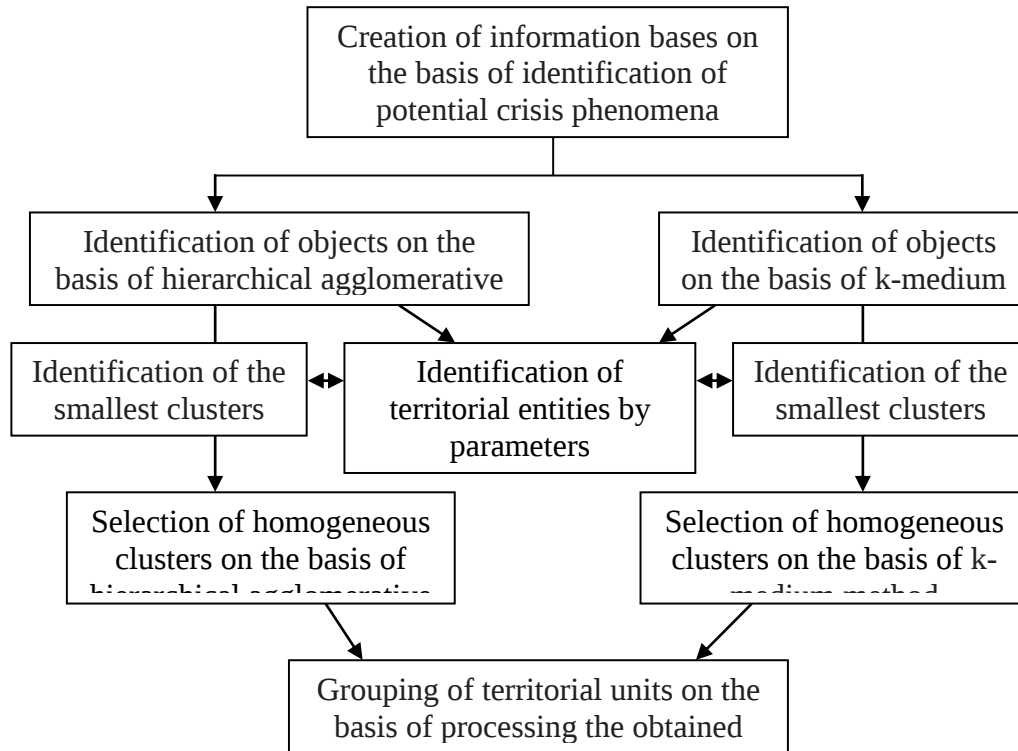
1. Based on the k data array, the centroid is selected.
2. In a cycle, it performs the following actions until it reaches the criterion of convergence: the allocation of k-clusters is formed by assigning each point to the nearest centroid; centroids are redefined; the algorithm can use different measures of distance [5, p. 48-50].

On the basis of the analysis, an algorithm for grouping territorial entities according to the level of improvement of anti-crisis management by the national economy of Ukraine under the conditions of decentralisation is presented in Figure 2.

Personal studies allowed suggesting a particular methodology to improve the anti-crisis management of the national economy in a decentralised environment, which includes the following steps:

- 1) construction of the model of economic development on the principles of sustainable development under the conditions of decentralisation;
- 2) forecasting the level of economic development and identifying possible points of the crisis;
- 3) making decisions on improving the anti-crisis management of the national economy under the conditions of decentralisation.

Figure 2: Algorithm of grouping the objects according to the level of improvement of anti-crisis management of economy in Ukraine under the conditions of decentralisation



Source: developed by the author.

An indicator of the effect that the development of the national economy has, which is most adapted to the tasks set in this study, is the gross domestic product (hereinafter GDP), calculated according to the methodology of the national accounts system. However, for certain territories, including those of meso-level, the gross regional product (hereinafter GRP) is used.

The initial stage of calculating the value of GRP in a regional context is not always possible due to the lack of a number of statistical materials on its individual components. Therefore, they determine the expediency of making calculations in the traditional framework is determined (without extended interpretation). Simultaneously, the adequacy of comparing between the actual results of economic activity and its potentially feasible parameters requires an expeditious transition to the GRP calculation as soon as possible. Then the degree of using the existing potential in the effective form of its presentation can be determined from the following equation [5, p. 70]:

$$\alpha'_e = \frac{UDP_f}{UDP_p} \quad (2)$$

where α'_e is the degree of using the potential of the region in the indicators of comparing between actual and potential socio-economic effects;

UDP_f is the indicator of actual socio-economic effect;

UDP_p is the indicator of potential socio-economic effect.

The definition of social effect is of unconditional interest. In this case, it is expedient to separate and subtract from the value of the GRP the production part in the means of production, which in the considered variant represents an intermediate product intended for the production of the final result (goods and services for the population).

With the corresponding transformation of the potential productivity indicator, it is theoretically appropriate to present the following equation [4, p. 71]:

$$\beta_e = \frac{UDP_{p(c)}}{UDP_{f(c)}} \quad (3)$$

where β_e is the degree of using the potential in the comparison indices of actual and potential social effects;

$UDP_{f(c)}$ is the indicator of actual social effect;

$UDP_{p(c)}$ is the indicator of potential social effect.

If temporary tendency of $\beta^{(t)}_e / \beta^{(o)}_e > 1$ is available, it is possible to claim that there is a sustainable social reorientation of development.

In both cases, it is crucial to note that the GRP values are calculated in actual (current) prices, which, in its turn, makes it possible to compare them correctly with the value of the potential in order to obtain methodologically grounded results. The most reliable estimates of the GRP can be obtained via the calculations by the method of flow of goods and services rather than the production method, preferred by the existing statistical estimation methods. The latter, as a rule, overestimates the actual values of the GRP.

The considered methods of calculating the integral effect of using the potential can be represented in the resource form of their expression as well, provided that there is an index (norm) of their capitalisation for each specific territory. In this case, capitalisation of actual values according to the normative amount will result in over-expenditure of resources, which the society will have to bear to compensate for its insufficiently effective economic activity, which stimulates the onset of crisis phenomena.

The estimation of potential that natural, labour, and financial resources have is done on the basis of aggregate potential by a direct method: summing up of capital estimates of their accumulated expenditures of social labour, calculated on the basis of current prices:

$$V_s = V_n + V_l + V_k, \quad (4)$$

where V_s is aggregate resource potential y ;

V_n is potential of natural resources;

V_l is potential of labour resources;

V_k is potential of fixed assets.

To determine the effectiveness of using the potential, it is necessary to determine its potential effectiveness (P^y_p). Each component of the potential has its parameters of individual efficiency in calculations of aggregate resultant potential (E_n , E_l , E_k respectively), substantiated methodically, as there is a factor estimation of maximum productivity of their use. From this reasoning, it logically follows that it is possible to determine fairly correctly the aggregate indicator (efficiency norm) of using the potential (E^y_s):

$$P^y_p = \frac{E_n V_n + E_l V_l + E_k V_k}{V_s} \quad (5)$$

where d_n , d_l , d_k are respectively, the share of natural, labour and stock potentials in aggregate potential.

According to the calculations for each territorial entity, the norm of effectiveness will have its differentiated nature due to structural differences in the component composition of total potential of the territory. It allows making a theoretically correct justification of the sources of cluster differentiation in the costs of social labour as well as the methodological conditions for making cluster comparisons. The latter can be produced with bringing the component of the assessment into a single structural basis, in the form of the appropriate structure of the total potential of the national economy of the country.

4. CONCLUSION

Therefore, the conducted study allows developing an anti-crisis strategy and differentiated approach to creating plans for the development of various types of territorial systems, allocated in accordance with the identification of the crisis state of the territories, which allows for the perspective development on the basis of sustainability in the context of introducing decentralisation. To ensure the implementation of this strategy, a set of anti-crisis regulation tools has been supplemented, to facilitate complex development of the territories, taking into account economic and social constituents of sustainability, and to provide an opportunity to respond promptly in case of crisis phenomena or crises.

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DEMOGRAPHIC SAFETY IN THE CONDITIONS OF THE FOURTH REVOLUTION

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Maryna MRYK⁶

Abstract: *The provisions of the Fourth Industrial Revolution, which may affect the demographic security of the country, are considered. For Ukraine, which is a source of low-cost labor, the problem of demographic security is considered through aspects of demographic and educational criteria. The idea that the parameters of changes in the demographic security of the country are caused by the dynamics of the crude birth rate, death rate, natural increase, migration, and education level is substantiated. Based on the methodology proposed by the Ministry of Economic Development and Trade of Ukraine, demographic security studies have been conducted for the country as a whole. It has been established that the socioeconomic and demographic development of certain regions of Ukraine is not homogeneous, so it requires radical decisions at the local and national levels.*

Key words: *demographic security, socioeconomic development, Ukraine, Fourth Industrial Revolution.*

JEL Classification: J110, I250, O140, O150

1. INTRODUCTION

The Fourth Industrial Revolution, the inevitability of which in recent years has been actively discussed globally, will lead to the significant changes in economic and social processes. Ukraine will not be kept aloof from such changes, although the period of implementation of innovations of this revolution may last for decades. Significant changes are the most likely to have an instant impact in the demographic sphere, influencing the security of the country. Demographic security is a state of protection of the nation, society and the labor market from demographic threats, which ensures the development of Ukraine taking into account the set of balanced demographic interests of the state, society and the individual in accordance with the constitutional rights of citizens of Ukraine [1]. Considering the transformations that affect the demographic security of the country, one may note the following – changes in the structure of labor, lowering of menial and semi-skilled work value, middle class income loss, and wealth gap widening between Ukraine and the developed countries.

Considering this issue in advance, it is worth pointing out the need for the structural changes in the social policy of the country, as the advantages that Ukraine has now (geography and business environment, resource base, internal and external relations) will lose their importance in the age of Industry 4.0. Education and health care will rank foremost, because they can sufficiently contribute to the formation and preservation of highly skilled labor potential, thereby ensuring the development of the country up to par.

Today, national and foreign scientists have created a number of systems of indicators of living standards. As a rule, only three socioeconomic indicators are actually included in the evaluation criteria: unemployment rate, average pay and industrial (agricultural) production level. Other factors, including demographic factors, are left out: mortality rate excess over birth rate, population density, gender ratio, migration rate, and others. However, it is the consideration of all factors that makes it possible to envisage the development strategy of the country.

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In Ukraine, according to demographic data for 2016 [2]: 459,841 babies were born in the country; 651,619 people died; natural increase over the year amounted to 191,778 people; increase due to migration – 36,651 people; men in Ukraine – 19,532,226; women among the citizens of Ukraine – 22,929,992 people.

Living conditions, the nature of work, leisure, the level of education in the city and in the country are radically different. Citizens have higher social activity and mobility; broad options for education and self-development. At the same time, city residents are characterized by estrangement. Rural communities are characterized by the traditional way of life, informal connections and means of informal control. Countrymen do not feel alienated from people and nature, and their lives are more stable. However, they do not have such opportunities for development and education as in the city. Considering population in the cities and rural settlements in Ukraine, it may be noted that in 2014 – 2018 the number of urban population has more than doubled (table 1).

Table 1: Urban and Rural Population (people, as of 1 January)

Structure	Years				
	2014	2015	2016	2017	2018
Ukraine	45 426 249	42 929 298	42 760 516	42 403 027	42 248 129
Urban population	31 339 017	29 675 358	29 584 952	29 482 298	29 371 112
Rural Population	14 087 232	13 253 940	13 175 564	13 102 234	13 015 387

Source: Based on figures provided by [2]

Today, the economic indicators of Ukraine show that it is far behind the countries of the European Union [3]. The key indicators characterizing the social policy of the state and its impact on the development of human capital assets include GDP per capita and human development index. The successful development of the Ukrainian social sphere is complicated due to the following factors: the lack of clear strategic priorities of social policy; insufficient funding; poor social orientation of budget policy; deep social stratification and high polarization in income; incapacity of transfer policy of the state; significant deterioration of demographic characteristics of the population; and deterioration of living conditions. At the same time, the society is restoring its understanding of the self-value of human capital assets, highly developed science, education, culture, health care, which determines the economic future of the country and its possibilities in the world economy.

2. PROBLEM FORMULATION AND METHODOLOGY

The basis of further research is the methodological recommendations of the Ministry of Economic Development and Trade of Ukraine, developed to determine the level of demographic security of the country as one of the main components of national security [4]. The integral security indicator can be calculated using the following formula:

$$I_m = \sum_{i=1}^n d_i y_i, \quad (1)$$

where I_m is the aggregate indicator/subindex of the m sphere of economic security, where $m = (1, 2, 3 \dots 9)$;

d_i is the weight number that determines the score of the i index to the integral security index;

y_i is the standardized score of the i indicator.

Methodological recommendations are based on a comprehensive analysis of security indicators with the identification of possible threats in the further development of Ukraine and provide means to identify the level of security components for management decisions on the

analysis, averting and prevention of real and potential threats to national interests in the relevant areas.

The parameters of changes in the demographic security of the country and regions are driven by the dynamics of the crude birth rates, mortality, natural increase and migration rates [1]. We consider it appropriate to add indicators that characterize the level of education. Therefore, the indicators and their descriptions are specified below:

1) index of vitality (birth-death). Since the vitality index characterizes the mode of reproduction of the population, which reflects the demographic decline, stagnation or growth, its value equal to one in case the births and deaths over a period are in line is the threshold below which depopulation begins – the natural population decline.

2) total fertility rate. This indicator reflects the number of children that a woman will give birth to on average over the entire reproductive period, with the existing intensity of age and gender fertility. It is sufficiently informative to assess demographic dynamics and its value for the simple replacement of generations with the existing life expectancy and age and gender structure of the population should be equal to 2.14. This is the threshold below which the narrowed reproduction mode is manifested, when each subsequent generation is smaller in number than the previous one.

3) migration efficiency ratio. Amid the steady declining fertility rates, the migration factor is becoming increasingly important. Arriving migrants compensate for natural decline and ensure overall population growth. Therefore, the excess of emigrants over immigrants is an important component of demographic security. The degree of this excess can be determined by migration efficiency ratio, calculated as the ratio of the migration balance to the migration turnover, expressed as a percentage. Migration efficiency of less than 70% cannot significantly improve the demographic and socioeconomic situation.

4) share of illegal migrants in migration growth. At the same time, it is wrong to consider the migration inflow only as a positive phenomenon, since there is such a negative one as illegal migration, which is a negative factor affecting demographic security for a variety of reasons (corruption, shadow market, crime, economic losses for the state budget, social strain). Therefore, to characterize demographic security it is advisable to identify the share of illegal migrants. The author's opinion is that when illegal migrants begin to exceed the number of those who live and work officially and legally in the country, it becomes a threat to security. Hence, the threshold should be considered as 50% of illegal migrants out of all immigrants.

5) share of single-parent families. Currently, in developed countries, the institution of the family is experiencing a serious crisis, which began in the middle of the 20th century, characterized by low stability of marriages, families, high divorce rates, an increasing proportion of single-parent, and dysfunctional families. Early 21st century was marked by a series of same-sex marriages legalization by a number of European countries, which are not able to fully ensure the reproduction of new generations. The probability of having subsequent children in single-parent, incomplete families is statistically very low, which will not allow even simple reproduction in the population. If the proportion of such families exceeds one third of the total amount, it will be crucial for the demographic development.

6) average life expectancy, which largely depends on the level and quality of life, which is a security indicator. At the same time, the high life expectancy of the population contributes to the increase in labor longevity and the level of economic activity of the population, and, consequently, the volume of the gross domestic product. But here it should be clarified that according to the standards of the International Labour Organization, the economically active population is between the ages of 14 and 72. Therefore, when determining the threshold of the average life expectancy of the population, it is advisable to use the upper age limit of economic activity, since the majority of the population of older ages is rapidly decreasing this activity.

(7) share of the population over 65 years of age. In all developed countries of the world population is aging, which is caused by the laws of demographic development, the entry of industrial and post-industrial societies in the third phase of the demographic transition. The Rosset-Boget-Garnier scale of population aging developed in the middle of the 20th century, taking into account the share of the population over 60 years of age, loses its applicability, because according to this scale there is a very high level of population aging (the share of the population over 60 years of age is 18% or more) in most developed countries. The United Nations uses the 65-year-old age criterion and the population is considered to be old if the proportion of people over 65 years of age is 7% or more.

(8) share of children under 18 without parental care. An important parameter of the demographic situation is the number of children left without parental care. Unfortunately, this indicator is difficult to calculate, but the indicators that are officially published do not express the reality. So far, these are tenths of a percent of all children. Still, this indicator will be crucial if it reaches the threshold, constituting a significant part of the total number of all children in the country – 15-20%.

(9) share of the children born to unmarried women. Somewhat less catastrophic, but still expressing the state of the institution of the family is how many extramarital children are born. This trend is typical for many developed countries, but at this point in general the number of children born to married women is significantly higher – 1.5 to 2-fold. If more extramarital children were born, this would be an increasing pattern; then we can talk about an irreversible crisis of the institution of the family, which will affect the social stability of the state and is a serious threat to demographic security. In this case, the threshold value of this indicator is 50%.

(10) ratio of abortion to childbirth, which along with the high mortality rate of infants and middle-aged people, represents the ongoing depopulation and the existing, irreversible threat to demographic security. The author thinks that the threshold is equal numbers of births and abortions.

11) level of education, which includes the ability to solve creative problems; successful progress through the stages and levels of education, accompanied by the mastery of relevant knowledge, skills and experience, and development of personal potential; adaptation in society through the formation of social competence and access to professional activity [5]. The progress of training is defined as an integral indicator of the ratio of academic progress of students with the pedagogical progress of teachers as equivalent subjects of the learning process.

(12) education index, which represents adult literacy (two thirds of the value) and the combined gross enrolment ratio (one third of the value). This index shows how many percent of the population can read and write, while the gross enrolment ratio indicates the percentage of students from kindergartens to post-graduate education.

3. PROBLEM SOLUTION / RESULTS / DISCUSSION

The input parameters were selected according to the statistical data of Ukraine, the results of their processing are specified in table 2.

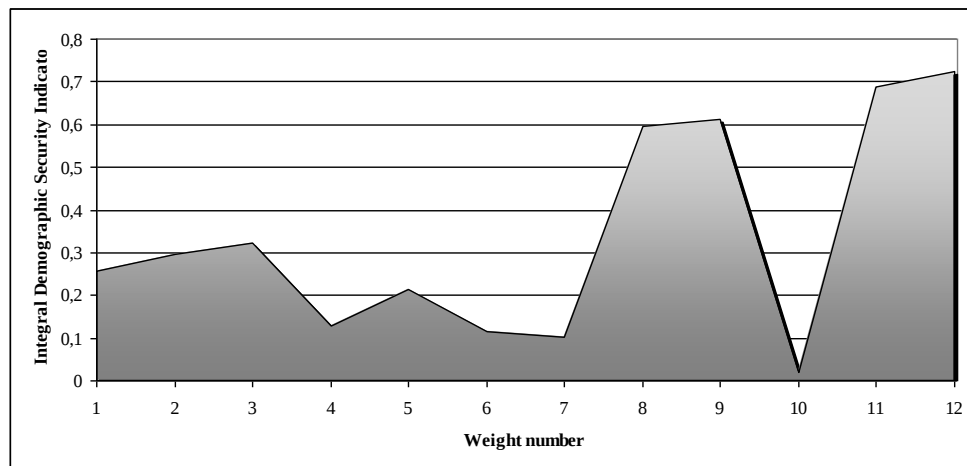
Table 2: Dynamics of the Parameters for the Study of Demographic Security of Ukraine

Parameters	Years				
	2014	2015	2016	2017	2018
Index of vitality	0,74	0,69	0,68	0,63	0,57
Total fertility rate	1,50	1,51	1,47	1,37	1,40
Migration efficiency ratio, %	47,0	41,5	47,4	72,7	72,7
Share of illegal migrants in migration growth, %	35	38	37	33	30
Share of single-parent families, %	39,4	40,5	28,3	32,7	-
Average life expectancy, years	71,37	71,38	71,68	71,98	72
Share of the population over 65 years of age, %	15,3	15,6	15,8	16,2	16,5
Share of children under 18 without parental care, %	18,8	18,7	17,8	18,0	18,0
Share of the children born to unmarried women, %	21,1	20,6	20,1	20,5	-
Ratio of abortion to childbirth	54	55	53	53	-
Level of education, %	99,9	99,0	98,3	98,4	-
Education index	0,80	0,97	0,96	0,96	-

Source: Based on figures provided by [2]

As Table 2 shows, the demographic security indicators evidence a rather ambiguous trend over the past five years. Thus, according to the index of vitality, there is a decrease in this indicator and its value is still below the threshold of simple reproduction of the population, i.e. it is impossible to talk about a significant improvement of natural reproduction. This is also evidenced by the values of the total fertility rate, which is also gradually decreasing but is still at a highly critical level, which is common to the contracted reproduction of the population, i.e. it represents the continuing natural population decline. As for migration efficiency ratio, for the last two years this value has almost doubled. At the same time, it is necessary to take into account the structure of migrants entering and staying to live and work in the country, among which the university-educated specialists amount to fifth; and the ethnic structure of migrants is changing. Illegal migration is quite difficult to track and record, but the data indicate a decrease in this indicator, which is most likely due to the transit location of Ukraine. The next demographic security indicator is the share of single-parent families, where fluctuating values can be found, but the dynamics is still positive. The average life expectancy over five years has increased though slightly, reaching 72 years of age based on projection data. There is also an increase in the share of the population over 65 years of age, which will continue to grow in the near future amid a low birth rate. The negative trend is the almost stable share of children without parental care, exceeding the normative value. There is a certain interconnection of this phenomenon with the transformation of the institution of the family, marked by a fairly frequent birth of children to unmarried women. The ratio of abortion to childbirth is also almost stable. The last two indicators – the level of education and education index – have quite high values.

The integral indicator of demographic security was calculated using weight numbers determined by expert evaluation. The results of the calculations, according to the above methodology, made it possible to identify the following trend, shown in Figure 1.

Figure 1: Integral Demographic Security Indicator of Ukraine

Source: please author's calculations.

Thus, there is a tendency of correlation between the significance of the selected indicator and its evaluation. In general, the integral demographic security indicator evidences the threats, the localization of which should be made by the local and state authorities; the factors that cause the formation of the existing threats, and measures to overcome them were found.

4. CONCLUSION

Thus, the undertaken study shows the level of demographic security, which is insufficient for the sustainable development of the country. The existing threats to demographic security require a comprehensive and integrated assessment, the identification of the causes and factors of their growth, and, as a result, the intensification of the activities of local and state authorities to create the necessary conditions for the full functioning living of the population, business entities, and social sectors. The main priorities are: the reform of social projects; improvement of an effective judicial and law enforcement system; elimination of systemic corruption that hinders effective state regulation of demographic and migration processes; minimization of differentiation of the population with provision of equal options for access to resources, thereby increasing entrepreneurial activity; transition to an innovative economy, using a system which is an incentive for the development of companies with high-tech and competitive goods and services; reduction in uneven socioeconomic development of regions. In addition, the implementation of these programs will potentiate the demographic policy aimed at increasing the birth rate, reducing mortality in working age, efficiency and organization of migration processes. In view of this, the implementation of preventive measures will ensure a decent transition of Ukraine to the Fourth Industrial Revolution.

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DIGITALIZATION OF LOGISTIC PROCESSES BY CUSTOMER SERVICES

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Marie JUROVA⁸

Abstract: *The paper is based on the expertise and conclusions resulting from a research of approaches by companies to creating customer relationships in the South Moravian Region. Today's customers and users require an increasingly higher quality of services offered by the supply chain organizations. The above trends imply that the digitalization of logistics must be given a higher priority in cooperation with marketing policy. This fact was the main reason for the requirements being defined of a perfect delivery and creation of the value supplied to the customer. A customer demands higher and higher parameters of products and the quality of the services offered. The paper aims to find a way of increasing the value perceived by the customer by digitalizing the logistic conception, which also is focused on approaches other than the control of distribution stages and customer service levels with a narrow focus on the supply chain.*

Key words: *control of supplier stages, customer service level, digitalization, logistic conception*

JEL Classification: *L 23, M 11, O 33*

1. INTRODUCTION

The arrival of digital technologies and digitalization of value chains affect the product itself, particular company areas as well as entire industries or business models (Jurová et al. 2016). The empirical research of the previous years (Management Challenges: theory and practice, Specific Research FP-S-15-2627) has confirmed that in the present “customer era” at a time when competing products are increasingly similar to each other in terms of both the utility value and quality and price (this does not apply to fast-moving consumer goods only) that customers are no longer loyal to the traditional products and makes. Improving the quality of the services offered to the customer is one of the few methods that can be used for being different from the competitors and evading exhausting price wars. The availability of a product in the markets, which have been transforming to “commodity” ones, and the constant increase in the value provided for the customer usually affect the customer's preferences more than the repute of a traditional brand and the image associated with it (Bauernhansl et al., 2014).

Some properties of a saturated market are similar to those of a commodity one in which the customer is offered competing products with only minor differences (Donelly, J. jr., 1997). It is clear that, under such circumstances, the customer will be willing to accept a product offered by competitors rather than the preferred but currently not available one. Not even (substitute) products with a high innovation frequency are entirely immune to such a trend. In the current business world, the level of the services offered to the customer is generally a factor critical for the success of a company in the market. In every marketplace, even in the Czech Republic, the customers will expect a constantly increasing standard of the services provided by the suppliers, particularly those related to the distribution (Johnson and Scholes, 2000). Organizations concerned with inventory minimization are compelled to keep a close watch on the suppliers' reliability and quality. At the very end of the supply chain is the customer demanding the same quality of the services supplied. The customers are less and

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less inclined to wait for products to meet their needs and requirements or services that are supposed to be delivered along with the product. This means that it is the availability of a product in the market that is decisive regardless of the fact that another brand is usually preferred.

A company striving to assume the leading position concerning the quality of the services offered to its customers must identify the specific needs of each market segment to be able to customize its digitalized supply chain accordingly. Most companies across industries find that differentiation based on the delivery of unique customer services is an opportunity as well. Although there are numerous customers in each market segment for whom price is still a major factor, a considerable number can be found of those deciding by the quality of the services offered (Jurová et al. 1999).

2. PROBLEM FORMULATION AND METHODOLOGY

The idea of integration and digitalization in the supply chain necessitates a major change in the traditional approach to the relationships such as the one of Parasuraman et al. (1985) and others.

The relationship between the supplier and the customer must be replaced by the principles of mutually advantageous cooperation (see Nakano (2009) or Mehrjerdi (2009)). For a company in a globalized competition to be successful, it must embrace the below activity levels:

- developing relationships to customers who prefer the company's products to those of the competitors;
- developing relationships to the company's suppliers who see their most reliable and favourable partner in the supply chains,
- supporting the efficiency of the supply chain that offers services of supreme quality

Control of the supplier-customer chain at the service level becomes a critical factor of success in market competition. Both the quality of the customer services and the total business cost to a considerable extent depend on the structure of the supplier chain and communication within this chain.

When addressing the questions of qualitative research, paired methods were used of analysis-synthesis, induction-deduction, abstraction-concretization, as well as methods of text-analysis and causes and consequences.

2.1 Control of service processes at supplier levels

In research, the following question may be asked: How can a company meet the “delivery with a higher value added” requirement quickly in each situation. The answer might be found in the ideas and experience of the leading quality control managers. For a long time they have been finding that a hundred-percent quality of the output products can only be achieved by continually inspecting the processes (Lambert et al., 2006)

The same methods employed in controlling the production process can also successfully be applied to controlling processes providing the customers in the supplier chain with quality services.

The following procedure is recommended:

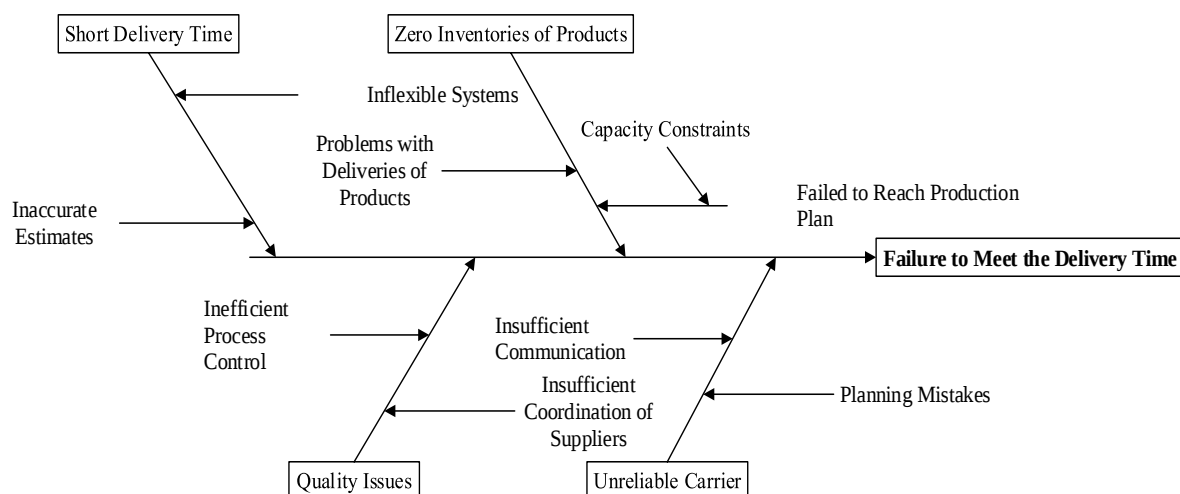
- The correct definition and understanding of such processes should be the first step. It usually involves a detailed analysis of process maps and a diagram for each service process – such as one for order management. Sometimes the managers are surprised and astounded by the degree of sophistication and interrelationship of processes. However, experience may bring valuable information about the way such processes can be simplified and accelerated.

The cause-and-consequence analysis based on a fish-bone diagram, for one, can be employed to identify the high-risk points of the supply process. This simple method is based on Pareto's law, according to which 80 percent of problems appearing in a process can be accounted for by 20 percent of the possible causes. Thus, there are only a few causes bringing about most of the defects.

- Identifying the causes of a failure to meet the delivery time may be taken for an example. A number of regularly recurring problems can be found: zero inventory of the product, unreliable carriers, short delivery time, etc. If we want to identify further causes, we can apply a fish-bone diagram, which may be an efficient tool for managerial decision-making – which measures should be taken where to diminish or eliminate such errors as can be seen in Figure 1. By analyzing the high-risk points of the process, a system may be introduced of preventing errors by monitoring the high-risk points to help identify latent problems. Using methods of statistical process control, limits will be determined for a process. Organizations that struggle to supply a value added to the customer must be endowed with a system of indicators reflecting the key performance figures. The factors affecting the quality of a customer service must be continually monitored and analyzed at all process stages (Hendl, 2012).

The guiding principle of success is the idea that a long-term customer relationship is based on a consistent offer of high-quality services. The achievement of the service quality level expected by the customer requires exact knowledge the factors critical to success for each market segment and willingness to fulfil the customer's wishes under all circumstances and at every level of the supply chain (Russell, 2009).

Figure 1: Cause-and-consequence analysis diagram to introduce digitalized logistic services



Source: The author's own

3. PROBLEM SOLUTION

First and foremost, a service should serve the customers. Given a digitalized logistic conception based on the value added to the customer and on the economic characteristics within the supply chain, solution is the first concern. The creation of a utility value perceived by the customer makes it possible for a consumer – customer to meet their wishes and needs in their own way.

As succinctly put by Rutner and Langley (2000), the value provided for the customer is in proportion to the quotient of the perceived benefits of a transaction to the total product costs. This can be written as:

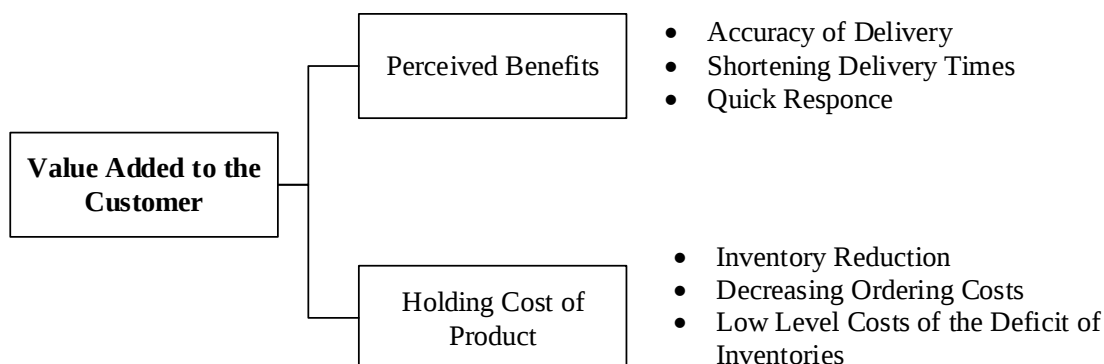
$$\text{value supplied to the customer} = \frac{\text{benefits perceived by customer}}{\text{holding cost of product}} \quad (1)$$

In many situations, the customer must expect extra costs in addition to the product price. Therefore, the holding cost of product seems to be more appropriate than just the price. Such extra costs include storing, packaging, and operation costs as well the cost of the product disposal or recycling – circular economy (e.g., Manninen, et al. (2018)).

The digitalization of supply chain should aim to maximize the above quotient more than the competitors can do. Logistics may be thought of as an almost perfect instrument improving both the numerator and the denominator of the quotient. In the [B2B] industrial marketplaces, it is exactly the efficient logistics that adds the value provided for the customers, making it possible for the next supply levels to better serve the customers and with lower supply and storing cost at that. The same result may also be achieved in consumer [B2C] marketplaces where the value added may consist in a better buying comfort and with the customer's costs are pushed down thanks to the more favourable payment terms. It is the creation of a product value provided for the customers in the form of quality supply chain services that is higher than that of the competitors that provides an opportunity of getting a sustainable competition edge.

In reality, it is necessary, at all supply levels, to know the customer and his cost structure as well as the dynamics of the market. This information may help create a digitalized supply chain, which will significantly enhance the value provided for the customer. The below figure shows how to capture the ways of increasing the value added to the customer using logistic processes that in turn will help the customer provide services for his customers.

Figure 2: The value added to the customer by digitalizing the supply chains



Source: The author's own

For a supplier, the best way of winning and keeping new customers is focusing on those product properties regarded by the customer as the most important. Success in this regard is conditioned by the perfect knowledge of the value chains of all the customers. If the customer is a manufacturer of consumer goods, the supplier should know the way the value provided for end users is created (Lambert et al., 2006).

3 DISCUSSION

It is necessary to further develop the distribution level areas because the strength of the distribution levels is increasing in most of the markets. It is extremely important to see the relationship to the end customers as an integral part of digitalized supply chains. Based on the research we conducted as part of the project, FP – S – 18 – 6395, it is necessary to realize that, without support for each element of the supply chain, the products of a company would not reach the full market potential.

Due to the market concentration, the customers possess more purchasing power and, in addition, try to minimize the number of suppliers. For each supplier, this is a threat, but it may also bring an opportunity. If a supplier can make an economical offer to the customer of quality products and services, then his chances are not low. Today, the customers employ state-of-the-art rating methods such as:

- analysis of total product acquisition costs,
- analysis of maintenance costs per product life cycle,
- analysis of the total product costs and benefits.

In this respect, an effort is necessary to establish long-term supplier-customer relations based on mutually beneficial services offered.

In a market environment with well informed and demanding customers, it is difficult to predict the competitors' strength. It seems that, in the present volatile market environment, it may be exactly the quality of services offered that will decide whether a supplier wins or loses an order – thus, the logistic process may be the key source of the value added to the customer along with a product or a service (Hendl, 2012)

Adopting the concept of value added to the customer as the pillar for devising logistic and marketing strategies may bring a number of benefits for each supply level. That, of course, will require a much more proactive approach to developing customer relations. The idea of and approach to customer care by services provided by a fully digitalized supply chain consist in better information about the customer's organization and needs and in adopting a joint access to the creation of business strategy.

4. CONCLUSION

Every part of the supply chain, that is, the supplier can exactly determine what values are expected of him by each customer segment and find a way of giving them such values in the form of better services with minimum costs. In most of the markets, the value added to the customer has become a dominant factor by which suppliers can be differentiated. The condition necessary for implementing customer services is the introduction of the information technology needed as a supporting instrument for digitalizing logistic chains (Industry 4.0). All digitalized applications should support large amounts of data generated by facilities, processes, and products depending on the support and monitoring of the target-oriented service processes. An important technical parameter is connectivity, which makes it possible to acquire the required outcomes of the company service processes online. Most companies realize what opportunities of this type are offered by logistics as part of a supply chain that

decided to go digital. And this is a question to be considered in any business strategy and, thus, logistics strategy when striving for a competition edge through services.

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SOCIAL AND PROFESSIONAL CHARACTERISTICS OF LABOR MIGRANTS AND LABOR MARKET DEMANDS IN A RUSSIAN MEGALOPOLIS

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Abstract: *The article presents the problem of the role of labor markets under the conditions of the transition to 4.0 economy on a scale of a Russian megalopolis. The authors analyze the social and professional characteristics of labor migrants arriving to Ekaterinburg from Central Asia, using the statistical data and the results of the sociological study. The authors come to a conclusion that the labor migrants from Central Asia in the territory of Russia in general and the Ural megalopolis in particular, being in-demand mainly in the sphere of menial work and in the extensively developing economic sectors, are not motivated and do not have real opportunities to expand professional skills necessary in the context of the Russian economy, which is now following the path of forming the Industry 4.0.*

Key words: *industry 4.0, labor migrants, labor market, Russian megalopolises, Ekaterinburg*

JEL Classification: *J23, J24, O15*

1. INTRODUCTION

The first references on Industry 4.0 appeared in 2011 [1]. Transition of the majority of developed countries to 4.0 economy requires special attention towards the social and professional characteristics of labor force. Education and vocational training needs to be remodeled and upgraded by the efforts of governmental and non-governmental stakeholders [2]. In the modern society as an information and communication system the following groups are formed: 1) consumers of goods and services, having the basic skills of using the technology encapsulated in these goods and services; 2) engineers and operators, design engineers and managers, working on developing new goods and services based on new technologies and on the market launch of the manufactured goods; 3) engineers and researchers developing new technologies at the stage of R&D and preparing them for commercialization [3]. Beata Ślusarczyk notes, that the majority of the entrepreneurs recognize the concept of Industry 4.0 as a great opportunity for development and improvement in competitiveness [1]. It is obvious that the increase in the number of labor migrants from countries with a low level of development poses a question of the possibility of their integration in the labor market of the host countries and their influence on the country's transition to the new economic level.

According to the Federal Statistics Service of the Russian Federation, in 2016, 511 773 people (89%) out of 575 158 migrants who arrived to the Russian Federation and were officially registered by the Federal Migration Service came from the CIS countries. In 2016, the share of migration gain owing to foreign citizens from CIS countries in the Ural Federal District made up 11% of the total number for the whole country. In the Sverdlovsk region,

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being part of the Ural Federal District the migration gain owing to foreign citizens from CIS countries amounted to 1 855 people. Out of the total number of migrants coming to Russia from CIS countries in 2016, 43% were from five Central Asian countries (Kazakhstan, Kirghizia, Uzbekistan, Tajikistan and Turkmenia). Before 2015, the percentage of migrants from Central Asia made up to 70%. Thus, notwithstanding the fact that the migration flow from Ukraine altered the share of migrants, the “accumulated” migration is represented mostly by people from Central Asia, possessing their specific social and professional characteristics and occupying a specific niche in the labor market of the region.

Ekaterinburg became an important element of the migration corridor formed between Central Asia and the Russian Federation. The main migration flow is labor migration, which involves from 2.7 to 4.2 mln people, or from 10 to 16% of economically active citizens of Central Asian countries. This represents not only a significant scope of migration, but also implies serious economic consequences for both the migrants’ countries of origin and the host country.

The importance and usefulness of external migrants as a labor force is declared officially in the Russian Federation. It is stated in the Concept of Demographic Development of the Russian Federation by 2025. Besides, over the last years according to the state policy of the Russian Federation aimed at supporting voluntary resettlement of compatriots living abroad to the Russian Federation, there are more migrants of different ethnicities coming to the Russian Federation than ethnic Russians. For example, since 2013 the Sverdlovsk region has been implementing the regional program presupposing that by 2020 17 300 migrants are going to enter the territory of the Sverdlovsk region, with two thirds of them being the representatives of the titular ethnic groups of their countries of origin. It is planned that the majority of migrants will arrive from Kazakhstan, Uzbekistan, Tajikistan and Armenia.

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. After gaining the Russian citizenship or the right to work in Russia, they do not change their social and professional characteristics and differ from the professional personnel of the host country.

The principal transformations of the employment of labor migrants in the sphere of distribution of the foreign labor force can be traced most significantly according to the types of economic activity.

Table 1: Changes in the structure of the employment of foreign workers according to the types of economic activity in 2017, %

Year	Type of economic activity						
	Construction	Wholesale and retail trade	Manufacturing activity	Transport and communications	Community and social facilities	Agriculture	Other
2007	48,9	30,6	7,0	6,0	4,1	0,3	3,1
2017	29,5	26,2	15,1	7,5	11,2	3,9	7,1
Increase rate	61,8	84,3	206,2	122,0	263,1	1233,6	237,5

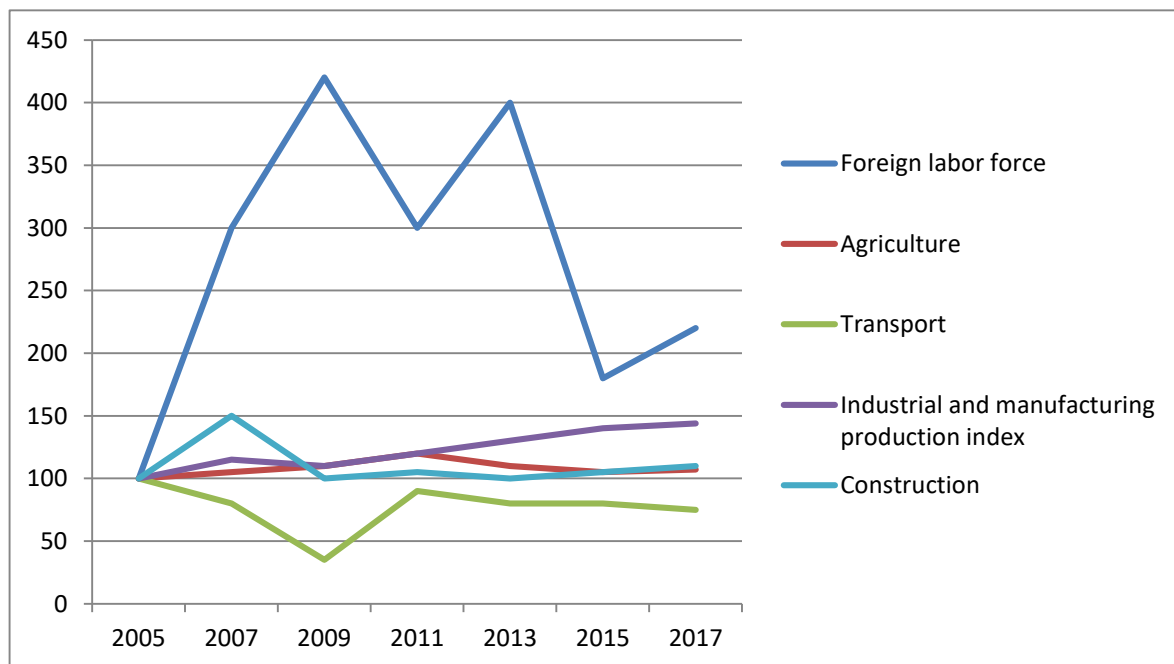
Source: Compiled by the authors on the basis of the data from the Department of the Federal Migration Service of the Russian Federation in the Sverdlovsk region.

The data of the table 1 demonstrate that the leaders among the types of economic activities involving external migrants are construction and wholesale and retail trade, though, their share is decreasing rapidly. One can mention the expansion or the diversification of foreign

employment in terms of new directions. Thus, the percentage of labor migrants working in the housing and utilities infrastructure has increased by 2.6 times during the last years. A huge increase in the rate of employment of foreign workers in agriculture can be observed (increase by 12 times), even taking into consideration the fact that the Sverdlovsk region is an industrial area, where agriculture makes up not more than 4% of the internal regional product. Thus, in the economy of Ekaterinburg we can also note the trend of formation of the sectors with the increasing percentage of migrants.

Other Russian researchers come to the same conclusions. In the Russian labor market, foreign workers compete with Russian citizens in a relatively indirect manner. It is most relevant for those subjects of the Russian Federation, where there is a higher percentage of university-educated population seeking higher salaries [4]. It means that in such regions, the foreign labor force is in demand only in the sector of menial work. The fact that the foreign and the Russian labor force do not compete in the labor market is intermediately confirmed by the comparative analysis of the dynamics of the accumulated indicators of the increase in the numbers of labor migrants and the change in the development indicators of different economic sectors.

Figure 1: Dynamics of the accumulated growth rates (2005 = 100%)



Source: calculated by the authors on the basis of the data from the Federal State Statistics Service [5].

On the basis of the dynamics analysis of the accumulated growth rate of different economic sectors (see Figure 1), it can be stated that the significant gap between the rates of increase in the numbers of labor migrants and the growth rates of economic sectors is an evidence of the fact that the migrants do not have a serious influence on the development of these sectors. They are actively involved in the economic sectors characterized by the extensive type of development. Migration and the level of economic development are intercorrelated during short time periods mainly. At the same time, the foreign labor force is in demand during the period of active construction works or economic recovery. After these stages are completed, the numbers of labor migrants, as a rule, stop influencing the development of the economic sector. Sometimes we can observe an inverse dependence. During the period of crisis or post-crisis, when economic sectors start active recovery, they don't require labor migrants.

2. PROBLEM FORMULATION AND METHODOLOGY

When carrying out the social and economic analysis of migration processes in the Sverdlovsk region, we based on the following approaches of foreign scientific schools studying migration: migration as a means of accumulating capital (Pietro Reichlin & Aldo Rustichini); as a means of accumulating human capital (Uwe Walz, Nadeem Ul Haque); migration from the point of view of innovations and technology (Per Lundborg, Paul S. Segerstrom, Lucas Bretschger). Researchers Stephen Drinkwater, Paul Levine, Emanuela Lotti, Joseph Pearlman study different models, considering migration as one of three drivers of the economic development of the country. When assessing its effect on the economy of the host country, the positive influence of migration on the indicator of the Gross Domestic Product per capita is described in the studies by Jacques Poot, Ganesh Nana and Bryan Philpott.

We used the method of statistical analysis to assess the scale and the structure of migration processes and their influence on the social-economic and demographic situation in the Ural Federal District. 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. The authors applied the descriptive method of information analysis.

3. RESULTS

Today the megalopolis of Ekaterinburg is a large inter-regional innovative industrial financial, scientific, educational and cultural center of the Ural Federal District. Ekaterinburg is the fourth city in Russia in terms of population, a transport and logistics hub on the Trans-Siberian line, an administrative center of the Sverdlovsk region. The Sverdlovsk region demonstrates high demand for the foreign labor force in industrial and transports sectors. A change in the structure of migration flows from Central Asia to Ekaterinburg can be observed. The main contribution to the increase of foreign employment is made by work on the basis of a labor patent. Thus, in 2015 in the Sverdlovsk region 47 710 patents were issued, in 2016 — 37 644 [6].

Table 2: Structure of migrants in terms of sex and age in the Sverdlovsk region in 2016

	Number of incoming migrants			Number of outgoing migrants			Migration gain		
	Male & female	Male	Female	Male & female	Male	Female	Male & female	Male	Female
Total	119074	55606	63468	117550	54452	63098	1524	1154	370
Of working age	87847	41912	45935	86290	40859	45431	1557	1053	504
Elder than working age	11287	3380	7907	11237	3309	7928	50	71	–21

Source: according to the Department of Federal state statistics service in the Sverdlovsk region and the Kurgan region (2017).

The data of the table 2 demonstrate that the migration gain in 2016 is determined by the influx of women of working age and the deflux of men of working age. It is related to the fact that more and more women independently come to Russia for work. It should be noted that women from Central Asia are in demand in the sector of menial work in Russia to a larger extent than men.

The crisis strengthened the focus of the migration policy on the short-term labor migration, which impedes the effective substitution of the loss of the working population by migrants. This fact contradicts to already formed behavior patterns of labor migrants: more than 60% of them spend the majority of time during the year in Ekaterinburg; one third are oriented at permanent residence. While own resources are decreasing, and the economy is developing and being restructured, the demand for the labor force will become more diversified in terms of economic sectors and will require more qualified workers. Still, at the present moment we can observe the decrease of the education level of labor migrants arriving to Ekaterinburg. Analysis of the structure of migrants from Central Asia according to the level of education demonstrated that the absolute leader in terms of supplying Russia with qualified personnel is Kazakhstan. Almost one fourth of migrants who came to Russia from this country in 2015 had a diploma of higher professional education [7].

Referring to the data of the sociological study, we can draw attention to such important social characteristics of migrants from Central Asia as the significant cultural distance from the local population, the insufficient knowledge of the Russian language and the minimum number of contacts with the local population.

Thus, according to the results of the study, only 32.2% percent 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. Labor migrants mentioned meetings with the representatives of the same nationality (41.3%) and Internet (41.3%) as the main sources of information about Russia and Ekaterinburg. Only one fifth of the respondents (21.0%) mentioned that they communicate with the Russians in social media.

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, as they are not sufficiently involved in the information and communication environment of Ekaterinburg. It also has an impact on the migrants' involvement in the industrial environment of the city. It should be noted that, according to our data, more than 65% of the migrants in Ekaterinburg are interested in gaining the Russian citizenship or in the long-term migration.

4. CONCLUSION

Despite of the manifestations of crisis in the economy, Ekaterinburg continues to be an attractive city for labor migrants. External labor migration is, in general, profitable for Central Asia, as it is the only possible solution for many pressing social and economic problems in the sending countries. Generally, for Russia, and Ekaterinburg in particular, the influx of labor migrants from Central Asia has more positive than negative aspects: there is an infusion of low-cost labor; economically active population is attracted. 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, are not motivated and 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. Their social characteristics, including the orientation towards cultural differentiation and isolation in relation to the citizens of the host territory, contribute to this situation as well. Ekaterinburg, being the capital of the Russian industrial region, develops information and communication foundations of industrial labor. Still, labor

migrants from Central Asia, in the context of the new economy, do not have potential possibilities to expand the required professional skills.

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RECENT DEVELOPMENT TRENDS OF VOCATIONAL EDUCATION AND TRAINING IN LATVIA

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Abstract: Competitiveness of companies on local and international markets greatly depends on skilled labor force. There is an increased need for well-trained medium level specialists prepared by the vocational education and training (VET) systems especially for Industry 4.0. An effective approach for this is work-based learning. In Latvia in 2016 legal regulation on work-based learning was adopted. Still there is not enough research on the pre-conditions enabling the public administration to implement innovative VET approaches and what are the factors that make VET an attractive path. The aim of the paper is to investigate the opinions of relevant stakeholders from the education, employment and economic sectors regarding innovation in VET and the feasibility of strategic partnerships in this regard. The methods used: stakeholder survey results analysis by most of the evaluations in scale of 1-10. For analysis of data obtained in survey indicators of descriptive statistics (means and indicators of dispersion) as well as cross tabulations and multivariate analysis – factor analysis were applied

Key words: 3-5 keywords, competitive labor force, innovation, partnerships, vocational education and training, work-based

JEL Classification: I25, I28, O15, L38

1. INTRODUCTION

Analysis on attracting and educating skilled labor force have been performed in academic research in many countries. International global competition requires competitiveness of companies on local and international markets which to great extent depends on skilled labor force. There is an increased need for well-trained medium level specialists prepared by the vocational education and training (VET) systems especially for Industry 4.0. Work-based learning is an approach enabling the employers to train the future labour force according to the labour market needs, also in relation to global tendencies and technological developments. For Latvia work-based learning is an innovative approach. As the legal regulation on work-based learning in Latvia was adopted in 2016, there is a need for analysis of the context of implementation of those regulations. Still there is not enough research on the pre-conditions enabling the public administrations and motivating the employers to implement innovative VET approaches. The aim of the paper is to investigate the opinions of relevant stakeholders from the education, employment and economic sectors regarding innovation in VET, the factors contributing to the attractiveness of VET and the motivation to get involved, as well as regarding the feasibility of strategic partnerships in effective realisation of work-based learning and other innovative approaches. An important aspect is to study factors that make VET an attractive path in order to attract prospective workforce. The methods used in research: scientific publications analysis, in empirical part - experts survey results analysis by most of the evaluations on analysed statements in scale of 1-10, where 1 – do not agree and 10 – agree to full extent. For analysis of data obtained in survey indicators of descriptive statistics (means and indicators of dispersion) as well as cross tabulations, statistical testing of

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hypothesis with t-test on differences of arithmetic means and analysis of variance (ANOVA) and multivariate analysis – factor analysis were applied.

2. THEORETICAL FINDINGS

Numerous researchers have analysed various aspects of work – based learning including managerial support and attitude (Ellström, Ellström, 2014), (Geiben, Grollmann, Wolfgarten, 2015), Issues associated with recruitment, induction, and training of new employees are analysed and found as crucial to companies (Geiben, Grollmann, Wolfgarten, 2015). These issues are entangled with costs, how the way work is organised, and the productivity of a company analysed by Geiben, Grollmann and Wolfgarten who have stressed that for employees, these are crucial times in life. Researchers Geiben, Grollmann and Wolfgarten have also stressed that tasks for work-based learning settings and other ways of supporting learning and competence development for new recruits are of great importance (Geiben, Grollmann, Wolfgarten, 2015). The focus of respective research is recruitment, induction, and training of job entrants at an intermediate skill level. Employers were also asked to provide an estimation of the quality of the VET system and the knowledge and competences learned by the young people during their initial vocational education and training (Geiben, Grollmann, Wolfgarten, 2015). Both aspects, the estimation of employers as well as their reports on recruitment, induction, and training of VET graduates can be seen as an indicator for the quality of a VET system (Geiben, Grollmann, Wolfgarten, 2015). The study by (Geiben, Grollmann, Wolfgarten, 2015) was implemented in an international comparative design (Germany, United Kingdom, Spain, Finland) and with an occupation-specific perspective, concentrating on two quite different occupations: business administration support and car service. The contribution represents certain findings of this feasibility study and relates these findings to differences across countries and occupations, drawing conclusions for the enhancement of the research approach (Geiben, Grollmann, Wolfgarten, 2015).

Important aspect is matching vocational training and labor market needs (Buligina, Sloka, 2013) and partnerships in education and respective industry field (Ursache, Avădanei, Ionesi, Loghin, 2017).

Research points to such relevant issues as organisation of training in vocational education: discussions on applications of modular approach (Pilz, Canning, 2017) and their benefits and challenges. Labor market needs and requirements have to be taken into account not depending from vocational educational establishment (Ryan, Gwinner, Mallan, Livock, 2017) with combining of labor market needs and educational establishment flexibility, including development of critical thinking and reflexive approaches. Comparisons of different approaches (Fjellström, Kristmansson, 2016) by contrasting education systems have been made, highlighting constraints regarding educational goals and workplace affordances in apprenticeship systems, which largely develop vocational competencies related to specific workplace demands and activities.

Researchers have also evaluate results yielded by various approaches (Sappa, Choy, Aprea, 2016) having analysed the understanding of key stakeholders' (learners, teachers, trainers and managers/coordinators) conceptions of connections between school-based and work-based learnings which offer the main sources for developing vocational competence, and are the main sites for the enacted and engaged curriculum for VET. (Sappa, Choy, Aprea, 2016) have identified and compared conceptions of vocational learning and teaching across education and workplace settings in Swiss and Australian VET actors.

The various approaches including also e – learning as an important method to be applied in fast developing branches of industry (Mullin, 2013). Differences and similarities are discussed

and implications for VET research and development of teachers and trainers are outlined by authors of the respective research (Sappa, Choy, Aprea, 2016).

Countries have different experience, also among most advanced countries, in the use of work-based learning, e.g. the Netherlands (Onstenk, Blokhuis, 2007) and for other researchers and policy makers this experience and research results could be very useful.

Several aspects of co-operation with private enterprises are of great importance (Harris, R., Simons, M. (2006), stressing that training reforms in the vocational education and training sector have been accompanied by a dramatic rise in the perceived value of the workplace as an authentic site for learning.

3. RESULTS OF EMPIRICAL ANALYSIS AND DISCUSSION

Theoretical findings and research results were used to conduct empirical research in Latvia to analyse the views of experts from different branches involved in the development of vocational education with the introduction of work-based learning in selected vocational education establishments in close co-operation with enterprises and public administrators. The survey was conducted to evaluate several aspects important for work-based learning implementation in Latvia with evaluations by experts on scale 1 – 10, where 1- not significant, 10 – very significant. Main indicators of descriptive statistics on evaluations of analysed aspects regarding the increase of prestige of the vocational education are included in table 1.

Table 1: Main Indicators of Descriptive Statistics on Evaluations of Analysed Aspects of Increase of Attractiveness of Vocational Education

Statistic indicators	Higher salaries for medium level specialists	WBL where the employees pay a salary or grant to the trainee	Information campaigns in mass media promoting and praising professional specialists	Modern learning environment	Modern and innovation oriented VET content	A dialogue with children and their parents in pre-school and primary education on the advantages of the choice of a suitable profession	Promoting a higher social status for VET learners	Promoting a higher social status for middle level specialists	Awards and bonuses by enterprises and sectors for medium level specialists	More job opportunities at technology oriented enterprises
N Valid	118	117	117	117	116	115	116	116	115	117
Missing	14	15	15	15	16	17	16	16	17	15
Mean	8,33	8,44	7,68	9,06	9,06	7,98	8,18	8,20	7,79	8,89
Std. Error of Mean	0,148	0,141	0,181	0,095	0,108	0,189	0,180	0,161	0,165	0,116
Median	9	9	8	9	9	8	9	8	8	9
Mode	10	10	10	10	10	10	10	10	8	10
Std. Deviation	1,612	1,522	1,955	1,028	1,159	2,022	1,941	1,731	1,765	1,251
Variance	2,599	2,317	3,822	1,057	1,344	4,087	3,767	2,995	3,114	1,565
Range	8	8	9	4	6	9	9	9	9	5
Minimum	2	2	1	6	4	1	1	1	1	5
Maximum	10	10	10	10	10	10	10	10	10	10

Source: author's calculations based on Ilze Buligina conducted survey, n=132, Evaluation scale 1- 10, where 1 – not significant; 10 – very significant

Results of expert survey indicates that the highest evaluations are given to *Modern learning environment* with arithmetic mean of evaluations of 9,06; half of respondents gave evaluation 9 or less and half of respondents gave evaluations 9 or more (characterised by median), the most frequent evaluation was 10 (mode); the lowest evaluation for this aspect was 6; very similar evaluations but with larger variance are for statement *Modern and innovation oriented VET content* with arithmetic mean of evaluations of 9,06; half of respondents allocated evaluation 9 or less and half of respondents allocated evaluations 9 or more (characterised by median), the most frequent evaluation was 10 (mode); the lowest evaluation for this aspect was 4.

In some theoretical findings it was mentioned that respondent gender can influence evaluations on organisation of vocational education; for this reason analysis of results on evaluations by gender are included in table 2.

Table 2: Group Statistics on Evaluations on Aspects of Increase of Attractiveness of Vocational Education by Gender

Analysed aspects	Gender	N	Mean	Std. Deviation	Std. Error Mean
Higher salaries for medium level specialists	Female	80	8,45	1,457	0,163
	Male	35	8,03	1,932	0,327
WBL where the employers pays a salary or grant to the trainee	Female	79	8,47	1,632	0,184
	Male	35	8,31	1,301	0,220
Information campaigns in mass media promoting and praising professional specialists	Female	79	7,73	1,953	0,220
	Male	36	7,56	1,978	0,330
Modern learning environment	Female	80	9,01	1,097	0,123
	Male	35	9,14	0,879	0,149
Modern and innovation oriented VET content	Female	79	9,09	1,232	0,139
	Male	35	9,00	1,029	0,174
A dialogue with children and their parents in pre-school and primary education on the advantages of the choice of a suitable profession	Female	78	7,85	2,071	0,234
	Male	35	8,23	1,942	0,328
Promoting a higher social status for VET learners	Female	79	8,00	1,994	0,224
	Male	35	8,57	1,803	0,305
Promoting a higher social status for middle level specialists	Female	79	8,08	1,845	0,208
	Male	35	8,46	1,442	0,244
Awards and prizes by enterprises and sectors for medium level specialists	Female	78	7,86	1,518	0,172
	Male	35	7,60	2,265	0,383
More job opportunities at technology oriented enterprises	Female	80	9,00	1,114	0,125
	Male	35	8,57	1,501	0,254

Source: author's calculations based on Ilze Buligina conducted survey, n=132, Evaluation scale 1- 10, where 1 – not significant; 10 – very significant

Data of table 2 show that the evaluations by gender are alike but still different with more prominent differences in evaluations for some analysed aspects; for this reason statistical hypothesis was tested on the difference of evaluations by gender with t – test. Null hypothesis was stated: there is no difference in evaluations of analysed aspects by experts depending on expert gender. Rejection of null hypothesis would lead to acceptance of alternative hypothesis – that differences in evaluations by gender differ statistically significantly with reasonable level of significance. The results of statistical hypothesis testing with t – test are included in table 3.

Table 3: Statistical Hypothesis Testing for Equality of Means on Evaluations of Aspects on Increase of Attractiveness and Prestige of the Vocational Education by Gender

Analysed aspects	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Higher salaries for medium level specialists	1,288	113	0,201	0,421	0,327
	1,154	51,650	0,254	0,421	0,365
WBL where the employers pay a salary or grant to the trainee	0,493	112	0,623	0,154	0,312
	0,538	80,800	0,592	0,154	0,286
Information campaigns in mass media promoting and praising professional specialists	0,453	113	0,651	0,179	0,394
	0,451	67,067	0,653	0,179	0,396
Modern learning environment	-0,621	113	0,536	-0,130	0,210
	-0,677	80,058	0,501	-0,130	0,193
Modern and innovation oriented VET content	0,372	112	0,711	0,089	0,238
	0,398	77,305	0,691	0,089	0,222
A dialogue with children and their parents in pre-school and primary education on the advantages of the choice of a suitable profession	-0,925	111	0,357	-0,382	0,413
	-0,948	69,561	0,346	-0,382	0,403
Promoting a higher social status for VET learners	-1,452	112	0,149	-0,571	0,393
	-1,510	71,631	0,135	-0,571	0,378
Promoting a higher social status for middle level specialists	-1,084	112	0,281	-0,381	0,352
	-1,191	82,338	0,237	-0,381	0,320
Awards and prizes by enterprises and sectors for medium level specialists	,715	111	0,476	0,259	0,362
	,617	48,225	0,540	0,259	0,420
More job opportunities at technology oriented enterprises	1,701	113	0,092	0,429	0,252
	1,517	51,085	0,136	0,429	0,283

Source: author's calculations based on Ilze Buligina conducted survey, n=132, Evaluation scale 1 - 10, where 1 – not significant; 10 – very significant

Results of data included in table 3 indicate that evaluations by gender do differ for all analysed aspects for increase of prestige and attractiveness of vocational education. Average evaluations by female respondents are higher for the following analysed aspects of vocational education and training: *Modern learning environment*; *A dialogue with children and their parents in pre-school and primary education on the advantages of the choice of a suitable profession*; *Promoting a higher social status for VET learners*; *Promoting a higher social status for middle level specialists*. For other analysed aspects for increase of prestige of vocational education the average evaluations are higher by male respondents.

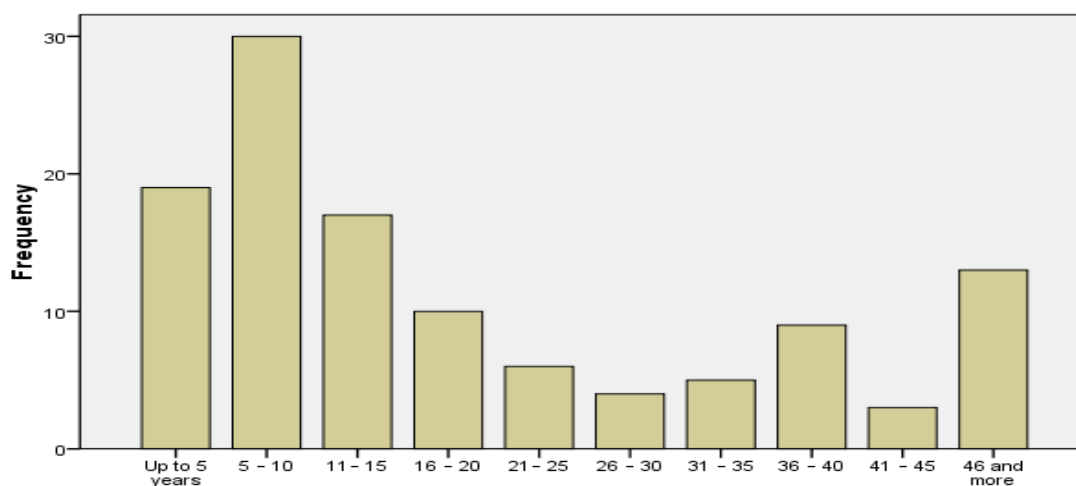
In some of research performed by researchers in other countries there are indications that views on different aspects related to the vocational education organisation and realisation do differ depending from the experience of experts in the field of respective competence therefore we have analysed data of evaluations by experience of experts in the respective field. The distribution of experts by experience (years of experience) in the indicated field of competence are included in table 4.

Table 4: Distribution of Respondents by their Experience in the Indicated Field of Competence

	Years of Experience	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Up to 5 years	19	14,4	16,4	16,4
	5 – 10	30	22,7	25,9	42,2
	11– 15	17	12,9	14,7	56,9
	16 – 20	10	7,6	8,6	65,5
	21– 25	6	4,5	5,2	70,7
	26 – 30	4	3,0	3,4	74,1
	31 – 35	5	3,8	4,3	78,4
	36 – 40	9	6,8	7,8	86,2
	41 – 45	3	2,3	2,6	88,8
	46 and more	13	9,8	11,2	100,0
	Total	116	87,9	100,0	
Missing	System	16	12,1		
Total		132	100,0		

Source: author's calculations based on Ilze Buligina conducted survey, n=132

The distribution of respondents by competence in the field is included in the figure 1.

Figure 1: Distribution of Experts by Experience in Respective Field (in years)

Source: author's calculations based on Ilze Buligina conducted survey, n=132

Results of tested hypothesis on differences of evaluations by experience – with analysis of variance (ANOVA) are included in table 5.

Table 5: Statistical Hypothesis Testing for Equality of Means (with ANOVA) on Evaluations of Aspects of Increase of Attractiveness of the Vocational Education by Work Experience

		Sum of Squares	df	Mean Square	F	Sig.
Higher salaries for medium level specialists	Between Groups	37,292	9	4,144	1,662	0,108
	Within Groups	261,804	105	2,493		
	Total	299,096	114			
WBL where the employers pays a salary or grant to the trainee	Between Groups	23,737	9	2,637	1,133	0,346
	Within Groups	242,052	104	2,327		
	Total	265,789	113			
Information campaigns in mass media promoting and praising professional specialists	Between Groups	64,639	9	7,182	2,036	0,042
	Within Groups	370,457	105	3,528		
	Total	435,096	114			
Modern learning environment	Between Groups	16,249	9	1,805	1,798	0,077
	Within Groups	105,438	105	1,004		
	Total	121,687	114			
Modern and innovation oriented VET content	Between Groups	18,043	9	2,005	1,527	0,148
	Within Groups	136,527	104	1,313		
	Total	154,570	113			
A dialogue with children and their parents in pre-school and primary education on the advantages of the choice of a suitable profession	Between Groups	51,616	9	5,735	1,440	0,181
	Within Groups	410,242	103	3,983		
	Total	461,858	112			
Promoting a higher social status for VET learners	Between Groups	33,668	9	3,741	0,985	0,457
	Within Groups	394,824	104	3,796		
	Total	428,491	113			
Promoting a higher social status for middle level specialists	Between Groups	26,076	9	2,897	0,961	0,477
	Within Groups	313,678	104	3,016		
	Total	339,754	113			
Awards and prizes by enterprises and sectors for medium level specialists	Between Groups	29,357	9	3,262	1,037	0,416
	Within Groups	324,112	103	3,147		
	Total	353,469	112			
More job opportunities at technology oriented enterprises	Between Groups	10,709	9	1,190	0,742	0,669
	Within Groups	168,335	105	1,603		
	Total	179,043	114			

Source: author's calculations based on Ilze Bulgina conducted survey, n=132, Evaluation scale 1- 10, where 1 – not significant; 10 – very significant

The results of analysis of variance indicate that the evaluations by experience in the fields of competence does not differ statistically significantly with level of significance less than 0,05 is for statement *Information campaigns in mass media promoting and praising professional specialists*, the evaluations by experience in the fields of competence does not differ statistically significant with level of significance less than 0,1 is for statement *Modern learning environment*. For other evaluated aspects evaluations of experts by experience in the fields of competence does differ statistically significantly.

The analysis of expert evaluation results by use of multivariate analysis – factor analysis are included in table 6.

Table 4: Complex Factors on Evaluations of Aspects on Increase of Attractiveness of the Vocational Education

Rotated Component Matrix^a			
	Component		
	1	2	3
Higher salaries for medium level specialists	0,730	0,180	0,102
WBL where the employers pays a salary or grant to the trainee	0,791	0,054	0,291
Information campaigns in mass media promoting and praising professional specialists	0,695	0,001	0,260
Modern learning environment	0,240	0,127	0,851
Modern and innovation oriented VET content	0,133	0,141	0,855
A dialogue with children and their parents in pre-school and primary education on the advantages of the choice of a suitable profession	-0,035	0,731	0,242
Promoting a higher social status for VET learners	0,585	0,649	-0,106
Promoting a higher social status for middle level specialists	0,649	0,629	-0,147
Awards and prizes by enterprises and sectors for medium level specialists	0,114	0,726	0,111
More job opportunities at technology oriented enterprises	0,123	0,462	0,385

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Source: author's calculations based on Ilze Buligina conducted survey, n=132, Evaluation scale 1- 10, where 1 – not significant; 10 – very significant

The complex factors of aspects on increase of attractiveness of vocational education obtained in 7 iterations with extraction methods: principal component analysis with varimax rotation are:

I – material and information factor (created from evaluations for statements - higher salaries for medium level specialists; WBL where the employers pays a salary or grant to the trainee; information campaigns in mass media promoting and praising professional specialists; promoting a higher social status for middle level specialists);

II - Organisational factor (created from evaluations for statements - a dialogue with children and their parents in pre-school and primary education on the advantages of the choice of a suitable profession; promoting a higher social status for VET learners; awards and prizes by enterprises and sectors for medium level specialists; more job opportunities at technology oriented enterprises);

III- Modern and innovative working environment (created from evaluations for statements - modern learning environment; modern and innovation oriented VET content).

4. CONCLUSION

Work – based learning has a great role in the education of competitive labor force able to perform work in fast developing environment. Various aspects of work – based learning are of great significance : good co-operation with employers, attractive and innovative learning environment, motivated teaching staff and material support and encouragement of trainees. The complex factors of aspects on increase of attractiveness and prestige of vocational education obtained in 7 iterations with extraction methods: principal component analysis with varimax rotation are:

I – material and information factor (created from evaluations for statements - higher salaries for medium level specialists; WBL where the employers pays a salary or grant to the

trainee; information campaigns in mass media promoting and praising professional specialists; promoting a higher social status for middle level specialists);

II - Organisational factor (created from evaluations for statements - a dialogue with children and their parents in pre-school and primary education on the advantages of the choice of a suitable profession; promoting a higher social status for VET learners; awards and prizes by enterprises and sectors for medium level specialists; more job opportunities at technology oriented enterprises);

III- Modern and innovative working environment (created from evaluations for statements - modern learning environment; modern and innovation oriented VET content).

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PRIJÍMANIE INOVÁCIÍ ELEKTRONICKÝCH PRODUKTOV V OKRUHU SLOVENSKÝCH SPOTREBITEĽOV

ADOPTION OF ELECTRONIC PRODUCT INNOVATION AMONG SLOVAK CONSUMERS

Angelika CSEREOVÁ¹⁴
Erika SERES HUSZÁRIK¹⁵

Abstrakt: *V súčasnosti sa technológia a v rámci toho najmä zábavná elektronika je tá, ktorá sa neustále rozvíja. Z hľadiska voľby správnej stratégie pre spoločnosti je dôležité nájsť tú cieľovú skupinu na Slovensku, ktorá prijíma produkt po kratšom alebo len po dlhšom časovom období. Inovativnosť spotrebiteľov pre nové technológie sa riešila v rámci tzv. teórie o difúzii inovácií. V tejto štúdii predstavíme najznámejšiu teóriu o difúzii a spotrebiteľské skupiny, ktoré prijímajú produkt v priebehu času. Cieľom nášho primárneho prieskumu je zistiť pomer spotrebiteľov zábavnej elektroniky mladších a starších ako 36 rokov žijúcich na území Slovenska v jednotlivých spotrebiteľských skupinách a na základe toho čas prijatia produktu. Okrem toho by sme chceli posúdiť medzi nimi pomer skorších a neskorších prijímateľov. Ďalším našim cieľom je preskúmať našu hypotézu sformulovanú o skorších prijímateľoch. V našom prieskume sme konštatovali, že väčšina skúmaných spotrebiteľov je prítomná v skupinách včasnej a oneskorenej väčšiny, takže prijíma produkt až vo fáze zrelosti – nie je väčší rozdiel ani medzi mladšími a staršími spotrebiteľmi. Našu hypotézu, podľa ktorej skorší prijímatelia sa nelíšia vo veku od neskorších prijímateľov, sme akceptovali.*

Kľúčové slová: *difúzia inovácií, skorší prijímatelia, neskorší prijímatelia, spotrebiteľské skupiny*

Abstract: *Nowadays the technology, within it especially the entertainment electronics are constantly evolving. For a company in order to choose the right strategy, it is important to explore that Slovakian target group, which adopts the product after a shorter or just a longer period of time. Consumers' innovativeness towards new technology has been dealt within the so-called diffusion of innovation theory. In our study we introduce the best-known diffusion theory and then the consumer groups who adopt the product in the course of time. The aim of our primary research is to explore the proportion of Slovakian consumers of entertainment electronics under and over the age of 36 within the consumer groups of Rogers, hereby the time of product adoption. In addition, we would like to measure the proportion of earlier and later adopters among them. Another important aim of us is to examine our hypothesis formulated about the earlier adopters. In our research we found, that the majority of examined consumers is present in the early and late majority consumer groups, so adopts the product in the stage of maturity - there is no significant difference between the younger and older consumers. Our hypothesis, according to which the earlier adopters don't differ from later adopters in age, was accepted.*

Key words: *consumer groups of Rogers, diffusion of innovation, earlier adopters, later adopters*

JEL Classification: *D12, M31, O33*

1. ÚVOD

So šírením novej technológie v spoločnosti a s inovatívnosťou spotrebiteľov k novej technológii sa odborníci zaoberali v rámci teórie o difúzii inovácií, z ktorých najznámejší difúzny model môžeme ďakovať Everettovi Rogersovi.

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Táto teória sa považuje za starú, ale podľa nášho názoru je táto téma aktuálna, keďže vďaka neustále sa vyvíjajúcej technológii spotrebiteľia sú obklopení čoraz väčším množstvom elektronických výrobkov. Práve preto považujeme za dôležité posúdiť pomer skúmaných spotrebiteľov v jednotlivých spotrebiteľských skupinách, a tak môžeme usúdiť, v ktorej fáze životného cyklu prijímajú produkt, teda koľko času uplynie až do prijatia. Takto si môžu spoločnosti vyrábajúce zábavnú elektroniku vytvárať stratégiu vyhovujúcu rôznym potrebám svojich cieľových skupín.

Ďalej testovaním hypotézy považujeme za dôležité posúdiť, či existuje vzťah medzi vekom a inovatívnosťou, teda či sa líšia skorší prijímatelia od neskorších prijímateľov vo veku? Takto je možné určiť, či má vek vplyv na pomer spotrebiteľov v jednotlivých spotrebiteľských skupinách.

1.1 Rogersova teória o difúzie inovácií

Proces, v ktorom sa výrobok šíri prostredníctvom skupín zákazníkov, sa nazýva proces difúzie inovácií. Dvaja prominentní odborníci sa zaoberali s modelmi difúzií a so skúmaním prijímania inovácií: Everett M. Rogers a Frank Bass. [5]

Najznámejší model procesu difúzie vyvinul Everett Rogers v 60 rokoch 20. storočia. Svoju teóriu difúzií vyvinul na základe študovania predchádzajúcich výskumov (napr. Gabriel Tarde v roku 1903), v ktorých skúmali, ako nové výrobky zaujali členov spoločnosti. Začiatkom 20. storočia Tarde si všimol, že miera imitácie alebo prijatie novej myšlienky vo všeobecnosti sleduje krivku S v priebehu času – ktorý neskôr využil aj Rogers pri vytvorení svojej teórie o difúzií. Rogersov model sa stal hlavným analytickým nástrojom pre rôzne marketingové, organizačné- a vývojové (vývoj výrobkov) štúdie. [3], [7], [15]

Rogers považuje proces rozšírenia technologických inovácií za komunikačný proces, keďže rôzne informácie o produktových inováciách sa šíria cez určité kanály, v priebehu určitého času, v danej spoločnosti. Podľa jeho predpokladu komunikácia medzi jednotlivcami a difúzia inovácií sa stávajú účinnou vtedy, keď sú jednotlivci navzájom podobní. Cieľom Rogersovej teórie difúzií bolo vytvoriť taký model rozhodovania o inováciách, ktorý by bol schopný vysvetliť a predpovedať, že určité inovácie s akou rýchlosťou, cez aké komunikačné kanály sa stávajú známymi v rámci sociálneho systému. Teóriu difúzií, ktorú vytvoril, mediálny výskum dodnes aplikuje v širokom kruhu - najnovšie pri skúmaní penetrácie internetu a digitálnych médií. Autor rozlišuje 4 základné zložky procesu rozšírenia: *inovácie*, *komunikačné kanály*, *čas* a *daný sociálny systém*, v ktorom sa celý proces uskutočňuje. Rogers skúmal jednotlivé dimenzie a tie faktory (zhrnuté v nich), ktoré výrazne ovplyvňujú rýchlosť šírenia inovácií. V roku 1962 vydal svoju priekopnícku knihu o teórii difúzií, ktorá mala názov „Diffusion of innovations”. [1], [4], [9], [10], [12], [13]

Komunikačné kanály zahŕňajú v sebe formálne (napr. reklama, priamy marketing) a neformálne (napr. ústna reklama prostredníctvom názorových vodcov) kanály. V prvej časti procesu difúzie sa získavajú informácie o existencii inovácie a o jej základných charakteristikách. Masmédiá (napr. rozhlas, televízia, noviny) sú najrýchlejšími a najefektívnejšími prostriedkami informovania verejnosti o existencii inovácie. Interpersonálne kanály sú najúčinnnejšími nástrojmi na presvedčenie jednotlivca o prijatí inovácie v neskoršej fáze procesu. Tu nastane osobná výmena informácií medzi dvoma alebo viacerými jednotlivcami. Medziľudské vzťahy vytvárajú rôzne komunikačné siete (siete difúzií) – v rámci nich prebieha skutočný proces šírenia. Okrem týchto kanálov v posledných desaťročiach sa stala čoraz dôležitejšou komunikácia cez internet. [1], [8]

1.2 Spotrebiteľské skupiny Rogersa

Rogers cez komponentu „čas“ kategorizoval členov spoločnosti do 5 spotrebiteľských skupín v závislosti od toho, ako rýchlo dokážu prijať (čiže nakúpiť) nový produkt. Teda zaradil ich podľa trvania prijatia produktu, inovatívnosti. Inovatívnosť je úroveň adaptácie, počas ktorej jednotlivec prijíma inováciu relatívne skoršie než ostatní jednotlivci. Rogersove trhové segmenty sú: *inovátori*, *skorší príjemcovia*, *včasná väčšina*, *oneskorená väčšina* a *oneskorenci*. Každá jedna skupina alebo trhový segment obsahuje takých jednotlivcov, ktorí vykazujú podobné správanie súvisiace s prijatím produktu. Potreby skupín sa výrazne líšia od seba, preto je potrebné vytvoriť rôzne stratégie pre nich. [5], [8], [9], [10]

Inovátori predstavujú 2,5% spotrebiteľských prijímateľov produktu. Patria sem tí jednotlivci, ktorí sú aktívnymi vyhľadávačmi inovácií a tí, ktorí nový produkt najmä nakupujú. Berú na seba riziko pri nákupe nového produktu. Ďalej zohrávajú dôležitú rolu v procese difúzie, t. j. v toku nových myšlienok do systému. Do tejto spotrebiteľskej skupiny sú zaradení mladší jednotlivci patriace do najvyššej sociálnej triedy, s vyšším vzdelaním a vyšším príjmom. Títo jednotlivci výrobok prijímajú už vo fáze zavedenia. Teda skoro po zavedení výrobku na trh oni sú prví, ktorí ten výrobok kúpia. Sú to tí, ktorí sú nezávislí od názorov iných ľudí o inováciách. Ďalších 13,5% prijímateľov tvoria *skorší príjemcovia*. Od inovátorov sa líšia v tom, že proces prijatia sa u nich väčšinou uskutočňuje vo fáze rastu produktu. S predchádzajúcou skupinou sa podobajú v tom, že členovia sú mladší, disponujú vyšším vzdelaním a vyššími príjmami. Sú však v užšom vzťahu s ďalšími spotrebiteľmi, najmä s členmi včasnej väčšiny. Táto skupina vrcholne plní úlohu názorových vodcov. Sú rešpektovaní spoločníkmi. Spoločnosti predávajúce výrobky sa zaujímajú o tieto prvé dve kategórie, pretože inovátori a skorší príjemcovia zaručia na začiatku objem predaja a vedia ovplyvniť ďalších potenciálnych spotrebiteľov. Prijímateľov v najvyššom podiele, v 34% tvorí *včasná väčšina*. Táto skupina je oveľa viac obozretná v súvislosti s nákupom produktu a patrí k sociálno-ekonomickej vrstve nad priemerom. Členovia tejto skupiny pred rozhodnutím na nákup sú ochotní počkať, kým výrobok prijmu ostatní, takže sú náchylní na prijatie vo fáze zrelosti – pred spoločenským priemerom. Mottom včasnej väčšiny by mohlo byť „Nebuď prvý, komu dajú vyskúšať nové, ani posledný, kto odloží staré“. Vytvárajú dôležitý vzťah v procese difúzie medzi veľmi skorým a pomerne neskorým prijatím. Zámernou ochotou sledujú pri prijímaní inovácií, ale zriedka vedú. Taktiež 34% prijímateľov tvorí *oneskorená väčšina*. Táto skupina je nútená prijímať nový produkt buď z ekonomických alebo zo sociálnych dôvodov, alebo kvôli rastúcemu sieťovému tlaku až vtedy, keď produkt už dosiahol fázu zrelosti – bezprostredne po sociálnom priemere. K inovácii sa približujú skepticky a opatrne. Jej členovia sú konzervatívnejší, menej vzdelaní a finančne menej stabilní ako členovia predchádzajúcej skupiny. Sú pomerne v nižšej sociálno-ekonomickej situácii a pod jej priemerom, menej využívajú masmediálne prostriedky a získavajú informácie o novinkách najmä od rovesníkov (sú vo vzťahu s včasnou väčšinou a oneskorenou väčšinou). Patria sem najmä členovia staršej generácie. Potrebujú si osobne overiť výrobok a taktiež je veľmi dôležité, aby sa takmer všetky neistoty odstránili pred prijatím nového výrobku. Poslednú skupinu tvoria *oneskorenci* s pomerom 16%. Jej členovia prijímajú výrobky už iba vo fáze poklesu, keď výrobok začína opustiť trh a jeho miesto nahradí nový výrobok. Členovia aktívne odolávajú všetkým zmenám a reprezentujú nižšiu sociálno-ekonomickú vrstvu. Sú starší než členovia predchádzajúcich skupín. Nemajú takmer žiadny názor o produkte. Oni sú najviac lokálne orientovaní zo všetkých skupín. Stýkajú sa len s rodinnými príslušníkmi a s priateľmi (úzke zhromažďovanie informácie). Kým ľudia žijúci vo väčšine sociálnych systémov hľadajú na cestu zmien, pre oneskorencov často je rozhodujúca minulosť, ukážu sa tradicionalistickými. Orientácia na tradíciu spomaľuje rozhodovací proces inovácií. Sú nedôverčiví voči inováciám a voči sprostredkovateľom zmeny. Ich zdroje sú obmedzené – preto musia byť veľmi opatrní pri prijímaní inovácií. [2], [3], [5], [8], [10], [14]

Rogers spotrebiteľské skupiny zaradil do ďalších dvoch hlavných skupín: do skorších a neskorších prijímateľov (earlier and later adopters). Skorší prijímatelia pozostávajú z inovátorov, skorších príjemcov a včasnej väčšiny, kým neskorších prijímateľov tvorí skupina oneskorenej väčšiny a oneskorencov. Rogers identifikuje rozdiely medzi dvoma hlavnými skupinami v 3 hlavných charakteristikách: v ekonomicko-spoločenskom postavení, osobných charakteristikách a v komunikačnom správaní – tieto vo všeobecnosti sú spojené s inovatívnosťou pozitívne. Rogers vytvoril 25 všeobecností o skorších prijímateľoch, z ktorých sme sa v tejto štúdii zaoberali iba s prvou všeobecnosťou, pretože tá všeobecnosť slúžila ako základ pre našu hypotézu. Podľa tejto všeobecnosti *skorší prijímatelia sa nelíšia vo veku od neskorších prijímateľov*. Tvrdil to Rogers na základe viacerých štúdií, pretože polovica týchto štúdií nevykazovala žiadny vzťah medzi vekom a inovatívnosťou. Iba niekoľko štúdií vykazuje, že skorší prijímatelia sú mladší, kým podľa ďalších štúdií sú starší než neskorší prijímatelia. [8], [10]

2. CIEĽ A METODOLÓGIA

Najdôležitejším cieľom nášho výskumu je zistiť pomer spotrebiteľov zábavnej elektroniky mladších a starších ako 36 rokov žijúcich na území Slovenska v jednotlivých spotrebiteľských skupinách, ďalej to, že najmä v ktorej fáze životného cyklu výrobku prijímajú produkt. Okrem toho by sme chceli posúdiť medzi nimi pomer skorších a neskorších prijímateľov. Naším ďalším dôležitým cieľom bolo dokazovanie našej hypotézy o skorších prijímateľoch. Založili sme jednu hypotézu v súvislosti so skoršími prijímateľmi. V hypotéze sme tvrdili, že *skorší prijímatelia sa nelíšia vo veku od neskorších prijímateľov*. Túto hypotézu sme založili na základe prvej všeobecnosti o skorších prijímateľoch. Na dosiahnutie vyššie uvedených výskumných cieľov sme najskôr sformulovali naše výskumné otázky:

1. *V akom pomere sú rozložené skúmaní spotrebiteľia v spotrebiteľských skupinách Rogersa?*
2. *V akom pomere sú rozložené skorší a neskorší prijímatelia v okruhu skúmaných spotrebiteľov?*
3. *Existuje vzťah medzi vekom a inovatívnosťou spotrebiteľov?*

Tento výskum patrí medzi marketingové výskumy, v rámci toho medzi deskriptívne (opisné) výskumy, lebo jeho hlavným cieľom je zistiť pomer spotrebiteľov žijúcich na území Slovenska v spotrebiteľských skupinách Rogersa. V skutočnosti teda pripravíme jeden popis o situácii (o rozložení) spotrebiteľov. Okrem toho počas analyzovania dotazníka by sme chceli dostať odpovede na také výskumné otázky, kde sme zvedaví na to, či existuje nejaký vzťah medzi dvomi faktormi, v našom prípade medzi vekom a inovatívnosťou. Opisný výskum má vopred plánovanú a štruktúrovanú konštrukciu a je schopný určiť stupeň nadväzovania závislých (napr. inovatívnosť) a nezávislých (napr. vek) premenných. [6] Zhromažďovanie údajov sa počas primárneho výskumu uskutočnilo pomocou dotazníka. Dotazníkový prieskum patrí medzi kvantitatívne výskumné techniky (metódy). Vybrali sme elektronické dotazovanie, pretože podľa nášho názoru ten je najvhodnejší na zhromaždenie viacerých údajov – chceli sme posúdiť pomer rozloženia spotrebiteľov užívajúcich zábavnú elektroniku v spotrebiteľských skupinách skúmaním pomerne veľkej cieľovej populácie. Dotazovanie sa uskutočnilo pomocou internetu. Mysleli sme si, že to by bolo najvhodnejšie riešenie pre respondentov, pretože takýmto spôsobom môžu vyplniť dotazník kedykoľvek doma v pohodlí a vyplnenie sa môže uskutočniť rýchlejšie. Dotazníky boli vytvorené pomocou editora dotazníkov Google, účastníci prieskumu mohli preposlať iným, vyplniť a poslať naspäť dotazník na im poslanej webovej stránke. Metóda dotazovania patrí medzi štruktúrované zhromaždenie údajov, preto sme rozposlali formálny dotazník, v ktorom za sebou nasledovali otázky vo vopred určenom poradí. Nami vytvorený štruktúrovaný dotazník obsahoval 28 otázok. Vybranú cieľovú populáciu tvorili spotrebiteľia zábavnej elektroniky,

mladší a starší ako 36 rokov žijúce na území Slovenska. Vekové skupiny boli dotazované v rovnakom pomere (75-75 osôb). Tieto dve vekové skupiny bolo potrebné vytvoriť pre spoznanie rozdielov medzi mladšími a staršími spotrebiteľmi, okrem toho aj našu hypotézu sme skúmali podľa toho. Bohužiaľ nemáme k dispozícii výberový rámec, čiže zoznam adries, ktorý by sme mohli použiť, preto bolo vhodné použiť nepravdepodobnostný (zámerný) výber. Na zhromaždenie údajov sme tak použili metódu snehovej gule. Naš dotazníkový prieskum je možné považovať za reprezentatívny vzor iba do takej miery, nakoľko sú naše výsledky pravdivé na dotazovaných 150 osôb.

Našu hypotézu sme dokazovali pomocou krížovej (kontingenčnej) tabuľky. Táto tabuľka ukazuje distribúciu dvoch alebo viacerých premenných. Uskutočnením analýzy chceme zistiť, či sú dve nominálne alebo ordinálne premenné navzájom prepojené. [11] S našou hypotézou by sme chceli dokazovať, že skupiny skorších a neskorších prijímateľov sa nelíšia vo veku. Vek bol skúmaný na základe vekových skupín, ktoré sú ordinálnymi, nemetrickými, nezávislými premennými, a položky inovatívnosti (čiže skorší a neskorší prijímatelia) sú tiež ordinálnymi, nemetrickými, ale závislými premennými.

Po vykonaní dotazníkového prieskumu údaje boli spracované anonymne. V dotazníku sme považovali za potrebné skúmať nákupy na trhu zábavnej elektroniky, pretože je to typ výrobku, ktorý prechádza neustálymi zmenami a rozvoji.

3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

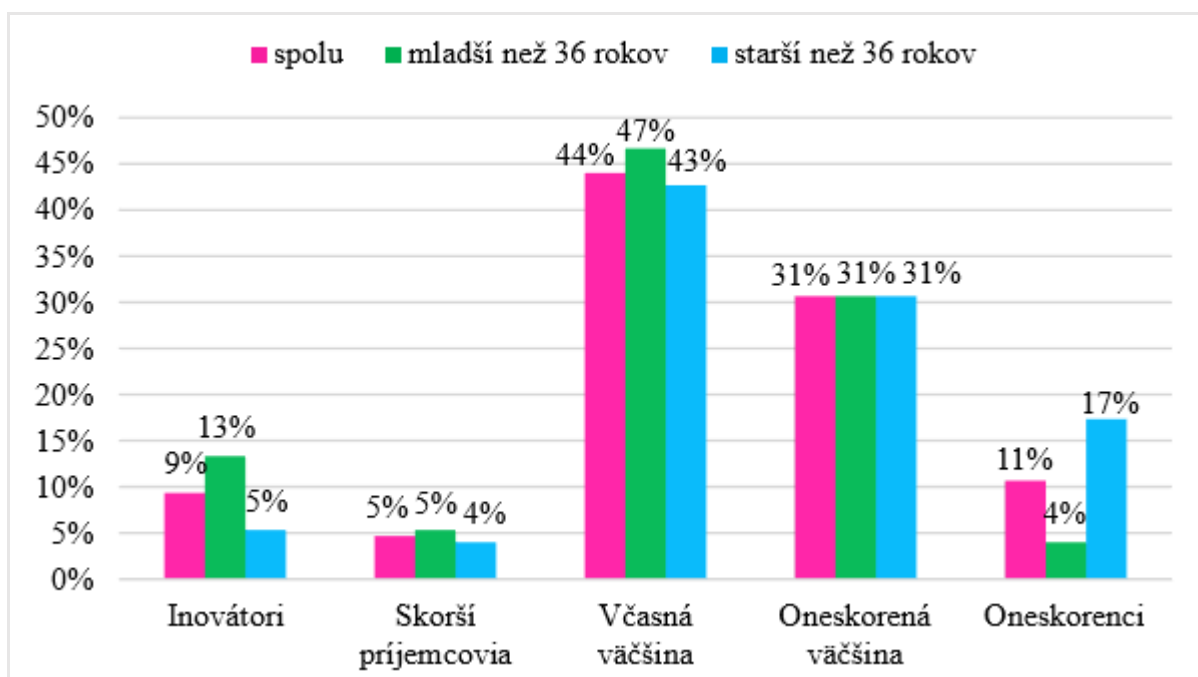
Na to, aby sme získali odpoveď na našu najdôležitejšiu výskumnú otázku, sme v použitom dotazníku vytvorili celkom 5 tvrdení o spotrebiteľských skupinách. Chceli sme zistiť, do ktorej spotrebiteľskej skupiny patria skúmaní spotrebiteľia (aj z pohľadu dvoch vekových skupín) a do akej miery prijímajú nové výrobky, teda nakoľko sú inovatívni a tiež sme chceli zistiť, že kedy u nich nastane čas prijatia produktu. Spotrebiteľia si museli vybrať z tých 5 tvrdení to najcharakteristickejšie na seba. Väčšina (44% respondentov) patrí *k ohľaduplným kupujúcim, predtým než si prijíma (nakúpi) nový elektronický výrobok, musí sa uistiť o výhodách nového produktu proti starému produktu od svojich známych a priateľov. Vtedy je ochotná prijať nový produkt, keď okolo neho to používa viac ľudí.* Teda tí spotrebiteľia patria do skupiny *včasnej väčšiny*. Potom nasledujú s 31% tí spotrebiteľia, ktorí *sú zvedaví na nové elektronické produkty, ale sú aj opatrní, čakajú na chvíľu, kedy cena tovaru poklesne, alebo nový produkt si prijímajú len vtedy, ak je to potrebné (napr. keď starý videoprehrávač stiahnu z trhu, tak musia to nahradiť DVD prehrávačom, pretože chcú pozerať filmy).* Na základe toho sme ich zaradili do skupiny *oneskorenej väčšiny*. V podobnom pomere nasledovali tí respondenti, ktorí *sa cítia dosť odvážne na to, aby medzi prvými začali používať najnovšie elektronické produkty – sú veľmi otvorení voči novinkám a tí, ktorí sú podozriví voči novým elektronickým produktom, takže nekupujú žiadne nové veci, novinky, nemajú radi, ak na nich skúšajú novinky* (9 a 11%). Oni patria k *inovátorom* a *oneskorencom* v poradí. V najmenšom pomere (5%) boli tí respondenti, ktorí *sú ochotní nakúpiť elektronický produkt, keď je to ešte novinkou a radi dávajú rady o produkte ostatným.* Oni patria k *skorším príjemcom*. Porovnaním pomerov našich spotrebiteľských skupín s pomermi spotrebiteľských skupín Rogersa môžeme konštatovať, že pomer skúmaných spotrebiteľov je podobný k pomeru oneskorenej väčšiny zo spotrebiteľských skupín Rogersa, pretože tam tá skupina má pomer 34%, ktorý v našom prípade predstavuje 31%. Pomer inovátorov a včasnej väčšiny je v našom prípade väčší než 2,5% a 34% u Rogersa, kým skorší príjemcovia a oneskorenci sú prítomní v menšom pomere podľa výsledkov nášho výskumu.

Pri skúmaní spotrebiteľských skupín medzi mladšou a staršou vekovou skupinou sme zistili, že obidve vekové skupiny sú prítomné vo *včasnej a oneskorenej väčšine*. Kým mladší než 36 rokov patria skôr k *inovátorom* (13%) než k *oneskorencom* (4%), zatiaľ starší než 36

rokov na rozdiel od nich patria skôr k oneskorencom (17%) a menej sú prítomní v skupine inovátorov (5%). Teda rozdiel medzi dvoma vekovými skupinami je viditeľný najmä pri skupinách inovátorov a oneskorencov. Podľa dosiahnutých výsledkov môžeme vysloviť, že 13% *mladšej* vekovej skupiny prijíma nový produkt už vo fáze *zavedenia* životného cyklu výrobku, kým 17% *starších* prijíma produkt iba vo fáze *poklesu*. Obidve vekové skupiny sú prítomné iba v menšom pomere medzi skoršími príjemcami.

Celkovo možno povedať, že väčšina skúmaných spotrebiteľov a obidvoch vekových skupín prijíma nový produkt iba v *skoršej a neskoršej fáze zrelosti* životného cyklu výrobku, a obidve vekové skupiny sú ochotné prijať produkt najmä v prvej polovici fáze zrelosti. Pri skúmaní skorších a neskorších prijímateľov sa dá povedať, že väčšina (58%) respondentov patrí skôr do skupiny skorších prijímateľov (inovátori, skorší príjemcovia, včasná väčšina), kým 42% je prítomný v skupine neskorších prijímateľov (oneskorená väčšina, oneskorenci) – pomer týchto hlavných skupín v prípade Rogersa predstavuje 50-50%.

Obrázok 1: Pomer dotazovaných spotrebiteľov v jednotlivých spotrebiteľských skupinách



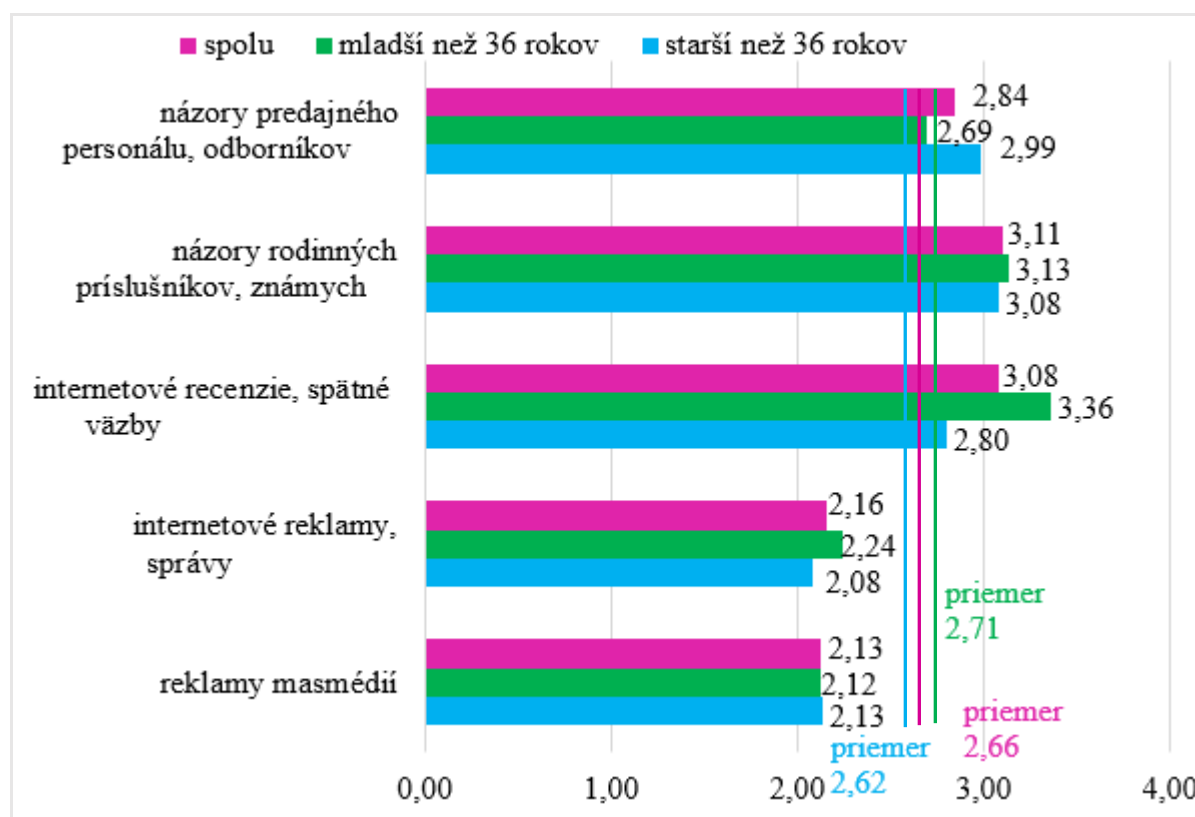
Zdroj: Vlastné spracovanie (podľa dotazníkového prieskumu)

Ďalej sme boli zvedaví na zdroje informácií spotrebiteľov súvisiace s produktom pred nákupom. Respondenti mohli hodnotiť jednotlivé faktory na stupnici od 1 až do 4 bodov podľa toho, že do akej miery sú pre nich dôležité z hľadiska získavania informácií o produkte pred nákupom. Časť týchto faktorov bola vytvorená z formálnych a neformálnych kanálov (uvedených v 1.1 časti tejto štúdiu), kde jednotlivci najprv získajú informácie z masmédií, neskoršie efektívnejšími nástrojmi sú medziľudské (interpersonálne) vzťahy, kde v prijímaní inovácií sú dôležité informácie získané od ostatných jednotlivcov. [8] V posledných desaťročiach sa stala čoraz dôležitejšou komunikácia cez internet [8], preto sme považovali za dôležité priradiť k možnostiam internetové správy a spätné väzby na internete. Respondenti mohli hodnotiť s 1 bodom ten faktor, ktorý nie je dôležitý pre nich, so 4 bodmi ten, ktorý je veľmi dôležitý pre nich. Najdôležitejšími zdrojmi získavania informácií pre respondentov pred nákupom elektronického produktu sú názory rodinných príslušníkov a známych a spätné väzby na internete. Ďalším dôležitým zdrojom sú pre nich názory špecializovaného predajného personálu – ten faktor považovali za dôležitý aj v prípade u nich preferovaných

obchodov (nakupujú hlavne v špecializovanom elektronickom obchode a nakupujú tu najmä kvôli odborným znalostiam predajného personálu – 2. a 3. otázka nášho dotazníka).

Ak chceme porovnať odpovede mladších a starších vekových skupín, tak z nasledujúceho grafu (Obrázok 2) vyplýva, že pre obidve vekové skupiny sú dôležitými faktormi názory rodinných príslušníkov a známych, ale mladšia veková skupina považuje za dôležitejšie hodnotenie produktov zákazníkmi cez internet (recenzie), ktoré staršia veková skupina považuje za dôležité ešte nad priemerom, ale ten faktor je menej dôležitý pre nich, ako odborné názory predajného personálu a odborníkov – ktoré hodnotili na 2,99 bodov. Ten posledný faktor dostal u mladších respondentov hodnotenie pod priemerom (pod 2,71 bodmi). Podľa nášho názoru pre starších je dôležité, aby o produkte dostali informácie od skúseného jednotlivca, alebo dôverujú najmä osobám im blízkym. Mladší sa už narodili do sveta internetu, takže pre nich je pohodlnejšie prehliadanie produktu online.

Obrázok 2: Dôležitosť informačných zdrojov na zhromaždenie informácií



Zdroj: Vlastné spracovanie (podľa dotazníkového prieskumu)

V našej hypotéze sme tvrdili, že *skorší prijímatelia sa nelíšia vo veku od neskorších prijímateľov*. Túto hypotézu sme postavili na základe prvej všeobecnosti o skorších prijímateľoch. Tu sme vytvorili nulovú hypotézu (H_0), čím predpokladáme nedostatok rozdielu alebo efektu. Pritom sme vytvorili aj alternatívnu hypotézu (H_1), s ktorou môžeme očakávať rozdiel alebo efekt. Keď nulovú hypotézu nezamietame, v tom prípade nenastane žiadna zmena vo východiskovom vyhlásení. Ak alternatívnu hypotézu akceptujeme, prijímame, to vedie k zmene stanoviska alebo aktov (skutkov). [6]

Naša hypotéza je nasledovná:

H_0 : Nie je vzťah medzi vekovou skupinou a inovatívnosťou

H_1 : Je vzťah medzi vekovou skupinou a inovatívnosťou

Na základe pomeru rozloženia spotrebiteľov v spotrebiteľských skupinách (17. otázka nášho použitého dotazníka) sme skúmali frekvenciu spotrebiteľov v skupinách skorších a neskorších prijímateľov (inovatívnosť) a na základe otázky o vekových skupinách sme skúmali frekvenciu mladšej (od 16 do 35 rokov) a staršej (od 36 do 75 rokov) vekovej skupiny. Vek patrí v rámci nemetrickej škály k ordinálnym, teda poradovým škálam. Inovatívnosť (teda keď hovoríme o skorších a neskorších prijímateľoch) tiež patrí v rámci nemetrickej škály k ordinálnej škále. Vek považujeme za nezávislú premennú a inovatívnosť za závislú premennú. Keďže obe naše premenné sú nemetrické, dáta sme analyzovali krížovou (kontingenčnou) tabuľkou. Pri kontingenčnej tabuľke sme použili Pearsonov chí-kvadrát test, ktorý pomôže určiť, či existuje vzťah medzi dvomi premennými. Nasledujúca tabuľka obsahuje pozorované hodnoty kontingenčnej tabuľky a očakávané hodnoty (očakávané frekvencie bunky), ktoré sú potrebné na vykonanie chí-kvadrát štatistického testu. Tieto hodnoty sme vypočítali pomocou programu Microsoft Office Excel.

Tabuľka 1: Pozorované hodnoty krížovej (kontingenčnej) tabuľky a očakávané hodnoty

		veková skupina		
		mladší než 36 rokov	starší než 36 rokov	riadky spolu
<i>inovatívnosť – skupina skorších a neskorších prijímateľov</i>	pozorované hodnoty			
	skorší prijímatelia	49	39	88
	neskorší prijímatelia	26	36	62
	stĺpce spolu	75	75	150
	očakávané hodnoty			
	mladší než 36 rokov	44	44	88
	starší než 36 rokov	31	31	62
	stĺpce spolu	75	75	150

Zdroj: Vlastné spracovanie (podľa výsledkov dotazníkového prieskumu)

Po vytvorení kontingenčnej tabuľky sme určili hladinu významnosti (úroveň signifikancie: α) a mieru voľnosti. Použili sme hodnotu $\alpha = 0,05$ pri hladine významnosti preto, lebo táto hodnota je všeobecne uznaná hodnota. Mieru voľnosti sme vypočítali nasledovne: $df = (\text{riadok}-1) * (\text{stĺpec}-1)$. Takto vypočítaná hodnota bola 1. Kritickú hodnotu sme určili pomocou hladiny významnosti a miery voľnosti z distribučnej tabuľky (Chi-square distribution table). Takto získaná kritická hodnota bola 3,841.

Pre ľahšie vypočítanie chí-kvadrát testu sme použili program Microsoft Excel, kde sme najprv vykonali testovanie štatistiky χ^2 pomocou funkcie CHITEST. Chí-test porovná očakávané hodnoty s pozorovanými hodnotami. V našom prípade hodnota chí-testu bola 0,097, ktorá bola vyššia než hladina významnosti, teda na základe toho nemôžeme odmietnuť nulovú hypotézu. Hodnotu chí-kvadrátu sme vypočítali pomocou funkcie CHIINV, kde sme získali hodnotu $\chi^2 = 2,749$. S porovnaním hodnoty chí-kvadrátu a kritickej hodnoty je možné akceptovanie alebo zamietnutie nulovej hypotézy. Keďže hodnota chí-kvadrátu bola nižšia než kritická hodnota, nemohli sme odmietnuť nulovú hypotézu, podľa ktorej nie je vzťah medzi vekovou skupinou a inovatívnosťou. Môžeme predpokladať, že skorší prijímatelia sa nelišia vo veku od neskorších prijímateľov – teda v oboch skupinách môžeme nájsť dve nami skúmané vekové skupiny. Preto našu hlavnú hypotézu – podľa ktorej „*skorší prijímatelia sa nelišia vo veku od neskorších prijímateľov*” – sme akceptovali.

4. ZÁVER

Hlavným cieľom nášho výskumu bolo zistiť v okruhu spotrebiteľov zábanej elektroniky mladších a starších ako 36 rokov žijúcich na území Slovenska, že v akom pomere sa nachádzajú v jednotlivých spotrebiteľských skupinách. Ďalším cieľom bolo zistenie času prijatia produktu. Okrem toho naším dôležitým cieľom bolo dokazovanie našej hypotézy o skorších prijímateľoch. So skúmaním hypotézy sme chceli dokázať to, že *skorší prijímatelia sa nelíšia vo veku od neskorších prijímateľov*. Po analýze sme našu hypotézu akceptovali.

Po vykonaní výskumu bolo zistené, že väčšina spotrebiteľov užívajúcich spotrebnú elektroniku sa nachádza v *skupinách včasnej a oneskorenej väčšiny*. Z pohľadu pomeru v spotrebiteľských skupinách nie je žiadny rozdiel ani medzi mladšou a staršou vekovou skupinou, pretože väčšina nich sa nachádza v týchto dvoch spotrebiteľských skupinách. Na základe toho väčšina skúmaných spotrebiteľov prijíma produkt *vo fáze zrelosti* a najmä v skoršej fáze toho (včasná väčšina). O mladších sa dá povedať, že sú viac prítomní v skupine inovátorov než v skupine oneskorencov, kým starší sú viac prítomní v skupine oneskorencov než v skupine inovátorov. Celkovo možno povedať, že väčšina skúmaných spotrebiteľov patrí najmä do skupín *skorších prijímateľov*, kým 42% patrí k *neskorším prijímateľom*.

Ako zdroj získavania informácií o produkte boli najvyššie hodnotené názory rodinných príslušníkov a známych, spätné väzby na internete a názory špecializovaného predajného personálu. Pre mladších za dost' dôležité zdroje informácií sa ukázali názory rodinných príslušníkov a známych, najlepšie hodnotenie dostali spätné väzby na internete, kým v okruhu starších za najdôležitejšie zdroje informácií sa ukázali najmä názory rodinných príslušníkov, známych a názory špecializovaného predajného personálu. Podľa nášho názoru pre starších je dôležité, aby o produkte dostali informácie od skúseného jednotlivca, alebo dôverujú najmä osobám im blízkym. Mladší sa už narodili do sveta internetu, takže pre nich je pohodlnejšie prehliadanie produktu online. Teda môžeme konštatovať, že starší pred nákupom elektroniky využívajú najmä tradičné metódy získavania informácií (tradičné komunikačné kanály), kým medzi mladšími sú využívané sociálne siete.

V našej hypotéze sme tvrdili, že *skorší prijímatelia sa nelíšia vo veku od neskorších prijímateľov*. Túto hypotézu sme postavili na základe prvej všeobecnosti o skorších prijímateľoch. Na skúmanie hypotézy sme pripravili kontingenčnú tabuľku, potom nasledovalo vypočítanie chí-kvadrátu. Hodnota chí-kvadrátu bola nižšia, ako kritická hodnota z distribučnej tabuľky, teda našu nulovú hypotézu – v ktorej sme tvrdili, že nie je vzťah medzi dvoma premennými – sme nemohli zamietnuť. Na základe toho sme našu hypotézu – v ktorej sme tvrdili, že skorší prijímatelia sa nelíšia vo veku od neskorších prijímateľov – sme prijali. Tým sme prijali aj Rogersovu všeobecnosť o skorších prijímateľoch. Na základe tohto výsledku sme dospeli k záveru, že vek nemá vplyv na to, do ktorej spotrebiteľskej skupiny spotrebiteľ patrí.

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THE OPPORTUNITIES TO IMPROVE INTERNAL AUDIT IN LATVIA PUBLIC SECTOR

Ivita FAITUSA¹⁶

Abstract: *Local government auditors lack the knowledge and skills in the sphere of internal audit and internal control system. However, in the aggregate, there is a lack of IT auditing competencies; it is recommended to use the COSO model as a solution, which is already integrated into the internal control systems of both Latvia and other EU Member-States. The research paper includes the description of the possibilities for improving the internal audit of Latvia's direct state administration and local governments. Using the analysis of theoretical and empirical research results, options for the implementation of internal audit in local governments are developed. Based on the analysis of the results of the research, the author developed recommendations to the ministries of the Republic of Latvia to improve the internal audit function in local governments. Internal auditors of local governments work according to different methods, in some municipalities, there is no methodology, in 50% of cases internal audit unit works without methodology. Local governments have a different approach to developing IA methodology and structure of regulations, different approach to plan preparation, mainly using previous years' audit plans and/or consulting with the heads of departments and management of the institution.*

Key words: *internal audit, local government, public sector*

JEL Classification: *M42, L38*

1. INTRODUCTION

At present, the key role of internal audit in evaluating existing processes is to prepare recommendations for management aimed at improving processes in the future, thus creating value added to the organisation through competent internal auditors. Internal audit was conducted in 22 municipalities out of 119 municipalities in Latvia.

The aim of the research paper is to evaluate the internal audit in the public administration of Latvia, to develop proposals to local governments of Latvia to improve the internal audit function based on fundamental and applied research on the role and implementation of internal audit in practice. The author has put forward the following tasks: evaluate the internal audit approaches in the direct state administration and local governments of Latvia in order to identify the shortcomings; develop recommendations for the improvement of internal audit in the direct state administration and local governments of Latvia; define the criteria for the unified implementation of the internal audit function in the local governments of Latvia.

2. PROBLEM FORMULATION AND METHODOLOGY

Section 3 of the "Internal Audit Law" of Latvia republic being in force lays down that "The procedure for the derivation of public person's internal audit systems, internal audit work organization and the procedures of internal audit are determined by its decision-making body. In order to ensure more efficient performance of the internal audit function, the decision-making body of the derived public person, if necessary, can enter into a cooperation agreement with the ministry of the relevant sector regarding the inclusion of this person in the internal audit system of the ministry" (*the Saeima, 2012*).

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The provision of the foregoing law creates the situation that each municipality decides individually whether it needs an internal audit unit or not.

Local government auditors lack the knowledge and skills in the sphere of internal audit and internal control system. However, in the aggregate, there is a lack of IT auditing competencies; it is recommended to use the COSO model as a solution, which is already integrated into the internal control systems of both Latvia and other EU Member-States. However, separate elements from other internal control models should be used as well (*Nikolo group, 2011*).

The author found that the methodology of the 7 evaluated internal audits of the municipalities of Latvia, both according to the type of document (regulation or procedure), differ very much and practically are non-comparable in terms of their nature and application. It is necessary to improve internal audit system in local governments in Latvia.

In the authors' research "Local Governments and Internal Audit of Latvia" carried out in 2013, it was established that in 50% of cases IAS works without methodology. Local governments have a different approach to developing IA methodology and structure of regulations, different approach to plan preparation, mainly using previous years' audit plans and/or consulting with the heads of departments and management of the institution.

Methods used in the research paper: 1) survey method - an expert survey was used to find out the effectiveness of the Latvian direct state administration and local government internal audit and the main determinants of methodology improvement; the survey of auditors was used to clarify the development of internal audit in the direct state administration and local governments of Latvia; 2) the graphical method is used to reflect the results of the research.

3. PROBLEM SOLUTION / RESULTS / DISCUSSION

Internal audit methodology as an important part of internal audit process was discussed in European Commission published reports on implementation and operation of internal audit and internal control systems in EU countries, Compendium (2012., 2014.) One of the last year's publications Chambers A.D. (2015, 2016.) IIARF researches as Ramamoorti S., Siegfried A.N.(2016)), Piper A. (2015) and Niekwlands H.(2006.) include researches in fields of the standards for the professional practice of internal auditing, definition, internal audit performance methods, approaches, work documents and examples analysis. Researches that demonstrate the role of internal audit function in normative acts in different countries around the world.

Since 2013 - Improvement of the internal audit system, legal regulation. The *Internal Audit Law* proclaimed on 12 Dec 2012 followed by Cabinet Regulation No. 238 "*Procedures for the Certification of Internal Auditors*" of 30 Apr 2013 and Cabinet Regulation No. 385 "*Procedure for the performance and assessment of internal audit*".

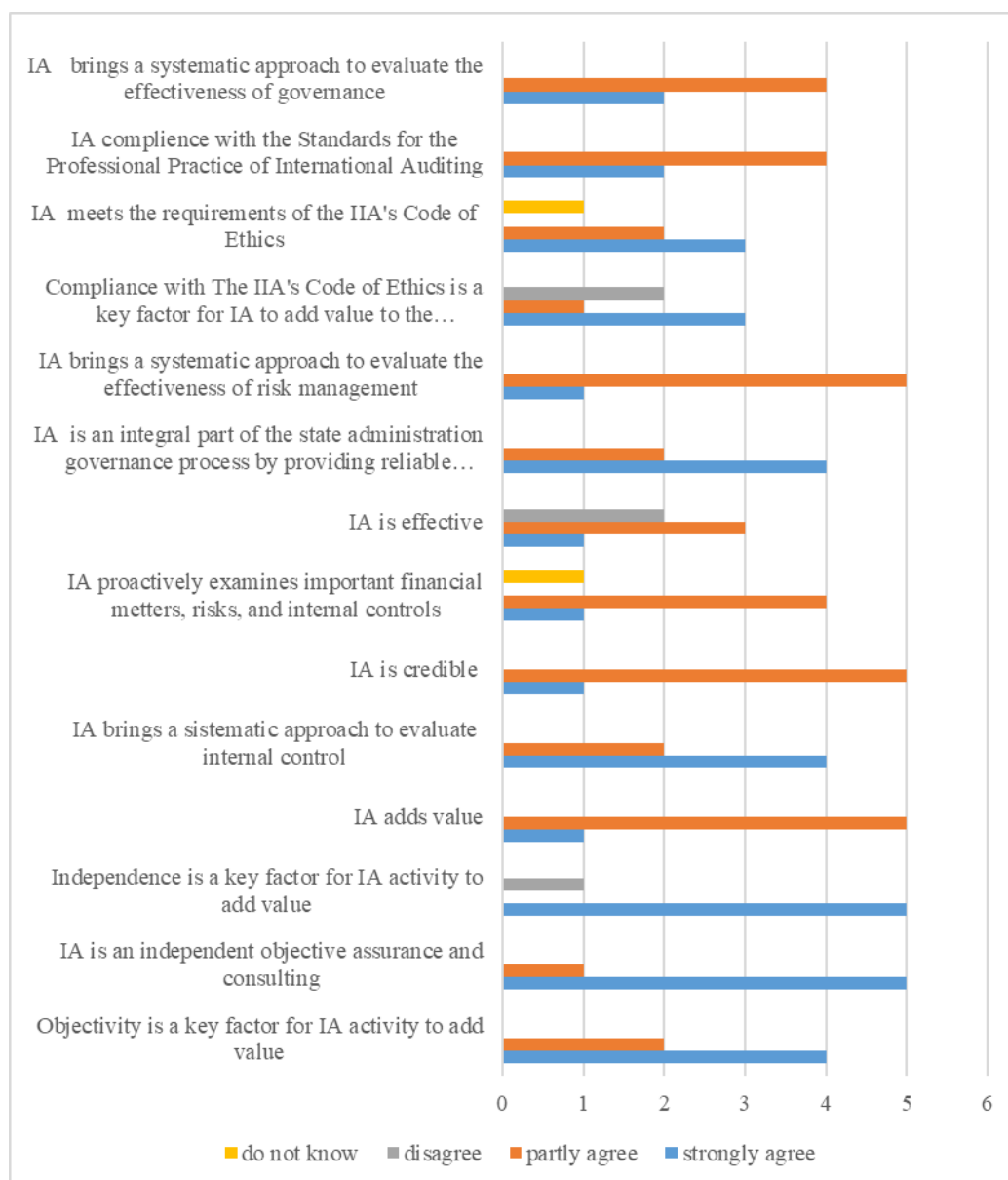
It is determined with the amended regulatory enactments that the internal audits planned are such internal control systems valuations that follow from the internal audit annual plan. If an unplanned internal audit is required during the reporting year, then the Internal audit unit will submit the updated annual internal audit plan to the management for the approval. The regulation clarifies the delegation determined by law, defining that the Ministry of Finance is responsible for the development of internal audit policy.

Six experts from Latvia state administration, Institute of Internal auditors took part in the polling of experts carried out by the author in 2015 on the *internal audit efficiency of direct state administration of Latvia and the key decisive factors in improving the methodology*.

All experts have more than 10 years of experience in the field of internal audit, the experts represent various national direct administrations. A summary of the questionnaires highlighted several areas of improvement of the state direct administration's internal audit. When analysing 14 statements regarding the audit of the state direct administration of Latvia, the experts expressed the following opinions (See Fig. 1):

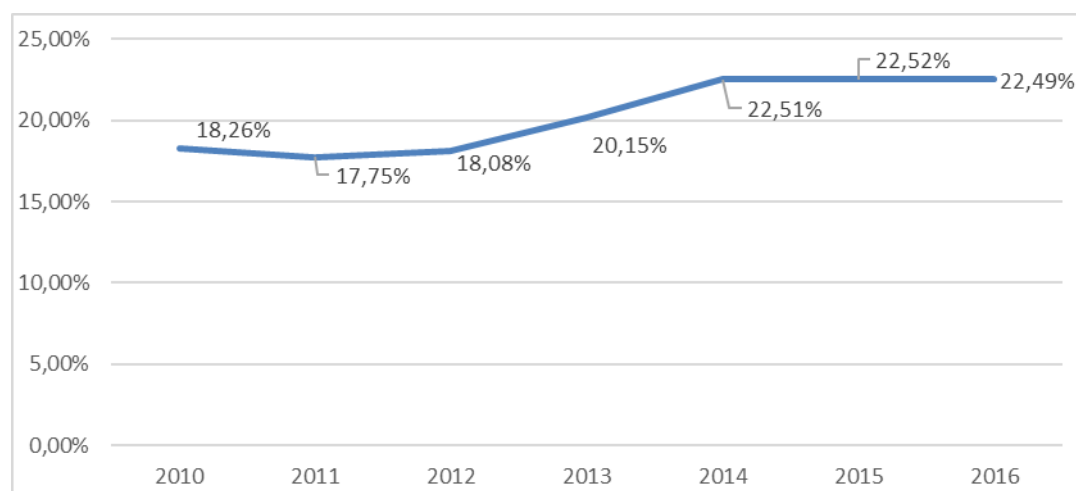
- 1) *agree in whole or in part* with the statement: objectivity is a key factor in adding the value to the internal audit (67% - fully agree, 33% - partially agree), one expert believes that a discussion is possible relative to the word "key"; internal audit is the creation of independent, objective assurance and counselling activities (83% fully agree, 17% partially agree);
- 2) *agree in whole or in part* with the statement that that the internal audit of the direct state administration of Latvia provides a systematic valuation approach to the efficiency of management processes (33% fully agree, 67% partially agree); operates in accordance with the International standards for professional practice of internal audit (33% - fully agrees, 67% - partially agree); provides a systematic approach to assessing the efficiency and risk management (17% - fully agree, 83% - partially agree); is an integral part of state administration's secure information and management processes of local government (67% fully agrees, 33% agree in part); is trustworthy (17% - fully agree, 83% - partially agree); provides a systematic approach to assessing the effectiveness of internal control (67% fully agrees, 33% partially agree); generates the added value (17% - fully agree, 83% - partially agree);
- 3) *agree in whole or in part or disagree* with the statement in the direct state administration of Latvia: compliance with the Code of Conduct of the Institute of Internal Auditors is a key factor in adding value to management processes (67% fully agree, 17% partially agree, and 33% disagree); the internal audit is efficient (17% - fully agree, 50% - partially agree and 33% disagree); independence is the major factor to the creation of the added value of internal (83% - fully agree, 17% disagree), one of the experts deems that a discussion is possible of the word "major";
- 4) *agree in whole or in part* with the statement or do not know that/whether the internal audit of the direct state administration of Latvia: meets the requirements of the IIA Code of Ethics (50% - fully agree, 33% - partially agree and 17% - do not know); valuation of the effects of important financial events, risks and internal control (17% - fully agree, 17% - partially agree and 67% - do not know).

Figure 1: Experts' estimation of the IA valuation criteria of the direct state administration of Latvia, 2015



Source: the author's developed diagram (2018)

Figure 2: Proportion of the number of employees in municipalities of Latvia to the number of employees in the direct state administration of Latvia %, 2010-2016



Source: the author's developed diagram based on the CSB data (2018)

The State Auditors are not fully prepared to rely on the opinion of the internal audit also in the state direct administration authorities, while the municipalities have not used the internal audit operation at all.

In 2005 already, SIGMA experts stated that “internal audit in the local authorities and state enterprises is not claimed by regulatory enactments, but it should be.” (SIGMA, 2005) The author believes that as long as there are no requirements for the internal audit implementation in municipalities stipulated by regulatory enactments, nothing will develop from itself and will not emerge.

Table 5 summarises the number of municipalities in statistical regions of Latvia that have or have not implemented the IAS for 2016. The most commonly used IAS are in the municipalities of the Pierīga statistical region (6 municipalities out of 29 municipalities or 20.7% of municipalities), but the least in the municipalities of the Latgale statistical region (14.3% in 3 municipalities out of 21 municipalities). In Kurzeme - 20% of all municipalities in the statistical region, in Zemgale - 18.2%, and in Vidzeme 15.4% of all statistical region's municipalities have implemented the IAS.

Table 1: Number of local governments in Latvia with and without IAS, 2013- 2016

Groupings	Is Internal audit	No Internal audit	Total local governments
Total local governments in Latvia	22	97	119
Local governments in Latgale statistical region	3	18	21
Local governments in Zemgale statistical region	4	18	22
Local governments in Kurzeme statistical region	4	16	20
Local governments in Vidzeme statistical region	4	22	26
Local governments in Pieriga statistical region	6	23	29
Local governments, except large towns	14	96	110
Local governments in Latgale statistical region, except large towns - <i>Rezekne, Daugavpils</i>	1	18	19
Local governments in Zemgale statistical region, except large towns - <i>Jelgava, Jēkabpils</i>	2	18	20
Local governments Kurzeme statistical region, except large towns - <i>Liepāja, Ventspils</i>	3	15	18
Local governments in Vidzeme statistical region, except large towns - <i>Valmiera</i>	3	22	25
Local governments in Pieriga statistical region, except large towns <i>Jurmala</i>	5	23	28

Source: prepared by author, based on author's research (2017-2018)

As a result of the study, the author has developed a recommendation: the Ministry of Finance in cooperation with the The Ministry of Environmental Protection and Regional Development, should develop a unified internal audit implementation system in the municipalities of Latvia, defining the essential requirements in the regulatory enactments, which ensure a unified approach to the development and implementation of the audit system, the unified compilation and publication of IA results and public information. The author proposes to include the provision in Section 5 of the law "On Local Governments" (the Saeima, 1994) to read as follows: "The internal audit function is provided to ensure efficient and expedient functioning of municipalities and institutions thereof". Section 2, Paragraph 6 of the "Internal Audit Law" (the Saeima, 2012) shall be supplemented to read as follows: "Internal audit - independent and objective activity of the internal auditor, which results in the evaluation of the operation of the internal control system in order to improve the operation of the internal control system in the ministry, institution and municipality".

The author proposes two options to establish the local government IA system:

Option 1. The internal audit structural unit to be established in large and very large municipalities (number of the population exceeds 20,000). Internal audits are planned annually, and internal auditors make a report on an annual basis for the Ministry of Finance on the internal audit activity in the municipality. Internal audits are planned annually, and internal auditors make a report on an annual basis for the Ministry of Finance on the IA activity in the municipality. Other municipalities must provide that the IA would be carried out within 3 - 5 years, subject to the priority, embracing all systems of local governments. Work can be arranged involving outsourcing specialists or by recruiting an internal auditor for a certain period.

Option 2. Following the municipal reform, which is currently being established by the The Ministry of Environmental Protection and Regional Development, aiming at the increase of potential of economic development of the territories and cooperation between local governments in the provision of public services, implementation at the territories of 29 districts or the territories of cooperation of local governments (See Fig. 3) for the

implementation of the IAS in all 29 areas of municipal cooperation or district centres. Planning of IA in large municipalities would be continuous, but in the small and medium-scale municipalities (up to 20,000 inhabitants) - periodic, which can be practically implemented in the following way: in large municipalities the systems are audited at least every 3-5 years, subject to the priority, while in small ones – the general internal audit, embracing all systems of local governments would be made at least once every five years. The author deems that both the options put forward are mutually exclusive.

Figure 3: Planned 29 territorial cooperation areas of the local governments of Latvia

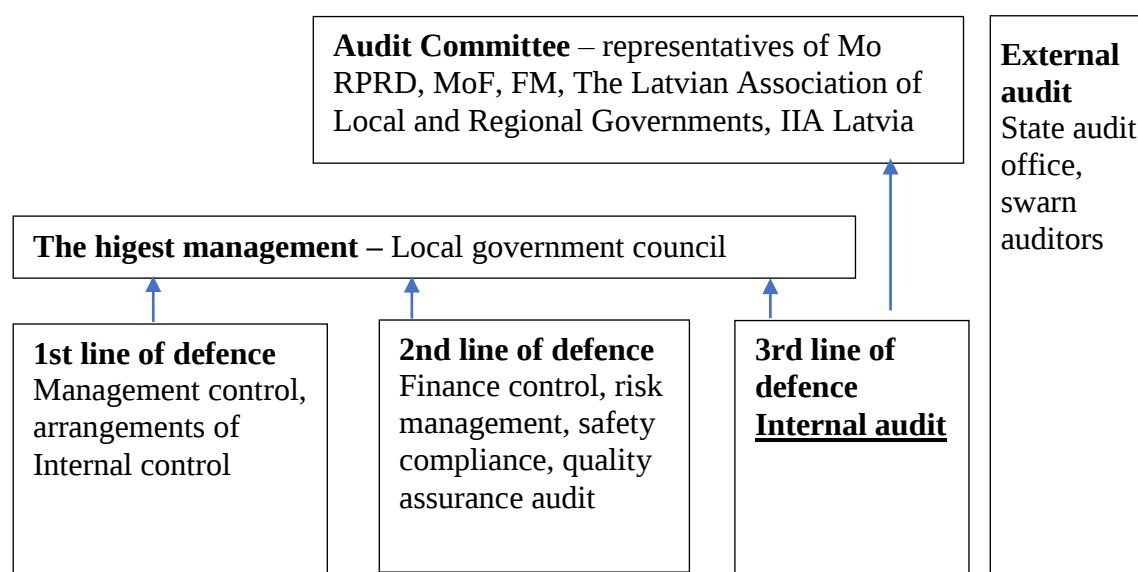


Source: On informative report of the Ministry of Environmental Protection and Regional Development of Latvia Republic (2017)

The author deems that the IAS would be at the centre of the districts and that auditors would operate in all municipalities within that area, for example the city of Rēzekne, Rēzekne province, Vilāni province is a part of Rēzekne district. The use of the services of internal auditors is possible as follows: contracts are concluded with each local government separately or a single contract with the district management, if it is formed after the implementation of the reform.

The author developed a proposal: the establishment of the internal audit unit and the key principles of operation must be included in the laws and the Cabinet regulations, with the internal audit structure defined clear-cut, internal audit reporting procedures for the management, and the functions of the audit committee. Similarly, it should be stated that the internal audit annual report of all local governments “*On the internal audit results of local governments during the current year*” is publicly available.

The protection lines seen in Figure 4 are included invariable in the model by the author – in the form as reflected in the scheme developed by the IAI: the first protection line includes responsibility for the valuation, for minimization of risks, simultaneously maintaining the efficient internal control; the second protection line – provides an efficient risk management process with activities of the management; the third protection line – the IA function provides the management of institutions with information and the assessment, how efficiently an institution manages such risks.

Figure 4. Potential IA and three-line protection model in local governments of Latvia

Source: the author's developed model, using ECIIA FERMA (2010)

The author believes that the framework of internal audit regulation included in regulatory enactments should be flexible and it should be allowed to local governments choose one of the practical verification approaches adopted worldwide and in Latvia on the implementation of the internal audit function. To ensure an independent and objective assessment of the internal control systems in order to improve the functioning of this system in local governments, the author offers several approaches to the solutions on the implementation of the internal audit function during the study: taking over the methodology of the direct state administration, adapting it to the needs of local governments; internal audit as outsourcing; risk management opportunities; implementation of the maturity model; self-assessment of control.

4. CONCLUSION

The research part summarises information about the internal audit units of Latvian local governments: in Latvia in 2012, internal audit was conducted in 18 municipalities out of 119 municipalities or 15% of all municipalities; in 2013, internal audits were carried out in 22 municipalities (18% of all municipalities), and this level remained in 2016 (22 municipalities). However, it should be noted that over the period, local governments with an internal audit have changed, although their number has remained unchanged.

Internal auditors of local governments work according to different methods, in some municipalities, there is no methodology, in 50% of cases internal audit unit works without methodology. Local governments have a different approach to developing IA methodology and structure of regulations, different approach to plan preparation, mainly using previous years' audit plans and/or consulting with the heads of departments and management of the institution. In assessing the role of the IA, the survey conducted in 2016 indicates that expert opinions point to a lack of mandatory IA regulation in local governments.

The results of the statistical data analysis for the period from 2013 to 2016 show that the volume of assets in the Latvian local governments with IAS and without IAS differs significantly. Analysing the statistical regions of Latvia, there is a correlation: in local governments where IAS is not established, the average income amounts and the volume of assets are lower than in those local governments where IAS functions.

The results of the expert survey indicate that respondents confirm independence as the key factor in creating the added value of internal audit and consider that the internal audit of the Latvian direct state administration provides a systematic approach to the assessment of efficiency and risk management, but not all the experts agree on the use of the internal audit methodology and the necessary changes.

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VPLYV INDUSTRY 4.0 NA POSKYTOVANIE SLUŽIEB V CESTOVNOM RUCHU

THE IMPACT OF INDUSTRY 4.0 ON TOURISM SERVICES

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Abstrakt: *Predkladaná štúdia analyzuje dopady zavádzania nových komunikačných technológií na rozvoj cestovného ruchu. Cieľom štúdie je analyzovať vplyv konceptu Industry 4.0 v segmente cestovného ruchu a vplyvu uvedenej koncepcie na predaj a poskytovanie služieb v tejto oblasti. Autori poukazujú na súčasný stav a dôsledky zmien, ktoré prináša využívanie moderných technológií a personalizácia predávaných produktov. Cestovný ruch je odvetvie, ktoré má z dlhodobého hľadiska výraznú perspektívu a môže byť v budúcnosti jedným z nosných odvetví, ktoré zabezpečia hospodársky rast krajiny a preto je veľmi dôležité skúmať faktory, ktoré ovplyvnia jeho rozvoj. Ukazuje sa, že jedným z takých významných faktorov je zavádzanie nových komunikačných technológií.*

Kľúčové slová: *Industry 4.0, cestovný ruch, informačné systémy, personalizácia produktov, zamestnanec,*

Abstract: *The presented study analyzes the impacts of the introduction of new communication technologies on tourism development. The aim of the study is to analyze the impact of Industry 4.0 on the tourism segment and the impact of the concept on sales and service in this area. The authors point to the current state and consequences of changes brought about by the use of modern technologies and the personalization of the products sold. Tourism is a sector that has a profound perspective in the long run. Tourism can be one of the industry's leading industries in the future to ensure economic growth in the country, and it is therefore very important to look at the factors that influence its development. It turns out that one of such important factors is the introduction of new communication technologies..*

Key words: *Industry 4.0, Tourism, Information Systems, Personalization of Products, Employee.*

JEL Classification: *Z31 Z32*

1. ÚVOD

Dnes sa mnohé mení vďaka technologickému pokroku, umožňujúcemu neobmedzenú úroveň automatizácie a všadeprítomnému využitiu inteligentných zariadení umožňujúcich takmer nepredstaviteľnú úroveň prepojenia ľudstva. Z istého hľadiska by bolo možné tento pokrok jednoducho považovať za pokračovanie tretej technickej revolúcie, ale vzhľadom na skok, ktorý technológie od čias automatizácie výroby urobili masovým nástupom inteligentných zariadení, štvrtú priemyselnú revolúciu už nemožno považovať len za jej pokračovanie, ale za úplne novú kapitolu.

Big Data prinesú veľké úspory času, energií a v neposlednom rade to prinesie aj zvýšenie bezpečnosti. Objavujú sa prvé pokusy uplatniť v doprave autonómne vozidlá a drony

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prepravujúce náklady a do budúcnosti aj prepravu ľudí. To isté čaká aj leteckú prepravu. Nositeľné zariadenia (wearable device) sú už dnes nápomocné pri monitorovaní zdravotného stavu a pomáhajú včasnému zásahu zdravotníckych pracovníkov pri zistení anomálií. Inteligentné zdravotníctvo bude pri neustálom nedostatku lekárov a zdravotných sestier strategickým riešením udržania dobrého zdravotného stavu obyvateľstva. Aj keď sa nepredpokladalo, že odvetvie cestovného ruchu zasiahne koncept Inteligentného priemyslu, skutočnosť je iná. Komunikačné technológie výrazne ovplyvňujú komunikáciu s klientom aj samotné poskytovanie služieb zákazníkom.

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 nevídané. 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.

2. INDUSTRY 4.0 V CESTOVNOM RUCHU

Komunikačné technológie a ich rozvoj sa priamo dotýka fungovania cestovného ruchu nielen vo svete ale aj na Slovensku. Toto odvetvie pomerne flexibilne reaguje na nové trendy v komunikačných technológiách. V sedemdesiatych rokoch 20.storočia sa začal výrazne používať počítačový rezervačný systém, v ďalšej dekáde sa rozšíril Global Distribution System – GDS, s využitím nákupu leteniek. Nástup internetu v 90. tých rokoch znamenal prelomovú erú. Spôsob fungovania cestovného ruchu sa dramaticky zmenil v dôsledku rozvoja informačných technológií (Ho, lee,2007). Zákazníkom sa otvorili možnosti samostatného rezervovania leteniek, požičania áut a iných dopravných prostriedkov ako aj objednanie si individuálnych služieb. Dostupnosť informácií zvyšuje záujem o určité destinácie a ponúkané služby v cestovnom ruchu a od rozšírenia internetu nastal nebyvalý rozvoj tejto oblasti. Cestovatelia sa stali sofistikovanejšími a samostanejšími pri vyhľadávaní destinácií a služieb, ktoré im môžu byť poskytnuté, to znamená že jednotlivé produkty s a stávajú individuálnejšími a odpovedajú požiadavkám zákazníka či už sa to týka kvality, ceny alebo dĺžky pobytu. Takýto koncept predávaného produktu plne odpovedá konceptu v rámci stratégie Industry 4.0.

Správanie spotrebiteľov ovplyvňujú viaceré faktory, ktoré sa môžu rozdeliť do týchto základných skupín: kultúrne, spoločenské, klimatické a psychologické. Nakoľko oblasť cestovného ruchu je ovplyvnená nepredvídateľnosťou klimatických podmienok a správaním zákazníkov, ubytovacie a stravovacie služby musia byť zabezpečené podpornými aktivitami. Patria sem možnosti športového vyžitia, turistika, wellness, možnosť navštívenia historických pamiatok a iných atrakcií. Využívajú sa animačné služby a čoraz populárnejším sa stáva gastronomický cestovný ruch, či agroturistika ako únik pred ruchom veľkomesta, aktívny odpočinok od stresujúcich faktorov dnešnej uponáhľanej doby. Pre úspešnú spoločnosť je podstatné získať výhodu tým, ako zaujme klienta. Znamená to, že ako strategický cieľ rozvoja stanovíme schopnosť spoločnosti uspieť v konkurenčnom boji. Vychádzame z predpokladu existencie spoločností v rovnakej oblasti s rovnakým zameraním, ktoré ponúkajú svoje služby klientom. Výhodou nami zvoleného subjektu by ale malo byť využívanie moderných informačných technológií, ktoré sú neoddeliteľnou súčasťou tohto obdobia.

V rámci cestovného ruchu sa používajú nasledovné informačné systémy, tak ako ich charakterizuje Gajdošík (2017):

- Transakčný systém (Transaction Processing System – TPS) sa používa na nižšej úrovni manažmentu pri riadení procesov prevádzky. V oblasti cestovného ruchu zaznamenáva registračné údaje, rezervácie hostí, skladové zásoby.
- (Management Information System – MIS) využíva stredný a vyšší manažment pri taktických úlohách, tvorbe produktu, cien, marketingovej komunikácii. Pri anglickej a slovenskej terminológii treba brať do úvahy rozdielnosť v preklade a skratkách. Riadiaci informačný systém s anglickou skratkou MIS nie je v slovenskom jazyku správne označiť pojmom manažérsky informačný systém. Manažérsky informačný systém s anglickou skratkou EIS sa využíva v oblasti vrcholového manažmentu.
- V oblasti taktického plánovania sa využívajú aj systémy na podporu rozhodovania (Decision Support System – DSS).
- Manažérske informačné systémy (Executive Information System – EIS) podporujú vrcholové riadenie organizácie (niekedy sa nazývajú aj Business Intelligence – BI). Umožňujú analýzy v oblasti financií, obchodu a iné na podporu prípravy strategických plánov a rozhodovania.
- Okrem týchto základných úrovní sa využívajú aj systémy na podporu kancelárskych činností (Office Information Systems – OIS). Najčastejšie sú nimi kancelárske balíky (napr. Microsoft Office). Tieto obsahujú textový procesor WORD, tabuľkový kalkulačor EXCEL, POWER POINT na tvorbu prezentácií, databázový program ACCESS, publikačný program PUBLISHER.
- K systémom externej a internej komunikácie (Electronic Data Interchange – EDI) zaradujeme internet, intranet a extranet. Spoločnosti v oblasti cestovného ruchu sú väčšinou malého a stredného charakteru a využívajú najmä transakčnú a riadiacu úroveň v jednom spoločnom systéme (Property Management System – PMS). Využívajú ho hotely, pohostinstvá a cestovné kancelárie. Tento systém možno rozšíriť prídavnými modulmi (napr. manažment vzťahov so zákazníkom – CRM, výnosový manažment) a tým sa vytvorí komplexný informačný systém organizácie. Takéto systémy využívajú aj väčšie organizácie (napr. sieťové hotely a letecké spoločnosti).

Informačné technológie teda znižujú prevádzkové a komunikačné náklady, zvyšujú efektívnosť, na podporné činnosti je potrebný menší počet zamestnancov. Informácie prístupné na internete nie sú časovo ohraničené a zákazník má k nim neustály prístup, nakoľko pri telefonickom alebo osobnom kontakte je pracovník k dispozícii len určitú časť dňa. Uľahčujú teda rezervovanie, zrýchľujú registrácie a platby. Procesy sa automatizáciou zjednodušujú, priamo naviazané účtovníctvo a mzdy umožňujú ich jednoduchý a rýchly výpočet. Informačné systémy však umožňujú aj efektívne prispôsobenie sa želaniam zákazníka a tým sa zvyšuje výhoda v oblasti konkurencie medzi firmami. Zjednodušujú výskum trhu, vytváranie produktu, pružne sa prispôbujú aj ceny a tým sa maximalizuje výnos. Kontrolná funkcia umožňuje manažérom rýchlejšie vykonať nápravné opatrenia. Ak hovoríme o modulárnej štruktúre, myslí sa tým prispôsobenie systému požiadavkám konkrétneho podniku, ktorý v určitom čase využíva istý typ modulov a v prípade rozšírenia oblasti si môže ďalšie pridať. Slovenský cestovný ruch charakterizujú malé a stredné firmy, ktoré sa ľahko prispôbujú meniacim sa podmienkam na trhu. Zavedenie inovácií podmieňuje okrem tejto schopnosti aj celý rad iných externých a interných determinantov. Tieto faktory majú rôzny vplyv v ubytovacích a stravovacích zariadeniach a v cestovných kanceláriách. Z charakteru jednotlivých typov podnikov vyplývajú aj rozdiely v typoch zavedených inovácií.

3. INTERNET AKO NÁSTROJ ROZVOJA CESTOVNÉHO RUCHU

Aj keď samotní zákazníci, spotrebitelia v cestovnom ruchu, nezasahujú priamo do informačných systémov, všetky ich osobné údaje a požiadavky sú v nich spracovávané. Virtuálne dáta sú prepájané priamo s informačnými centrami subjektov a následne spracovávané pre potreby finálneho produktu. Z historického vývoju v posledných storočiach jasne vidíme zmeny pri evidencii hostí, odbavovaní hosti ale aj rezerváciách. Keď v roku 1869 otvorili prvý hotel na území Slovenska, Hotel Bankov, jeho hostia nemali možnosť vykonať rezerváciu ani telefonicky ani emailom. Taktiež ani propagácia nebola možná vo virtuálnom svete. Návštevy jednotlivých hostí boli intuitívne a na základe pozitívnej referencie. Pokrytie telefónnym káblom a možnosť telefonickej objednávky v hoteloch na Slovensku sa datuje od roku 1916 kedy bolo v telefónnej sieti pripojených viac ako 7800 účastníckych čísel, medzi nimi mnohé hoteli a spoločnosti. V 90. rokoch 20.storočia s rozmachom internetu prichádzajú internetové rezervácie a rezervácie formou emailu, v dnešnej dobe spoločnosť booking.com, najväčší poskytovateľ rezervačných služieb, založená v roku 1999, realizuje viac ako 40% svojich tržieb (13,2mld USD) formou mobilnej aplikácie.(Forbes, 2018). S prihliadnutím na to, že spoločnosť booking.com je 398 najhodnotnejšou spoločnosťou na svete patrí medzi najmladšie v tom to rebríčku. V rebríčku implementácie nových, rozvojových technológií jej patrí celkovo 42. priečka na svete za rok 2018.

Obrázok 1: Vývoj rezervačného systému v 19. a 20. Storočí



Zdroj: internet, vlastné spracovanie 2018

K veľkému celosvetovému rozvoju cestovného ruchu prispieva zvýšenie užívateľov internetovej siete. Vďaka rozšírenému internetu, sa čím ďalej tým viac užívateľov dostáva k informáciám o možnostiach ubytovania, rezerváciách ale aj cenách produktov a služieb. Týmto sa informácie dostávajú bližšie ku konečnému spotrebiteľovi. Podľa posledných štatistík k 30.06.2018 (Internetworldstats, 2018) je k internetu pripojených viac ako 4,2mld užívateľov čo predstavuje 55,1% celosvetovej populácie. V porovnaní s rokom 2000 je to o 7% viac. Až 95% obyvateľov Severnej Ameriky je aktívnymi užívateľmi internetu naopak v Afrike je to len 36,1% obyvateľov tj. 11% z celosvetového počtu užívateľov.

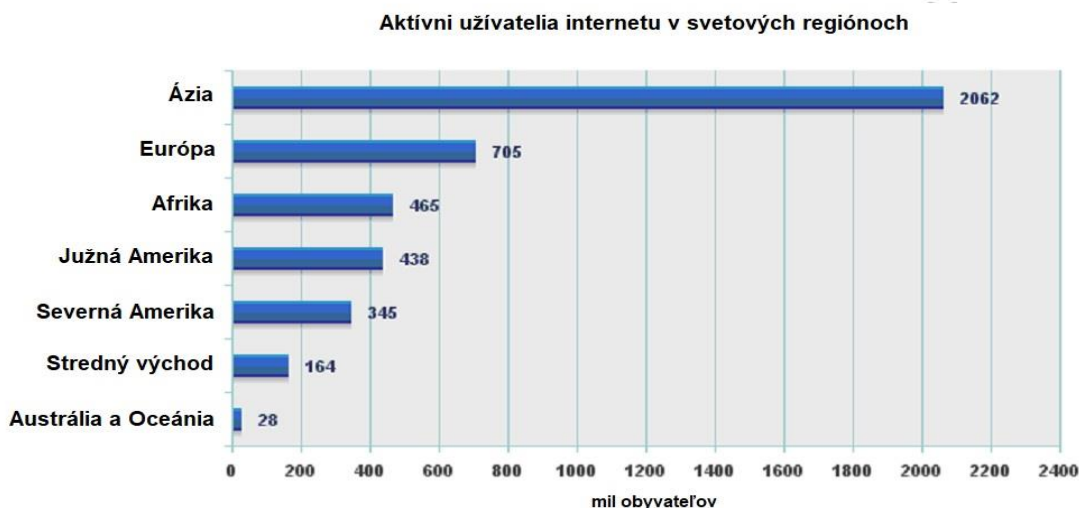
Tabuľka 1: Štatistika populácie a jej vzťah k používaniu internetu

Štatistika populácie a jej vzťah k používaniu internetu K 30. júnu, 2018						
Svetové regióny	Populácia	Populácia	Internetoví	Pokrytie	Nárast	Internetoví
	celkovo k 30.07.2018	% celosvetovo	k 30. júnu 2018	v % daného regiónu	v rokoch 2000-2018	používatelia
Afrika	1,287,914,329	16.9 %	464,923,169	36.1 %	10,20%	11.0 %
Ázia	4,207,588,157	55.1 %	2,062,197,366	49.0 %	1,70%	49.0 %
Európa	827,650,849	10.8 %	705,064,923	85.2 %	570%	16.8 %
Južná Amerika	652,047,996	8.5 %	438,248,446	67.2 %	2,33%	10.4 %
Stredný východ	254,438,981	3.3 %	164,037,259	64.5 %	4,89%	3.9 %
Severná Amerika	363,844,662	4.8 %	345,660,847	95.0 %	219%	8.2 %
Austrália a Oceánia	41,273,454	0.6 %	28,439,277	68.9 %	273%	0.7 %
Svet celkovo	7,634,758,428	100.0 %	4,208,571,287	55.1 %	1,07%	100.0 %

Zdroj: Vlastné spracovanie podľa: www.internetworldstats.com

V roku 2017 celosvetovo vycestovalo so štatútom turistu viac ako 1,24 miliardy osôb. Svetová turistická organizácia eviduje najviac turistov z Európy 620mil, Ázie 302mil a Ameriky 201mil. Tieto dáta potvrdzujú, že najviac turistov pochádza z krajín kde je rozšírené internetové pripojenie. Aktívni užívatelia internetu dokážu lepšie pracovať s dátami a využívať ich pri cestovaní.

Obrázok 2: Vývoj rezervačného systému v 19. a 20. Storočí



Zdroj: vlastné spracovanie podľa: www.internetworldstats.com

Môžeme tvrdiť, že za posledných 66 rokov narástol počet turistov o 1,2 miliardy (Roserom, 2018). Kým v roku 1952 to bolo len 25 miliónov turistov v roku 1990 niečo viac ako 439 miliónov. Magickú hranicu 1 miliardu turistov prekonal svet až v roku 2011. Toto číslo je spôsobené najmä rozmachom moderných informačných technológií, databázových modulov a leteckej dopravy umožňujúcej celosvetovú dostupnosť. Využitie informačných technológií zvyšujú efektivitu práce, šetria čas klientov ale aj zamestnancov subjektov v cestovnom ruchu. Dáta zadané pri rezervácii sa automaticky dokážu premietiť pri prijíme, spracovávaní klienta, ale aj pri jeho odchode. Najhorúcejšou novinkou je spracúvanie kľúča od izby už počas rezervácie a jeho následné vytvorenie v mobilnej aplikácii, po príchode je tento virtuálny kľúč aktivovaný a hosť následne odomyká pomocou mobilného telefónu. Technológie prispievajú k zvýšeniu konkurencie schopnosti, zníženiu nákladov a najmä prehľadnosti spracovania dát. Toto všetko by nebolo možné pokiaľ by podniky cestovného ruchu aktívne neimplementovali zásady Industry 4.0 do praxe.

4. ZÁVER

Moderné komunikačné technológie spôsobili významnú zmenu v organizácii cestovného ruchu. Zákazníkovi v oblasti cestovného ruchu sa otvorili možnosti nakupovať personalizované produkty, presne podľa jeho želania čo korešponduje so zavádzaním konceptu Industry 4.0 a dovoľme si tvrdiť, že práve táto oblasť služieb prechádza výraznými zmenami práve vďaka zavádzaniu nových technológií. Rezervácie leteniek ubytovania a iných služieb online sú čoraz populárnejšie a prinášajú výhody nielen zákazníkovi ale aj predajcom týchto služieb. Práve vďaka tomuto konceptu sa v posledných rokoch zaznamenal vysoký rozvoj cestovného ruchu v svetovom meradle. Okrem efektu rýchleho a personalizovaného nákupu a predaja služieb sa výrazne zvyšuje tlak na kvalitu poskytovateľov v dôsledku možnosti komunikácie medzi zákazníkmi na rôznych online fórach ako aj hodnotení nakúpených služieb a návodov na cestovanie. Systém masového cestovného ruchu založený na touroperatoroch ponúkajúci komplexný a nemenný produkt začal strácať klientov. To znamená, že v tomto segmente dochádza k výrazným zmenám aj čo sa týka vytvárania pracovných miest. Viac ako kedykoľvek pred tým sa začína používať internetový marketing najmä prostredníctvom sociálnych sietí, čo kladie iné požiadavky na pracovníkov marketingových oddelení ale aj pracovníkov zariadení poskytujúcich tento typ služieb. Na druhej strane sa stretávame s nedostatkom pracovnej sily v tomto segmente, pretože na slovenskom trhu práce sú mzdy na nízkej úrovni. Ak má zamestnanec dostatočné zručnosti a znalosti z oblasti marketingu, komunikácie a jazykovú vybavenosť častokrát prechádza do iného segmentu najmä do oblasti automobilového priemyslu, kde sa jeho mzda pohybuje ďaleko vyššie. Dôsledkom podhodnotenia pracovnej sily v oblasti cestovného ruchu a zavádzania konceptu Industry 4.0 sú na Slovensku viditeľné dva efekty a to zamestnávanie veľkého počtu zamestnancov zo zahraničia najmä na nižších pracovných pozíciách a rast cien poskytovaných služieb, ktoré sa dostávajú na zahraničnú úroveň. Cestovný ruch na Slovensku v posledných rokoch síce dynamicky rastie, ale je to len konštatovanie pri pohľade na hrubé čísla zohľadňujúce počty návštevníkov, prenocovania a tržby. Tržby vo všetkých službách, ktoré generuje cestovný ruch na Slovensku, prekračujú v posledných rokoch hranicu 5 miliárd EUR. Cestovný ruch dáva v súčasnosti prácu viac ako 160 000 zamestnancom na Slovensku. Zároveň sa ukazuje, že vývoj cestovného ruchu na Slovensku nemá z dlhodobého hľadiska stabilný rast.

Napriek rastúcemu počtu návštevníkov, prenocovaní, ale aj tržieb, cestovný ruch stagnuje. Prejavy stagnácie vidíme predovšetkým v poklese konkurencieschopnosti, ktorá je dôsledkom nedostatku investícií a v pomalom raste zamestnanosti, ktorú brzdia neustále sa zvyšujúce náklady. Je to výsledok zlého nastavenia podmienok na podnikanie v službách. Treba zdôrazniť, že viac ako 90% podnikov v cestovnom ruchu tvoria malé a stredné podniky, ktoré

majú jednak problém s kvalitným personálom a na druhej strane nie sú ešte celkom stotožnený s konceptom online predaja. Cestovný ruch je napriek tomu odvetvie, ktoré má z dlhodobého hľadiska výraznú perspektívu a môže byť v budúcnosti jedným z nosných odvetví, ktoré zabezpečia hospodársky rast krajiny.

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ANALYSIS OF SELECTED ISSUES RELATED TO HUMAN RESOURCES AND INDUSTRY 4.0 IN CASE OF ENGAGEMENT INTO CLUSTER COOPERATION ON EXAMPLE OF TECHNOLOGICAL SME

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Abstract: *The issues of industry 4.0 have become important also in case of cluster cooperation. Cluster represents the group of independent regional stakeholders with potential of increasing their competitiveness and creation of new work places. Nowadays, among the activities that are realized by clusters belong the activities connected with preparation of human resources and activities to apply the principles of Industry 4.0. The challenges that Industry 4.0 brings are required continuous innovation and learning, which is dependent on people and cluster's capabilities. The main aim of the paper is to evaluate the perception of selected motives connected with issues of industry 4.0, which are considered by small and medium sized entrepreneurs (SMEs) in case if they want to take part in the cluster cooperation. The focus is oriented on SMEs from areas in which Slovak technological clusters carry out their activities. To meet the main aim the questionnaire surveys among 472 technological SMEs and 44 experts were realized. The results pointed on the level of importance of observed risk/motives towards cluster cooperation related with human resources and industry 4.0.*

Key words: *risk, human activities, human resources, cluster, cluster cooperation, industry 4.0*

JEL Classification: L00, L26, R110, O15, O30

1. INTRODUCTION

Small and medium size enterprises (SMEs) present one of the major generator of economic development in any market economy. Sector SMEs has been successful in the whole world in the last decades, especially in the industrialized countries. The process of managing SMEs is very specific because the business activities are carrying out under conditions of scarce resources. (Milosevic et al., 2015) The development capability also of an individual is based on available resources and properties. It is not so much material resources and not so much technologies and innovations as specific features of the life and behaviour of individuals, moral ethical norms, and value system. (Rakauskienė, Strunz, 2016) SMEs are considered to be the driving force of economies because they make a significant contribution to increasing of innovation activities, the flexible introduction of new products, as well as job creation. They are adaptable and responsive to changes. The SMEs also influences the region in which it is located and regional development through its entrepreneurial activity. (Hitka et al., 2018) This is confirmed also by Fabus (2018) according to which the entrepreneurship has an irreplaceable role, especially in the area of job creation and regional development.

On the opposite side, the SMEs face several problems. The main are: to be competitive, they match with problems in existing production (planning, optimization, etc.), they have lack of knowledge and resources (human, investment) for development, they facing with problems related to the introduction of quality standards (e.g. ISO 9001), they are characterized by low production efficiency and finally they have problems with human resources management. (Srovnalíková, Karbach, 2016, Mura et al., 2017, Cseh Papp et al., 2018, Mészáros, 2018).

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Business environment is characterized by growing dynamics and diversity. To succeed enterprises must adjust to the demanding internal and external business environment. (Gorzen-Mitka, Okreglicka, 2015) The business environment, in its broadest sense, reflects the quality of economic conditions and assumptions for the economic activity of business entities. (Fabuš, 2018) Differences in quality of business environment are affected by many factors that can be described by many partial indicators. (Jaskova, 2016) Managing increasing business complexity is absolutely necessary to companies to compete better in global market. (Gorzen-Mitka, Okreglicka, 2015) In order to succeed in a competition, they have to constantly come up with innovative solutions that respond to customer needs (Laužikas, et al., 2016, Koval'ová et al., 2018). Innovations also in SMEs are the result of effective application of science, research and development in practice. Innovation is referred to a planned, managed and implemented change in terms of a new system or its better state. In the area of manufacturing companies, it is usually all about a new quality product creation and implementation, new production process or new organization methods such as marketing and management. (Kordos, Ivanová, 2017) SMEs are becoming to aware also of the opportunities and benefits of Industry 4.0 in terms of ensuring their long-term competitiveness. Industry performance entails the incorporation of the objectives of smart sustainable development, namely social and territorial cohesion, economic efficiency, innovation, digital and environmental performance, into a company's operational practices. (Krajčo et al., 2018)

The industry 4.0 becomes in 21st century one of the major trends with global impact. It is known as a boom (increase of production and circulation of global economy), the economic forces in the world are crossing borders. (Kordos, Vojtovic, 2016) Many solutions offered by platform of Industry 4.0 often do not meet the specific requirements of SMEs. In order to use the benefit of digitalization of different systems, it is necessary to use the platform of Industry 4.0 by not only individual systems, but also it is necessary to make the different systems interoperable with each other. Industry 4.0 therefore represents a qualitatively new challenge, even for companies that have experience with booting new automated technology for decades. The challenge is therefore to find competitive solutions for the implementation of Industry 4.0 in order to expand the supply on the labor market towards „good jobs“ – it means the qualified work places that support the need for further education and are a guarantee of a healthy working environment. (Fifekova, Nemcova, 2016)

The opportunity to implement issues of Industry 4.0 for SMEs flows also from cluster cooperation. The basic precondition for the cluster's existence, functioning, development and success is the common cooperation and trust among its stakeholders. Clusters, thanks to the advantages such as knowledge base and mechanisms, agglomeration economies and externalities (labor pool and critical mass of firms) and favorable more stable, less uncertain environment of trust and cooperation, may facilitate the digital transformation, particularly its phasing-in and testing phases. (Kordos, 2015; Kordoš, Krajňáková, 2018; Svec, Madlenak, 2017) Grencikova et al. (2016) argue that members of this generation are characterized by creativity, they are innovative, they prefer flexible working patterns and their big advantage is that they were actually born with the technology so there is nothing impossible for them. However, they are stubborn and disloyal what does not bring any benefits and advantages for the company. Human potential is also crucial for clusters. Notwithstanding this potential, it should be stressed that not all clusters would be able to play such prominent role. Only these equipped with adequate knowledge base and providing some expertise in the field of IT solutions, robotics, automatics, and so on, i.e. the technologies crucial to Industry 4.0 seem predestined to contribute to the emergence of fully-fledged industrial internet. Despite seemingly some inconsistency between these two categories, clusters can facilitate the business transformation towards Industry 4.0. (Gotz, Jankowska, 2017).

2. PROBLEM FORMULATION AND METHODOLOGY

The research realized in this paper focuses in a quantitative analysis of Slovak small and medium sized entrepreneurs' expectation about the issues of human resources and activities in the case of connection into cluster cooperation connected with issues of Industry 4.0. Within the scientific project VEGA reg. n. 1/0953/16 a questionnaire, survey was realized. The survey was applied in years 2016-2017 in eight Slovak self-governing regions, among 472 small and medium entrepreneurs that have knowledge/experience or consider the connection into cluster cooperation. According Grenčíková et al. (2017) if, it is not realistic to organize research with the completely basic set, we can findings based only on knowledge about sample (selection). The research is focused on entrepreneurs that are carrying their activities in the areas in which Slovak technological clusters operate.

To meet the main aim of this paper we have chosen three questions related with issues of Industry 4.0. To start with, the survey collects information such as participation in cluster, the location of enterprise, region, number of employees and annual turnover. This section was followed by questions focused on the evaluation of SMEs' perception of their risk/motive for connection into cluster cooperation. There are four main questions connected with human resources and related with the aspects of Industry 4.0. The results was compared with answers of professionals (researchers, representatives of municipalities, commerce chambers, etc.).

The methodological approach in this paper follows the research of Moreno García et. al (2018). The obtained data were evaluated by using of program STATISTICA and statistical analysis was carried out in order to obtain descriptive statistics, minimum and maximum values all this with the Shapiro Wilks test and its correction Lilliefors and p-values for each item. The relationship among answers of SMEs and professionals were evaluated by Chi-square test. This test was used to verify the null hypothesis (H0) about no association among answers of SMEs and professionals. The low level of p value <0.05 means that the H0 is rejected and we accept the alternative hypothesis H1, that between the answers of SMEs and answers of experts an association is present. Large probability (p-value >0.05) means the opposite.

3. PROBLEM SOLUTION / RESULTS / DISCUSSION

There are more than 20 clusters in eight Slovak regions. From this amount, the 18 is the technological. This type of clusters merge SMEs from following areas: ICT, creative industry, bio-economic focus, agriculture and food, engineering, energy, electrical engineering, construction, automotive, scientific research, and so on. The percentage structure of SMEs respondents is given in table 1.

Table 1: The structure of respondents (%)

Region	Respondents	Micro (0-9 employees)	Small (10-49 employees)	Medium (50-249 employees)	Total
Bratislava	SMEs	1.27	2.75	1.69	5.72
	SMEs in cluster	1.91	2.12	1.06	5.08
Trnava	SMEs	0.85	2.33	1.48	4.66
	SMEs in cluster	1.27	1.91	1.27	4.45
Trenčín	SMEs	13.35	11.23	10.59	35.17
	SMEs in cluster	0.21	0.21	0.00	0.42
Nitra	SMEs	2.12	1.91	2.33	6.36
	SMEs in cluster	0.21	0	0.42	0.64
Žilina	SMEs	8.26	6.36	6.99	21.61
	SMEs in cluster	0.00	0.00	0.00	0.00
Banská Bystrica	SMEs	2.33	1.27	1.69	5.3
	SMEs in cluster	0.00	0.00	0.00	0.00

Košice	SMEs	1.91	0.21	0.85	2.97
	SMEs in cluster	1.27	2.12	1.27	4.66
Prešov	SMEs	0.64	1.48	0.85	2.97
	SMEs in cluster	0.00	0.00	0.00	0.00
Total	-	35.59	33.9	30.51	100.00

Source: author's research

In table 1 we can see the division of respondents according size categorization, regional distribution and membership in clusters. The largest amount of respondents came from Trenčín region (35.17%), following by Žilina region (21.61%). From the point of view of size category, the largest group of respondents belonged to category of micro enterprises (35.59%). The largest group of respondents that belonged to clusters came from Bratislava region (1.91%). The structure of experts was following 54.54% researchers, 45.46% experts from economic practice.

4. RESULTS

The next part of paper show the results of statistical analysis to each evaluated question. The basic statistical characteristics necessary for following analysis were μ - the average of respondents' evaluation, SD - standard deviation, frequency – the percentage of respondents' evaluation based on the proposed scale, minimal and maximal value of scale, modus and its frequency, p – value of Shapiro-Wilk test, Lilliefors test and Chi-square test.

Doing business also involves so called business risk, which can be characterized as likelihood of taking a negative direction from reaching identified goals. (Fabuš, 2015) Production in cluster is related to factors of technical risk and they represent the losses in manufacturing process, most commonly caused by restriction or by stop of production process. These risks are associated with the option that due to a lack of various resources (raw, materials, labor force, and energies) comes to restriction of production process. (Haviernikova et al, 2016) For this research, we have focus on question: Q1: How could human factor affect the production?

Table 2: The evaluation of human factor impact by SMEs

Scale of impact	Frequency (%)	Min. value	Max. value	Modus (frequency)	μ	SD	p	Shapiro-Wilk test	Lilliefors
Without	4,66	0	5	4(135)	3.56	1.32	p<0.00	0.8619	p<0.01
Very low	3,39								
Low	8,26								
Middle	26,91								
High	28,60								
Very High	28,18								

Source: author's calculations

Table 2 shows, that SMEs' respondents evaluate stated factor with high level of risk (3.56 ± 1.32). Also results of Shapiro-Wilk test being 0.8619, more than 0.05, indicates that there is enough evidence to consider this factor as risky. In addition, the experts (Table 3) evaluated the impact of human factor as a factor with very high level of risk (3.31 ± 1.60). These results also confirm the Shapiro-Wilk test (0.8699).

Table 3: The evaluation of human factor impact by experts

Scale of impact	Frequency (%)	Min.value	Max. value	Modus (frequency)	μ	SD	p	Shapiro-Wilk test	Lilliefors
Without	9,09	0	5	5(14)	3.31	1.60	p<0.00	0.8699	p<0.01
Very low	4,55								
Low	13,64								
Middle	22,73								
High	18,18								
Very High	31,82								

Source: author's calculations

For evaluation of correlation between two groups of respondents' answers we used the Chi-square test. The results ($p=0.4058$) showed, that between answers of two groups of respondents the association is not present. We confirmed H_0 .

Table 4 and Table 5 are focused on results of question Q2 evaluation. Q2: How important are the educational services for cluster members for your decision to join cluster cooperation?

Table 4: The evaluation of importance of education services for cluster members by SMEs

Scale of importance	Frequency (%)	Min. value	Max. value	Modus (frequency)	μ	SD	p	Shapiro-Wilk test	Lilliefors
Without	9,75	0	5	3(114)	2.48	1.44	p<0.00	0.9318	p<0.01
Very low	19,28								
Low	19,49								
Middle	24,15								
High	19,49								
Very High	7,84								

Source: author's calculations

The results showed that SMEs perceive this motive as a moderately significant in terms of their potential entry into the cluster (2.48 ± 1.44). Experts have even considered this motive with low level of significance (2.18 ± 1.45). The results of Shapiro-Wilk test in both cases have gained values 0.9318 and 0.9103 what can interpreted that the described data are trustworthy.

Table 5: The evaluation of importance of education services for cluster members by experts

Scale of importance	Frequency (%)	Min. value	Max. value	Modus (frequency)	μ	SD	p	Shapiro-Wilk test	Lilliefors
Without	18,18	0	5	2(14)	2.18	1.45	p<0.00	0.9103	p<0.01
Very low	9,09								
Low	31,82								
Middle	27,27								
High	4,55								
Very High	9,09								

Source: author's calculations

The results of realized Chi-square statistics showed ($p=0.0219$) that also in case of evaluation of respondent's answers we admit the null hypothesis H_0 , that between the answers of two groups of respondents is no association.

Table 6 and Table 7 present the perception of motive related to preparation and education of employees in case of cluster cooperation.

Table 6: The evaluation of importance of common preparation and education of employees by SMEs

Scale of importance	Frequency (%)	Min. value	Max. value	Modus (frequency)	μ	SD	p	Shapiro-Wilk test	Lilliefors
Without	7,63	0	5	3(125)	2.18	1.43	p<0.00	0.92828	p<0.01
Very low	12,92								
Low	18,22								
Middle	26,48								
High	22,67								
Very High	12,08								

Source: author's calculations

The results showed that SMEs perceive (2.18 ± 1.43) this motive with middle level of importance that has impact on their decision about join the cluster cooperation. Similarly evaluated this motive also experts (2.36 ± 1.63). The results was confirmed also by results of Shapiro-Wilk test (0.92829 in case of SMEs' evaluation and 0.8801 in case of experts' evaluation).

Table 7: The evaluation of importance of common preparation and education of employees by experts

Scale of impact	Frequency (%)	Min.value	Max. value	Modus (frequency)	μ	SD	p	Shapiro-Wilk test	Lilliefors
Without	7,63	0	5	1(16)	2.36	1.63	p<0.00	0.8801	p<0.01
Very low	12,92								
Low	18,22								
Middle	26,48								
High	22,67								
Very High	12,08								

Source: author's calculations

On the opposite side, the results of Chi-square ($p=0.00076$) showed that we can observe the differences between respondents answers according respondents' category. For this motive, we reject the null hypothesis H_0 and we accept the alternative hypothesis H_1 .

5. CONCLUSION

On the opposite side, the results of Chi-square ($p=0.00076$) showed that we can observe the differences between respondents answers according respondents' category. For this motive, we reject the null hypothesis H_0 and we accept the alternative hypothesis H_1 .

The results analyzed in previous part of the paper showed that perception of evaluated questions by SMEs and experts is different only in cate of evaluation of importance of common preparation and education of employees. People who have little previous contact with the subject of Industry 4.0 find it difficult to analyze opportunities and risks toward this concept.

According Haviernikova et al. (2016) the human impact factor is the highest risk factor for SMEs in carrying out their activities. The results in this research also confirm the importance of this risk factor.

The necessity of education with relevant focus is also confirmed in Grenčíková et al. (2017) who stated that more support is needed for the dual system of education, including offers of study programs according to the real needs of the regional labor markets. It is necessary for the schools to be more focused on specific occupations relevant to their particular regions. Stated is also valid for effective realization of activities in technological clusters. The evaluation of questions related to education and Industry 4.0 that is more important issue for SMEs than experts, who only suggest the importance of these reasons.

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EMPLOYEE MOTIVATORS IN TELECOMMUNICATION COMPANIES IN LATVIA

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Abstract: *In organisations, as they adapt to the new conditions of current global competition, the employees becomes the main competitive advantage, and stresses change in the organisation itself: from marketing-orientated competitiveness to human-resource-orientated competitiveness. 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. One of these new attitudes to work is employee engagement, which, next to employee retention and commitment, is among the greatest challenges that organisations face in this decade. The authors in this study explore mutual relations among the organisation's motivation tools, job satisfaction, engagement and motivated work behaviour in telecommunications companies in Latvia. The conceptual model envisaged that the nature of the job, satisfaction with work, organisation's support, self-efficiency and satisfaction with life positively and significantly influences engagement behaviour and attitude. The conclusions that the largest weight of influence on engagement belongs to satisfaction with work, work resources and that satisfaction is a precondition or driver of engagement also correspond to the theoretical conclusions and results of other studies.*

Key words: *employee engagement, employee motivation, survey, telecommunications*

JEL Classification: *M54, M52, M50*

1. INTRODUCTION

The aim of the study is to explore mutual relations among the organisation's motivation tools, job satisfaction, engagement and motivated work behaviour in telecommunications companies in Latvia. The sub-aim of the study was to assess the opportunities of organisations to promote employee engagement by developing an employee engagement measurement tool, tailored for the industry and easy-to-use, by integrating the engagement-influencing and resultative factors in a single model.

In the paper results of studies and analyses of the theories and conceptual definitions that substantiate employee engagement and analyses concepts close to engagement: employee satisfaction, job involvement, commitment to organisation and motivation, and their mutual relations with the study subject are included. The theoretical part continues by analysing the factors that influence engagement and its resultative factors, and the more-often used engagement measurement scales. The authors in this study has used a multi-dimensional approach, which analyses employee engagement as organisation management practice, a personnel management strategy and internal communication tool, paying more attention to the assessment of mutual connections between employee engagement and motivation and to aspects of employee behaviour.

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In empirical part of the paper authors analyse the results of the empirical study (survey) in connection with factors influencing employee management. In the survey it was used evaluation scale 1 – 7, where 1- fully disagree, 7 – fully agree. An employee engagement measurement scale was developed, integrating elements from engagement behaviour, attitude and emotional aspects, and also a practically applicable model for the mutual relations between factors influencing employee engagement and resultative factors is offered.

2. BACKGROUND OF THE SITUATION

Globalisation, fiercer competition and growing uncertainty in the business environment make organisations continuously adapt to changes in the market structure, legislation and legal structure as well as to changes in the needs of various generations of the workforce. Also, the classical sources of competition advantages 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. In our days, as 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.

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 2016, most emigrants were young people in the age group 25-29 (3,507 people), then in the age group 30-34 (2,710 people), followed by the age group 20-24 (2,580 people) (CSB database, 2018). Skill and knowledge of the workforce has become a product that the organisations of developed countries buy for a higher price. 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. 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 (Caza, Cameron, 2008). 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 (Foster, 2010), (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 (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.

One of these new attitudes to work is employee engagement, which, next to *employee retention* and commitment, is among the greatest challenges that organisations (Aithal, Kumar, 2015) face in this decade. In practice employee engagement (Albrecht, et al., 2015); (Van Woerkom, et al., 2016) 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 (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 (Kumar, Pansari, 2014). demonstrating engaged behaviour, e.g. 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 (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 (Kahn, 1990); (Schaufeli, et al., 2002).

On the whole, external environment changes have created a new approach to employee management, called psychologisation of the workplace by researchers (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 (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 (Gordon, et al., 2015) refers to employees' personal initiative, and for the management of diversity prospective thinking is required (Peale, 1956), for team work — confidence and communication skills are prerequisite. Hence, the meaning of employees' engagement can be, to simplify, defined as motivated interest to put additional effort into work, contributing more of one's time, intellectual potential and energy (Frank, et al., 2004).

Studies have shown (Frank, et al., 2004); (Rana, Chhabra, 2011) that the overall economic situation is directly connected with the retention of employees, but employee engagement is not considered. In the current economic upswing, a comparatively low employee retention level can be seen, but engagement differs in various organisations and employee segments. Consequently, considering both the global and Latvian economy growth forecasts, the demand for workforce will only grow and a high turnover of personnel is expected in the nearest years. The main thing that will help employers keep their employees will be the ability and skills of the management to create and increase employee engagement and to strengthen commitment to the company. Most studies draw the same conclusion: engaged employees are

a considerable source of company competitiveness.

3. THEORETICAL FINDINGS

Employee engagement as a social definition as well as a measurement concept has contributed considerably to understanding what helps improve an organisation's performance indicators like employee productivity (Katou, Budhwar, 2015); (Sumanth, 1998); (Tarafdar, et al., 2007), job satisfaction (Boselie, DerWiele, 2002); (Rayton, Yalabik, 2014), commitment and motivation (Schaufeli, 2013); (Vroom, 1964). Most studies confirm the positive effect of employee engagement on a company's productivity (Koutroumpis, 2009), profitability, personnel retention and customer satisfaction and service quality (Zigarmi, et al., 2009); (Xanthopoulou, et al., 2009). (Xanthopoulou, et al., 2009). Furthermore, according to Baker and Demerouti (Bakker, Demerouti, 2008), there are at least four reasons why employee engagement is not only desirable, but also necessary for employees themselves. Firstly, engaged employees often experience positive emotions (e.g. happiness, joy and enthusiasm); secondly, engaged employees have better health; thirdly, engaged employees create their own work resources and personal resources; fourthly, engaged employees pass on their engagement to others.

Most often, in the scientific engagement literature, four conceptualisation approaches of engagement are used, and each of them stresses a different aspect of engagement: 1) approach of engagement as the satisfaction of needs that connects with the work role performance (Kahn, 1990); 2) engagement as an antipode of burnout (Bakker, et al., 2008), where the positive character of engagement in relation to the wellness of employees is stressed (Schaufeli, et al., 2002); 3) engagement as an effect of job satisfaction and its connection with work resources (Harter, et al., 2013). (Harter, et al., 2013); 4) engagement as a multi-dimensional phenomenon and its connection with work, employee behaviour as well as an organisation (Saks, 2006). In this study the author has used the multi-dimensional engagement approach as it defines engagement more broadly than other approaches and is more connected with the organisation management practice, and not with the psychology discipline. The multi-dimensional approach, along with the attitude (Yalabik, et al., 2013) component in the engagement concept, also integrates the behaviour dimension. Researchers Newman and Harrison (Newman, Harrison, 2008) have also separated the notions of job engagement and employee engagement, stressing that the former relates to the individual's psychological experience in doing the job and also the attitude and personal traits, whereas the latter means as well an organisational approach to managing own employees.

Employee engagement is one of the latest organisation management conceptual definitions and personnel management practice types. Conceptualisation of management-orientated engagement emerged as a reply to the search for how to manage knowledge workers in an environment of continuous changes and uncertainty in organisations. But the rapid development of telecommunications technologies created general access to knowledge, and it was IT industry innovations that made it possible for organisations to manage knowledge as a corporate asset. Knowledge has become an economic value in the society as a whole, as well as in organisation growth and development, giving an impulse to the rapid growth of knowledge-capacious jobs. Furthermore, rapid changes have taken place in the economy cardinally changing job requirements; these days, more jobs are connected with psychological requirements, not physical. To cognise the influence of change dynamics both at the individual and team level, as well as in the organisation's overall context, human capital and its management has become one of this century's most significant issues in the view of organisations. And employee engagement is one of the ways of how knowledge organisations can achieve higher added value, competitiveness and employee commitment and a lower resistance to changes.

Human resources in the telecommunications services industry are more strategically important than other organisational factors, as it is considered that human resources is the main factor in obtaining and retaining competitive advantages by telecommunications organisations. Thus, in companies based on competitiveness in creating and employing knowledge, the engagement of high-level knowledge employees becomes a critical advantage and necessity regarding competitiveness.

Employee engagement is an inter-disciplinary notion. Its theoretical origin and definitions arise from the field of psychology; whereas in practical work of companies employee engagement is related to the improvement of various performance indicators important for the organisation. As outcome factors of engagement, the following can be mentioned: employee productivity, higher motivation and organisation citizenship behaviour, higher satisfaction with work, commitment to the organisation and lower turnover. Therefore, personnel management specialists in organisations become more interested in theory-based models that explain how management practice can improve employee engagement and the overall performance of the organisation.

The author's research shows that in Latvia definitions of employee engagement, employee engaging and employee job involvement are used interchangeably, but they should be conceptually separated. The author recommends using the definition of involvement in cases and situations where an organisation wants to engage, and with various extrinsic motivators, can stimulate the participation of employees in taking decisions essential for the organisation or facilitating initiatives for the common benefit. But employee engagement is recommended for use in situations when the organisation wants to facilitate the individual interest and encourage an intrinsic motivation about work or influence a higher return from the employee in doing the direct work tasks or roles. The author considers that the definitions engagement and engaging are semantically the same but differ by the expression of activity in the expression of time, e.g. engaging is more related to the present tense, whereas engagement would be more attributable to an activity or state longer in time. Thus involvement is a result of external influence and relates only to behavioural aspects of employee, engagement is both the psychological state and behaviour of the employee and can be the result of external influence, as well as internal motivation and employee's own initiative; engaging is, in turn, only one's own initiative, and besides in the present tense.

Employee engagement should be viewed as the employee's psychological state in connection with the expression of their behaviour, integrating both attitudes and behavioural competences. Attitudinal engagement is a combination of the following factors: satisfaction with work, bonding to the organisation or commitment, and job involvement, understood in the scientific literature as job engagement. Most research in the field of engagement analyses the job or attitude engagement and relates more to the psychology discipline. Furthermore, behavioural engagement is also defined as employee engagement, the employee putting additional personal resources into achieving the organisation's aims. It is also more comprehensive than similar work attitude definitions: job involvement, satisfaction with work, and commitment to the organisation. The reason why engagement is more closely knitted with employee performance than other work-related attitudes, is that it reflects a more energetic action, not only the feeling of satisfaction that is characteristic to satisfaction of work; or job involvement, which is the result of the influence of an organisation's management and relates only to behaviour; or motivation that can also exist without internal motivation; or the commitment that rather relates to the extra role of behaviour outside work duties.

4. PROBLEM FORMULATION AND METHODOLOGY

Employee engagement in telecommunication industry is essential as technologies change very fast and qualified, motivated and engaged employees are essential for this industry. To keep qualified employees management of the company has to create conditions for attractive work place and feel the mood of employees. For getting information on employee evaluations of their work evaluations wmployee surveys are conducted. Research findings underline several important aspects which all are important but still it takes a lot of time by employees therefore it is important to investigate which are the most important aspects to be asked by management. For this reason taking into account scientific findings it was created questionnaire containing 29 important statements to be evaluated. To reduce statements to be asked to employyes it was organized survey of employees where 608 responses were collected. There was applied factor analysis with varimax rotation and as result of several iterations it was created complex factors.

5. PROBLEM SOLUTION / RESULTS / DISCUSSION

Since in the organisational environment, engagement is a new conceptual definition, there is no common approach among researchers in selecting tools for assessing engagement. For example, controversies in various studies are most often connected with the definition of engagement, mixing engagement confirmations with engagement causes or outcome factors. Also, it is considered that there are differences between the practical and theoretical definitions of engagement, which mark certain problems regarding the comparability of results. Depending on the aim and focus of the study, engagement can also be seen as the reason, agency variable or moderator or the result. Engagement can conceptually be considered both the organisation management practice and the psychological state of an employee. Therefore, before commencing employee engagement programmes at organisations, it is critically important to define the engagement goals and to assess the predicted driving or influencing factors and expected results of engagement.

In the academic field, there are two engagement conceptualisation approaches that are cited most: of the researchers Kahn and Schaufeli. Although they differ by the descriptive notions used, in essence they express a common conceptual understanding of engagement. To describe the essence of engagement, Kahn uses notions such as behavioural, cognitive and emotional engagement. But Schaufeli's definition of engagement covers dimensions of vigor, dedication and absorption, which, in essence, express the same idea as Kahn's, because vigor is energy and activity at work, dedication is intellectual interest about work, and absorption is psychological presence and positive emotions from the work role and process.

There are also several employee engagement measurement approaches, which conceptually define the essence of engagement: needs satisfaction approach; burnout antithesis approach; satisfaction with work approach; and multi-dimensional approach. The latter, in addition to the psychological state, integrates a more accurately defined behavioural component and relates more to management science. The most often used scale (*UWES* or Utrecht scale in the academic environment is used in 85% cases (Bailey et al, 2017), also in cases of other approaches) was initially created to substantiate the application of the burnout antithesis approach. It encompasses three dimensions: vigour, dedication and absorption, the origin of this scale is related to the psychology discipline, and it more analyses the psychological state of the employee. And, although the Utrecht scale dominates in the research and evidence base, academic literature is so rich in various understandings and measurement scales of engagement that there is still no reason to think that engagement is an unambiguously described definition and that one scale is more useful and stable than others. Furthermore, this scale is more often used in the psychology discipline.

Most of the many engagement measurement scales are unable to incorporate the fundamental engagement conceptualisation described by Kahn, who is considered the founder of engagement in the work environment. Most measurement scales are multi-factor combinations, and most do not reflect the multi-dimensional definition and approach of engagement. It is believed that such scales are useful and predictable as they measure various engagement-related, but lower, concepts. However, researchers also admit that, for practical and more often use, it is required to develop the shortest possible variant of instrument (scale). A shorter scale would reduce the time spent by respondents (which is a very significant reason these days), the stress of the assessment and keep attention, yielding more reliable replies, thus preventing systematic and random errors in measurements.

One of the tasks set forth by the authors was to develop a focused one-factor employee engagement scale for employees of the telecommunications industry that would at the same time reflect the multi-dimensional nature of the engagement concept: cognitive, emotional and behavioural engagement by the employee. Other researchers (e.g. Britt) have also pointed out the necessity to develop engagement measurement as a one-factor construct, because, if engagement is assessed in two or more factors, there will be uncertainties about what factors are connected with various resultative indicators of engagement. To make it possible to use the measurement scale for more frequent assessments of engagement (more than once a year or two as is most common in companies now), it should meet the following criteria. Firstly, it should be sufficiently brief and at the same time embrace the multi-dimensional nature of the concept of engagement as a dependant variable. The engagement scale should reflect the conceptualisation published by the founder of the engagement theory Kahn in 1990 and widely used throughout the world, integrating the behaviour, emotional and cognitive component of the essence of engagement. Secondly, it should be substantiated with the best 'set' of engagement drivers. Thirdly, it should be a single-factor engagement econometric solution to avoid problems that are faced by other frequently used scales: a multi-factor scale, containing several factors, can comprise the risk of multi-co-linearity. This can make it difficult to use it further for forecasting in other multi-dimensional analysis methods and would require more complex approaches. Fourthly, frequently used scales comprise too many emotionally loaded statements due to their origin from another field: from psychology and the engagement antipode approach — burnout. Therefore, the author selected those statements from the scales more often used in surveys that would more accurately fit the particular situation studied.

Kahn, founder of the conceptual creation of employee engagement, in his approach published in 1990 and thereafter widely used in the world, stated that employee engagement is a psychological state, in which employees express themselves in their work "physically, cognitively and emotionally". Consequently, engagement should relate to the individual's psychological connection with the work task and role, not only with the attitude to the organisation's or job's traits. The scale developed by the author is a single-factor solution and consists of 7 statements of which two reflect the physical behaviour or behavioural component, three the emotional or absorption component and two the cognitive vitality or dedication component. Thus, the author's scale corresponds to both the multi-functional approach and the validity of content of the scale. This scale also complies with the reliability, Cronbach's Alpha 0.869, indicator requirements (must be over 0.70); it means that the internal structural composition of the scale is stable and consistent. The sufficiency of selection for the factor's structure is also good, as shown with the Kaiser-Meyer-Olkin adequacy test (0.872) (must be over 0.75).

The employee engagement scale for telecommunications industry workers created in this study embodies and reflects the classical key principles of engagement and in general corresponds to both econometric and psychometric parameters. It measures employee

engagement attitude and behaviour with 7 statements. It was created to have as few superfluous statements as possible so that respondents would spend less time and also decrease the possibility that the respondent would be able to surmise what the organisation wishes to measure from many statements and therefore provide desirable answers. Table 1 comprises the main results that were obtained using the aforementioned realisations. Based on the initial factor statements that were assessed by the respondents, engagement was divided into four parts: E- emotional engagement; I- intellectual or cognitive engagement; F- physical or behaviour engagement.

Table 1. Variables composing engagement in factor analysis

Component matrix		Engagement		
		Corr. Coef.	Arithmetic Mean	Standard deviation
E	I love what I do and want to do it in the best way	0.810	5.86	1.084
I	I feel this job gives me professional fulfilment	0.800	5.41	1.139
F	I care about what our team tries to achieve; therefore, when required, I put in additional effort (more than expected) to help the company achieve more	0.793	6.19	0.895
E	This job is my opportunity to express myself best both professionally and individually	0.793	5.11	1.300
E	I feel proud about working in this company	0.707	6.33	0.875
F	In this job I always strive to be persistent, even if not everything goes as expected	0.683	5.88	0.873
I	In this job, time flies unnoticed	0.645	5.83	1.121

Method for separating complex factors: Principal Component Analysis 1 component separated

Kaiser-Meyer-Olkin measurement of sampling adequacy 0.872

Bartlett test 1863.71

Degrees of freedom (df) 21

Significance level (Sig.) 0.000

Cronbach's alpha based on standardised ratings 0.869

Number of ratings 7

E- emotional engagement; **I-** intellectual engagement; **F-** physical or behaviour engagement.

Source: Survey of telecommunications industry employees January 2017

Rating scale 1–7, where 1 is 'fully disagree' and 7 is 'fully agree', sample size n = 608.

The authors conceptual model envisaged that the nature of the job, satisfaction with work, organisation's support, self-efficiency and satisfaction with life positively and significantly influences engagement behaviour and attitude (Table 2). The studies' outcomes confirmed these hypotheses. The conclusions that the largest weight of influence on engagement belongs to satisfaction with work, work resources and that satisfaction is a precondition or driver of engagement (moreover, with a high standardised regression coefficient [$\beta=0.583$]) also correspond to the theoretical conclusions and results of other studies. The regression model is also shown to be useful by the high adjusted value of the coefficient of determination (0.656).

Table 2. Characteristic features of the regression equation: the influence of employee behaviour, attitude and organisation's support in engagement

Independent variables	Dependent variable of regression equation: <i>Engagement</i>			
	β	R	R ²	Adj R ²
		0.811	0.658	0.656
Satisfaction with job	0.583			
Self-efficiency	0.364			
Satisfaction with life	0.335			
ORG/Management support	0.272			

$p < 0.001$, β - standardised values of regression coefficients, Adj R² - adjusted coefficient of determination. Source: Survey of telecommunications industry employees January 2017, $n = 608$, rating scale 1–7, where 1 is 'fully disagree' and 7 is 'fully agree'

In *engagement* theory it is considered that employees must possess not only certain emotional and cognitive characteristics, but also a certain level of self-confidence in assessing themselves in relation to performance. Employee's self-efficiency or confidence in one's abilities has a sufficiently significant influence on *engagement*, i.e. its standardised regression factor is the second highest in the regression equation ($\beta = 0.364$, Table 2). Self-efficiency is the employee's personal resources that are related to flexibility, the ability to successfully control the environment, to accept and adjust emotions. Self-confidence, optimism, hope and stamina are examples of personal resources, and they create the psychological capital of the individual. And, although in the authors model, optimism (statement 'I look to the future with confidence') was part of another factor, 'satisfaction with life', both these factors (self-efficiency $\beta=0.364$; satisfaction with life $\beta=0.335$) are even greater influencers of engagement than the organisation's support ($\beta=0.272$). Outcomes from other researchers have shown that engaged employees are also very self-confident and self-accountable; it is thought that such employees can better fulfil work requirements. In practical application the study's outcomes mean that, by working with the employee's confidence in themselves (investing in developing their skills), employers are able to also achieve an increase in engagement.

6. CONCLUSION

1. The definition **employee engagement** is both behavioural and psychological and can be a result of both the external influence and the employee's initiative and intrinsic motivation. Engagement must be differentiated from term "job involvement" that is a result of the external or organisation's influence and is related to behaviour only.

2. *Employee engagement* should be viewed holistically as the employee's psychological state in connection with their expression of behaviour, integrating both attitudes and behavioural components. *Engagement* is manifested when the employee is feeling fulfilment with work, is absorbed in work role, puts in more effort and devotes more energy to help the organisation to achieve better results.

3. *Employee engagement* integrates similar concepts of work attitude: job involvement, satisfaction with work and commitment to an organisation, but is different from them as it reflects energetic actions, not only the feeling of satisfaction that is characteristic to satisfaction with work. Employee involvement is a result of the influence of the organisation's management and is related to behaviour or motivation only, and it can also exist without internal motivation; commitment more related to the extra-role behaviour.

4. *Employee engagement* is connected with adaptive behaviour. The study confirms the hypothesis that the level of *employee engagement* can be affected. It means that *engagement* can be a management subject matter, the aim of which is to focus on achieving or exceeding

the organisation's results. Primarily, *employee engagement* is directed to in-job-role activities, or to the key work tasks of employees. But an *engaged* employee also manifests active extra-job-role behaviour, for example, behaviour supporting the organisation that is expressed as activities outside the primary field of responsibility, e.g. company's advocating, reputation driving and recommending as a good employer (net promoter score). *Employee engagement* is a factor that can be influenced, and the telecommunications industry's company management possesses the resources and knowledge that can help facilitate their *employees' engagement*.

5. *Employee engagement* influences commitment, or loyalty, to an organisation. In the regression model, *engagement* explains almost 70% of the changes in the behaviour of a motivated work behaviour and organisation-supporting employee ($R = 0.805$; $R^2 = 0.648$; $\text{adj}R^2 = 0.648$). Furthermore, if the *engagement* rating is improved by one unit, it is expected that the behaviour rating would grow by 0.8 units on average. Motivation, organisation-supporting behaviour is characterised by six inter-correlating variables; thus, if the organisation's management stimulates any of them (e.g. my company inspires me to work with full return), extra-role factors such as recommending the organisation as a good employer or voluntary praising of the company will also be promoted. *Employee engagement* is source of internal motivation and an employee's readiness to put in efforts to help the organisation achieve more, and it results in organisation-supporting behaviour.

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THE READINESS OF THE LABOUR MARKET IN THE CZECH REPUBLIC FOR INDUSTRY 4.0

Vojtěch KOŘEN²⁵

Abstract: *Dynamic development of automation and digitalization significantly affects not only new forms of production and services, but above all the whole society. Changes in the nature of work, its organization and its forms naturally affect the execution of specific types of qualifications and competencies. This leads to changes in demand on the labour market and in connection with its potential also to changes in the location and the cost of human labour. Societal impacts can be traced in the fields of employment, legislation, tax policy, and content and form of education. The aim of this paper is to present the outputs of selected statistical data analysis of the labour market in the Czech Republic in the context of the results of the OECD study “Job Creation and Local Economic Development 2018: Preparing for the Future of Work” published in Paris 18 September 2018.*

Key words: 4th industrial revolution, labour market, Industry 4.0, human capital, employment

JEL Classification: E24, J24, J31, J62, O33

INTRODUCTION

Industry 4.0 is a popular buzzword for high level of automation and digitalization. This term is often referred to as the Fourth Industrial Revolution (Schwab, 2016). Probably the most influential factor of industrial and consequently socio-cultural changes is development of technologies (Reich, 2002). Our current ability to use energetical resources, transport and communicational infrastructure and information sharing is enormous. Nevertheless, industry 4.0 is only one part of this issue. Dynamic evolution of technologies creates essential influence on dynamization of society evolution. It has natural impact on labour market, structure of qualification needs and growing importance of new kinds of responsibilities and competencies (Schwab, 2016). The importance of optimal human capital conditions grows rapidly. The impact of this issue includes more than one topic.

The nature of work is rapidly changing. Technological progress and automation represent an opportunity to boost labour productivity and create flexible working conditions that better suit worker needs in all places—from cities to rural areas (Kamal-Chaoui, 2018, p.3).

It is necessary to recall that this situation is not everywhere at the same level. The status of specific regions is the indiscriminate level and focus of industrialization, the level of infrastructure, and naturally also the level of education, competencies and opportunities for their development (OECD, 2018). Finally, it is also important not to neglect the significant influence of the level, structure and focus of public and private investment in automatization and digitalization.

Indeed, the challenges and opportunities generated by greater use of technology in the workplace are not equally distributed across places. Within the same country, some regions will be more exposed than others to the risk of job automation because of their economic structure and the skills of their workers (Kamal-Chaoui, 2018, p.3).

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The question we do not yet have a satisfactory answer to is whether advanced automation and digitalization will reduce the number of available jobs, or just transform the traditional professions into the new "digital" professions (Kamal-Chaoui, 2018, p.3). Another issue which is closely linked with this theme is the impact of these changes into society, educational policy and systems, employment forms and employment relations, social welfare and law framework.

Technological innovations such as automation and digitalisation drive productivity growth, increase revenues, generate new jobs and thus can contribute to better living standards. But will this new future of work bridge or increase divides among people? Which workers will be replaced by robots and artificial intelligence? How can workers adapt and take advantage of technology? And, how will these changes occur in different places? (OECD, 2018, p. 19)

The majority of studies nowadays which are linked with work-force analyses describe mostly changes of qualification needs. However, the age of automation and digitalization also affects the labour market in other issues. It is possible to identify the growing importance in areas of non-traditional forms of employment (temporary placement, shared working places, self-employment, virtual work), increase of life-long learning importance, structural unemployment, unequal distribution of job opportunities etc. This article aims to draw attention to three related issues:

1. Opportunities and Risks of Automation and Digitalization in OECD Research Contexts
2. Potential of current Czech Labour market structure
3. Changes of human capital cost and value

The first topic will be presented through the conclusions of the report "Job Creation and Local Economic Development Report 2018: Preparing for the Future of Work" (OECD, 2018). For an introduction of the second and third topic, published data of a researching agency focused on Czech labour market²⁶ will be used. It is a company where the author of this paper is employed. Also the published data from national information systems (Average earnings information system²⁷, Czech statistical office²⁸) will be used.

Even though this paper is primarily concerned with the labour market situation in the Czech Republic, many findings can be transferred to other regions and situations.

²⁶ TREXIMA, spol. s r.o. is a private company engaged in research in the labour market. It is a partner organization of the Czech Ministry of Labour and Social Affairs, the Ministry of Education of Youth and Physical Education, the Czech Statistical Office and a number of regional offices in the Czech Republic.; www.trexima.cz

²⁷ Public statistical information system about earnings in the Czech Republic provided by Czech Ministry of Labour and Social Affairs; www.ispv.cz,

²⁸ Czech statistical office; www.czso.cz

OPPORTUNITIES AND RISKS OF AUTOMATION AND DIGITALIZATION

The OECD published a report called “Job Creation and Local Economic Development: Preparing for the Future of Work” in September 2018 (OECD, 2018). This report is one of the outcomes of a long-term international research organized by OECD which is focused on changes of labour market. The main published topics which are linked with the topic of this paper are:

- The impact of technological progress on regional and local labour markets.
- Factors and influential determinants of non-traditional forms of employment.
- Productivity and inclusion at regional and local labour market levels.

Results from these areas are used as a background for introducing the impact of technological progress and automation on the Czech labour market.

The actual position of Czech labour market from the OECD point of view

The OECD report 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).

About 10% of workers across all regions are employed in the five “riskiest” occupations. Food preparation assistants, drivers and mobile plant operators, labourers in mining, construction, manufacturing and transport, machine operators, and refuse collectors face a particularly high risk of automation (OECD, 2018, p. 47).

Figure 1: Percentage of jobs at high risk of automation, highest and lowest performing TL2 regions, by country, 2016 (OECD, 2018, p. 45)

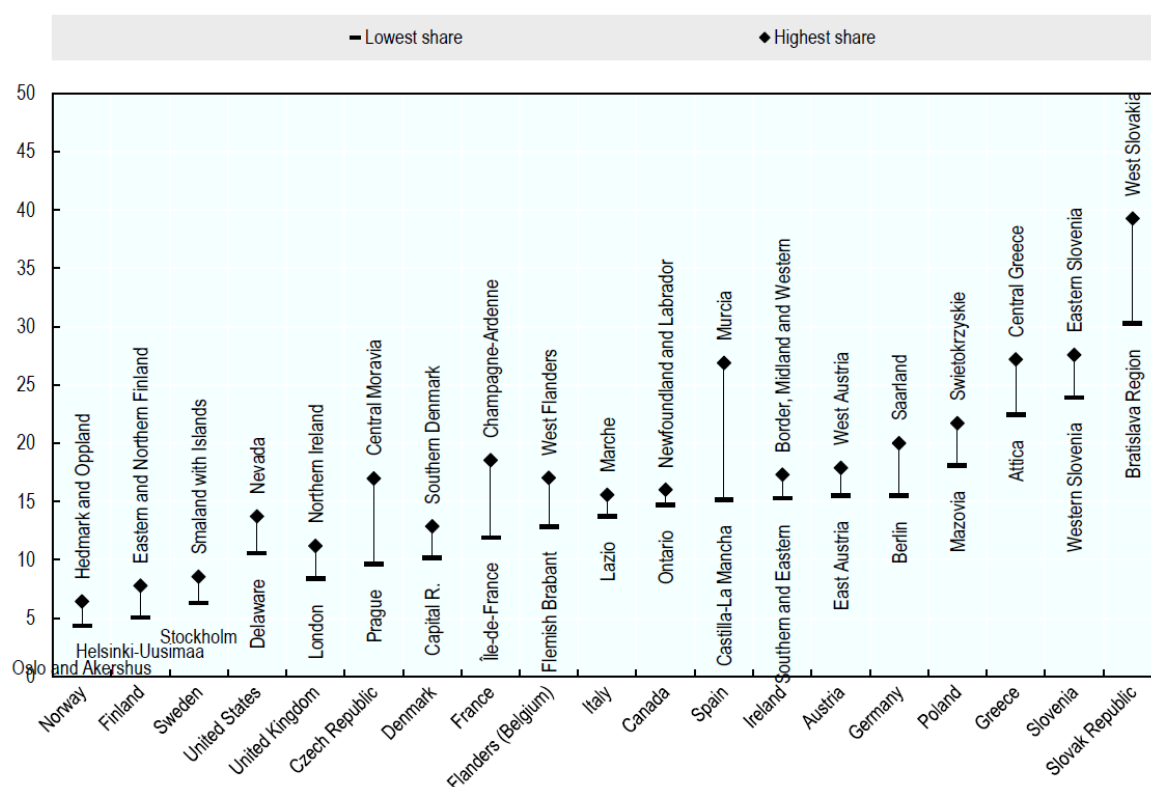


Figure shows the regional disparities in the share of jobs at risk of automation. It displays the region with the highest and lowest share in each analyzed country (OECD, 2018, p. 45).

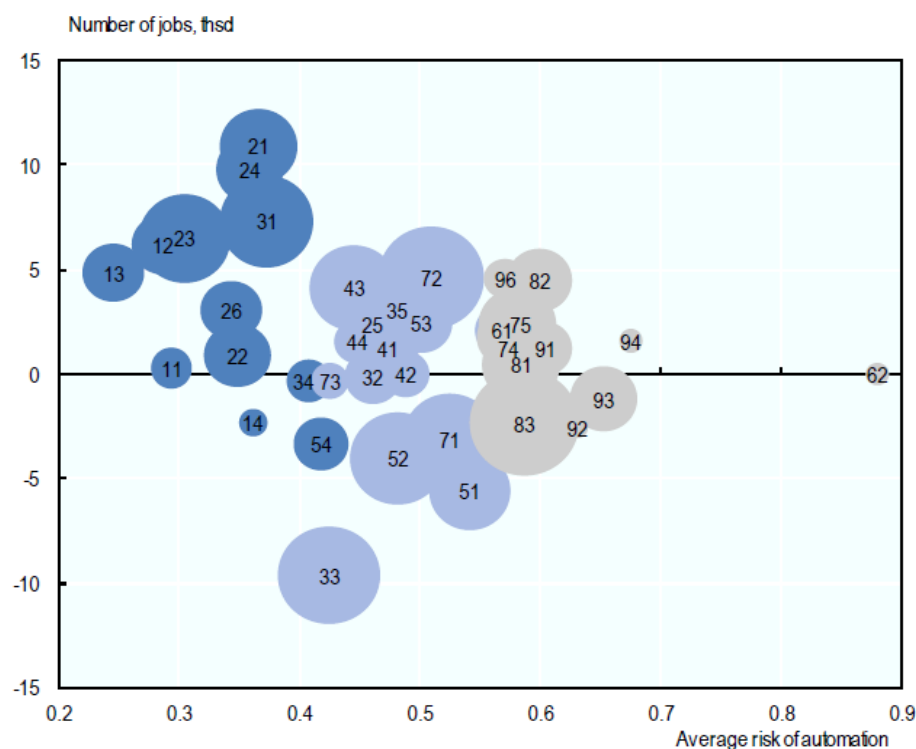
In the Czech Republic, of course, there are professions that are threatened by automation and digitalization (for example: accountants, manipulators, routine operators), but the overall level of regional threat compared to other OECD countries is not bad.

Frey and Osborne (Frey, 2017) define professions which are safe from the automation as professions where it is necessary to have at least one of the following competencies (skill required to perform the job):

- a) Perception and manipulation in unstructured processes
- b) Creativity (generating novelty, artistic creation)
- c) Social intelligence (necessary for successful negotiation, persuasion, caring for others)

Based on the results of their research it can be deduced that workplaces in social and health services (nursing, counselling) are less at risk. Very threatened are professions in production with a simple working algorithm with unambiguously definable procedures, but also those professions whose jobs can be replaced by software solutions (accounting, administration) (OECD, 2018). Similar situation is for professions in management, design, science, development, education, services, counselling. Despite the promising results of artificial intelligence, it is still not possible to replace complex work algorithms and heuristic strategies for solutions in these professions by automation.

Figure 2: Job creation by risk of automation, selected regions, 2011-16, Czech Republic
(OECD, 2018, p. 72)



The figure 02 shows the result of the research which was focused on threatening of position²⁹ by automation in the Czech Republic. The horizontal dimension demonstrates the

²⁹ The numeric codes in the chart and in the accompanying text refer to the main groups of professions according to the ISCO. The International Standard Classification of jobs (ISCO) is an International Labour Organization (ILO) classification structure for organizing information on labour and jobs. Occupations (code indicated in the bubble) are ranked from low to high risk of automation along the horizontal axis. Changes in the number of jobs

level of risk for professions and the vertical dimension show the level of growth of professions (number of position in the profession).

The growth of employment in the Czech Republic was mainly driven by jobs in occupations at low risk of automation (e.g., Science and Engineering Professionals (21), Teaching professionals (23), and Business and Administration Professionals (24)) (OECD, 2018).

Only three out of 12 vulnerable groups experienced a drop in working places.

- Drivers and mobile plant operators (83)
- Agricultural, forestry and fishery labourers (92)
- Labourers in mining, construction, manufacturing and transport (93)

The question is to what extent is the expected decline related to the deficient automation. For categories 83 and 92, the human resource needs are reduced gradually by automation. However, for category 93 only partly. The decline in jobs may be due to a decline in production in the industry segment.

The potentially dangerous tendencies on Czech labour market

Vulnerable groups where the number of jobs has risen or at least stagnated (OECD, 2018):

- Market-oriented skilled agricultural workers (61)
- Market-oriented skilled forestry, fishery and hunting workers (62)
- Electrical and electronic trades workers (74)
- Food processing, wood working, garment and other craft and related trades workers (75)
- Stationary plant and machine operators (81)
- Assemblers (82)
- Cleaners and helpers (91)
- Food preparation assistants (94)
- Refuse workers and other elementary workers (96)

The labour market in the Czech Republic is currently facing a shortage of labour. This is due, on one hand, to huge investments in production capacities and the creation of new jobs and, on the other hand, the stagnation of population growth and labour market constraints for the entry of foreign workers. The development of automation and digitalization can potentially contribute to solving this problem.

Automation may be considered much more of an opportunity in a place that has an aging population and faces a shortage of workers than in a place that has a high birth rate with many young people entering the labour market in search of jobs (OECD, 2018, p. 27).

However, low unemployment and the aging population are only one important factor. Other factors that affect the risks of automation and digitalization in the OECD report are: the structure of the professions, the distribution of the workforce and the level and focus of education.

Regions with smaller risk of automation are characterised by a larger share of workers with tertiary education, a larger proportion of jobs in services, and are highly urbanised (OECD, 2018, p. 26).

For the third consecutive year, the Czech Republic has the lowest unemployment rate in the European Union (EUROSTAT, 2018). Due to labour shortages, employers are putting

for each occupation are reported along the vertical axis. Bubble size represents the share of jobs in the occupation with respect to total employment in the region. Source: Calculations based on EU Labour Force survey (OECD, 2018). **StatLink:** <https://doi.org/10.1787/888933827270>

pressure on immigration and education policies to address their problems. However, there is a demand mainly for low-skilled workers and routine machine and equipment operators (TREXIMA, 2017).

Demand for labour is driven mainly by rising demand for professions requiring lower levels of qualifications, almost 2/3 of vacancies reported do not require employers to have higher education than basic education (MPSV, 2018).

The median of income in the Czech Republic between 2017 and 2018 in category machine and equipment operator increased more than 9%. This also corresponds significantly to the current demand (ISPV, 2018). All this causes a slow but certain tendency towards targeting.

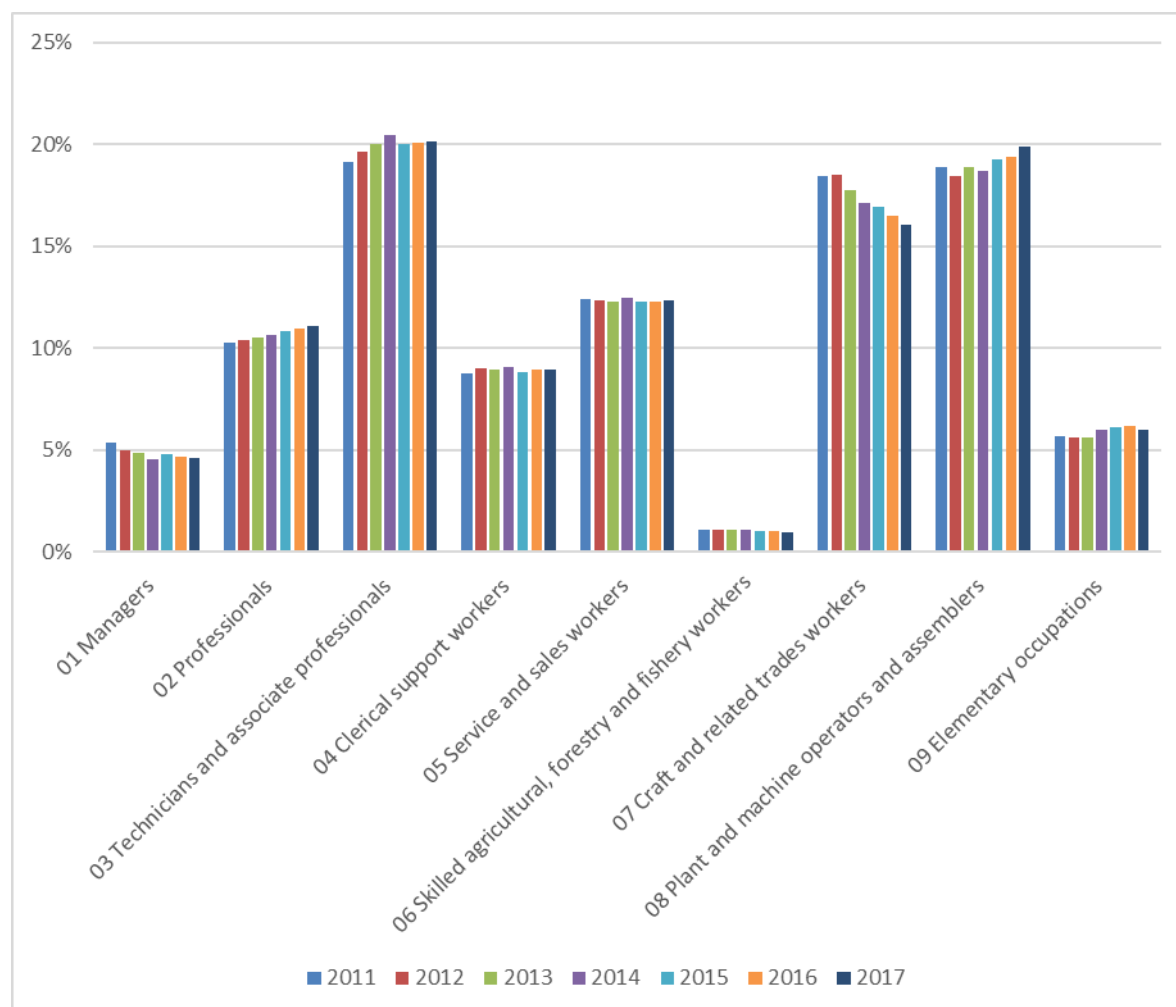
Technological progress is rapidly changing the nature of work across the world. It creates new job opportunities and is benefitting consumers. It improves the quality of products while reducing their price and leads to new and innovative products. However, technological progress also threatens established business models and can lead to job losses because it allows the automation of tasks that previously had to be done by manual labour. (OECD, 2018, p. 27)

The number of graduates who go to work directly after high school without continuing in tertiary education is growing. According to a survey conducted in five regions in the Czech Republic, 33% of graduates are going to work after completing their secondary education. In 2014, it was only 15% (TREXIMA, 2018). If this trend continues, there is a realistic possibility that the percentage of jobs and workers themselves threatened by automation and digitalization will rise.

POTENTIAL OF CURRENT CZECH LABOUR MARKET STRUCTURE

An important precondition for future employability in the labour market is, among other things, its absorption potential, labour market share of significant groups of professions and last but not least the qualification background of people on the market.

Figure 3: Share of main professions in the private employment sector of the Czech Republic³⁰



It is useful to consider the information shown in figure 03 in the context of figure 02 (Job creation by risk of automation) which is inserted in part 2.1 of this paper.

Major group 01 Managers

Labour market share of Managers (the major group of ISCO no.: 01) is around 5%. The whole group 01 includes: Chief executives, senior officials and legislators, Administrative and commercial managers, Production and specialized services managers, Hospitality, retail and other services managers.

In this group, a slightly downward tendency of share can be traced. Only subcategory 12 (Administrative and commercial managers) showed the potential to grow in the past as seen on figure 02 (Job creation by risk of automation). The likelihood that the 5% share threshold will exceed significantly is not too high.

³⁰ The share is calculated from the number of employees registered on The Public statistical information system about earnings in the Czech Republic ONLINE: www.ispv.cz

Major group 02 Professionals

Labour market share of Professionals (the major group of ISCO no.: 02) is around 11%. There (in figure 03) can be seen a slightly increasing tendency. Its share (around 11%) is certainly not negligible and, moreover, had an increasing tendency. The OECD considers (not only within the Czech Republic) this group as the least threatened by automation and digitalization (OECD, 2018).

The group 02: includes: Science and engineering professionals, Health professionals, Teaching professionals, Business and administration professionals Legal and social and cultural professionals. The biggest potential to grow could be seen in subcategory 21 (Science and engineering professionals), subcategory 24 (Business and administration professionals) and subcategory 23 (Teaching professionals).

Major group 03 Technicians and Associate Professionals

One of the most important group is Group 03 Technicians and Associate Professionals. This group includes: Science and engineering associate professionals, Health associate professionals, Business and administration associate professionals, Legal, social, cultural and related associate professionals, Information and communications technicians. Labour market share of Technicians and Associate Professionals (the major group of ISCO no.: 03) is around 20%. The growth of the group's share in the last three years is rather stagnant.

From the OECD report's point of view, only subcategory 31 (Science and engineering associate professionals) and 35 (Information and communications technicians) increased. However, the level of risk by automation of subcategory 35 is growing. This subcategory includes Software and applications developers and analysts and Database and network professionals. These professions are not threatened so much by automation but rather by digitalization and the extensive development of artificial intelligence.

The number of people in subcategory 33 (Business and administration associate professionals) decreased. One possible reason for job losses in this area is the secondary effect of automation and digitalization. Work performance itself has not disappeared, but it could be transferred into profession of others.

Major group 04 Clerical support workers

The number of jobs in this group of professions varied only marginally between 2011 and 2017. The average share of the labour market is still around 9%. Only subcategory 42 (Customer services clerks) stagnate. However, their automation and digitalization threat is substantially bigger than in previous cases (01-03). Nevertheless, the number of jobs in this area increased (see in figure 02).

The question is what will happen with this phenomenon in the future. Many activities are, as in the case of category 35 (Software and applications developers and analysts and Database and network professionals), substitutable by digitalization and, in addition, automation.

Major group 05 Service and sales workers

The number of jobs in this group of professions varied, similarly as in group 04 (clerical support workers), only marginally between 2011 and 2017. The average share of the labour market is still around 12%. The group 05 includes: Personal service workers, Sales workers, Personal care workers and Protective services workers.

In addition to subcategory 53 (Personal care workers), the number of jobs in this group increased, even though subcategory 54 (Protective services workers) is only incompletely

vulnerable to automation. The drop in the number of jobs in subcategory 52 (Sales workers) was probably affected by transition into self-service mode.

The drop in the number of jobs in subcategory 51 (Personal service workers) was probably affected by changes in the way in which their services are mediated in response to changes in other sectors.

Major group 06 Skilled agricultural, forestry and fishery workers

This group represents only 1% of jobs in the private sector in the Czech Republic. According to the OECD, it is the most threatened occupational area in terms of automation development. However, the number of working positions there stagnated. The possible reason is the small representation in the overall structure of employment. Massive investments in automation would not probably bring significant savings in the reduction of jobs in this sector in global numbers.

Major group 07 Craft and related trades workers

The number of working positions in this group has slowly dropped down. This group includes: Building and related trades workers, excluding electricians (subcategory 71), Metal, machinery and related trades workers (subcategory 72), Handicraft and printing workers (subcategory 73), Electrical and electronic trades workers (subcategory 74) and Food processing, wood working, garment and other craft and related trades workers (subcategory 75). Total group 07 represented almost 16% of jobs in the private sector in the Czech Republic.

Work positions in this group are in the mid-range of automation threats. In addition to subcategory 71 (Building and related trades workers, excluding electricians), there is no fall in the number of jobs in this sector and the decreasing number of work positions in subcategory 71 is not significant. Nonetheless, the future investment into the technologies could probably change this trend very quickly.

Major group 08 Plant and machine operators and assemblers

This group, thanks in particular to its strong job growth, is the most prominent group of professions. At present, it represents about 20% of working place in the private sector of the Czech Republic. In terms of automation, however, this category of occupation is the third most vulnerable group (OECD, 2018). The group 08 includes: Stationary plant and machine operators (subcategory 81), Assemblers (subcategory 82), Drivers and mobile plant operators (subcategory 83).

It is only in category 83 (Drivers and mobile plant operators) where the number of working positions decreased. One reason is the increasing level of automation in logistics centres and bulk transport. However, it may be assumed that in the event of further wage growth for workers in these professions, employers' interest in investment in technologies will gradually increase in the future, which will gradually eliminate these working places.

Major group 09 Elementary occupations

According to the results of the OECD survey, it is probably the most vulnerable group in terms of automation. This group includes: Cleaners and helpers (subcategory 91), Agricultural, forestry and fishery labourers (subcategory 92), Labourers in mining, construction, manufacturing and transport (subcategory 93), Food preparation assistants (subcategory 94), Street and related sales and service workers (subcategory 95) and Refuse workers and other elementary workers (subcategory 96).

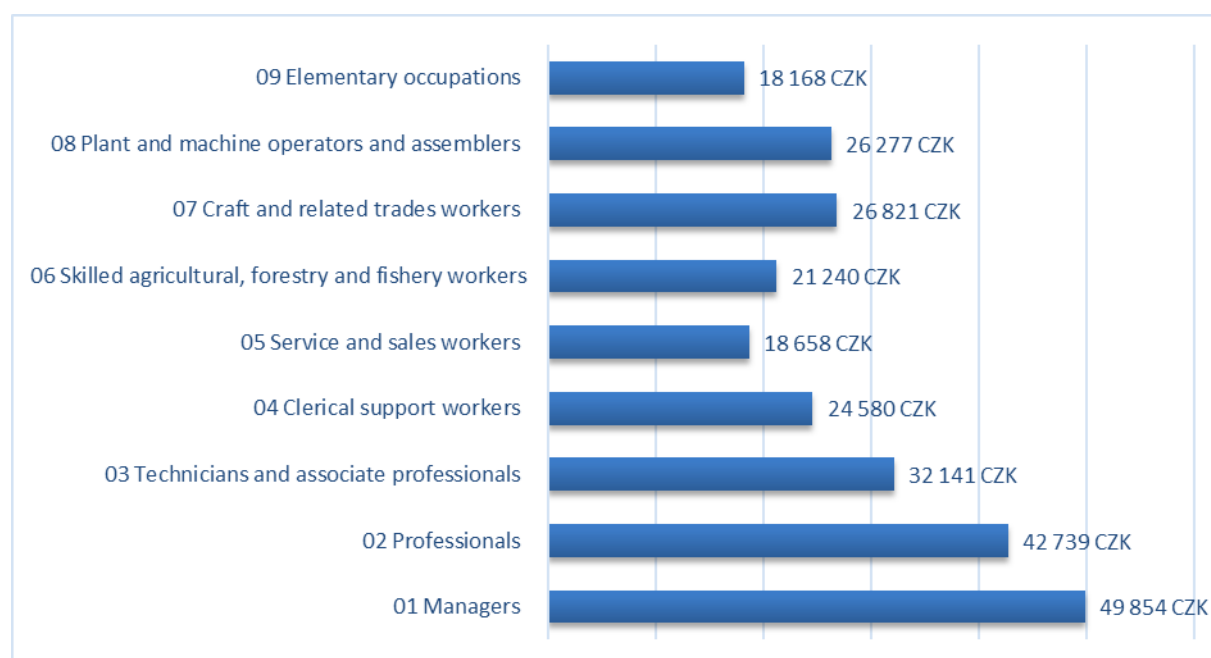
Total labour market share of this group is around 6%. According to the results of the OECD survey, the most vulnerable group of professions in this category is the group 94 (Food preparation assistants) and 93 (Labourers in mining, construction, manufacturing and transport).

The biggest grow of number of working places in subcategory 96 (in group 09) is probably due to the growing interest in low-skilled human work, which is still cheaper than technology replacement.

CHANGES OF HUMAN CAPITAL VALUE

Automation and digitalization is likely to affect not only qualification needs but also the value of work itself. Human capital, along with qualitative change, will also change its market value. Increasing pressure on new job competencies will also increase their value and therefore the cost of work.

Figure 4: Monthly earnings median in the first half of 2018 ³¹

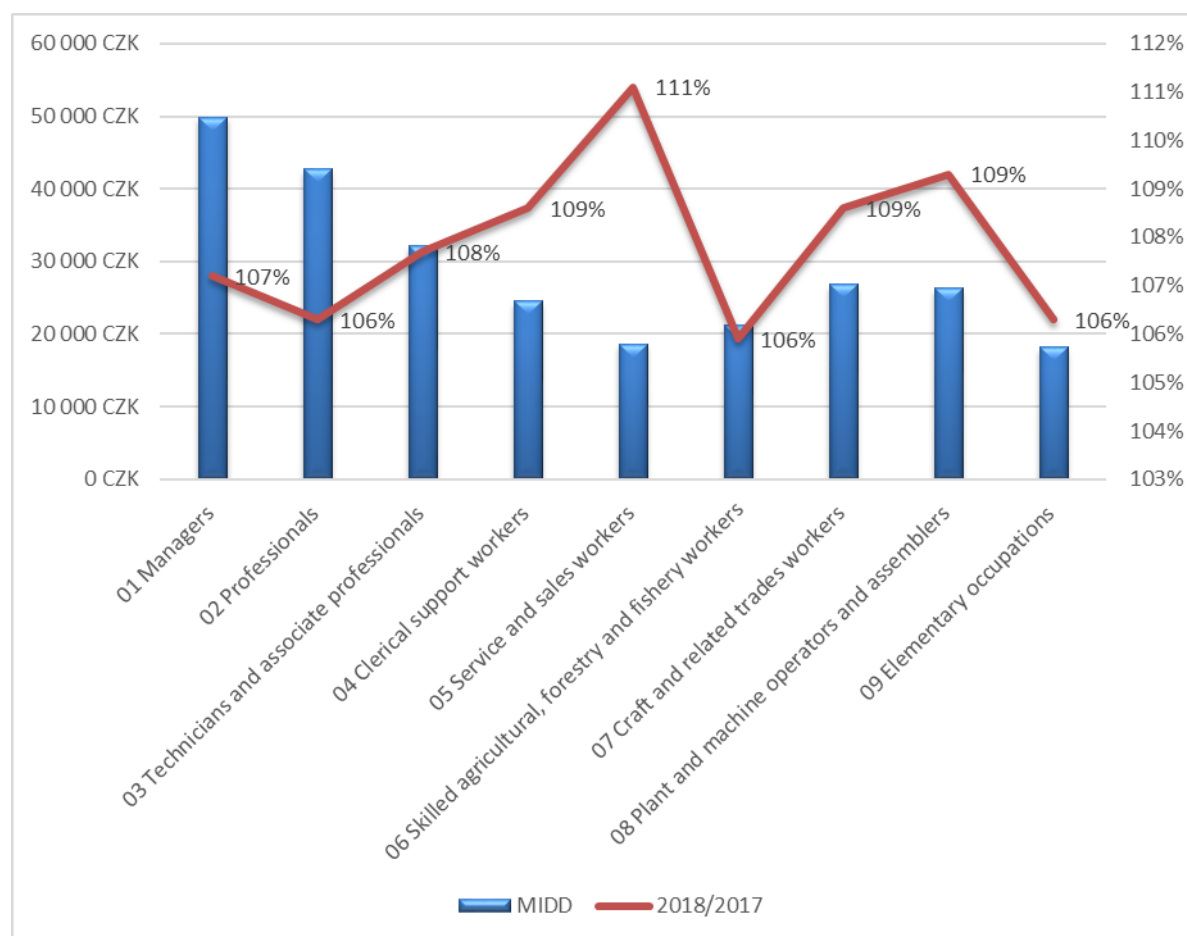


According to the results of the OECD survey (figure 02), the largest increase was in the number of jobs is in the group 02 (Professionals) and partly 03 (Technicians and associate professionals). In this case, the number of jobs increased in two of the three best paid categories.

³¹ For figure 4 data from the information system about earnings was used (ISPV, 2018)

In spite of the fact that earnings in the Czech Republic grow relatively dynamically in almost all categories, wages in the most vulnerable categories, with the exception of category 01 and 02, are in the average lower.

Figure 5: Monthly earnings median in the first half of 2018 and its increase compared to 2017 ³²



Unfortunately, the probability of smoothly moving workers from highly vulnerable occupational categories (06, 08, 09 and partly 07) into categories that do not suffer so much (01, 02 and partly 03 and 04) is not too high. The educational background and professional skills are significantly different (OECD, 2018). People in vulnerable groups are at greater risk of automating their work. Their earnings are, on average, lower than those in unprotected professions. Their ability to manage the transition to industry 4.0 is therefore limited by both their skills and their social capabilities.

While technology, such as automation and artificial intelligence, could increase labour productivity for many jobs it can also pose a challenge for inclusion. Some groups may be increasingly excluded from the labour market or suffer from low-wage jobs and nonstandard work. Effective policies to integrate disadvantaged groups in the labour market and ensure access to quality jobs will be critical for social cohesion and to reduce inequalities among people (OECD, 2018, p. 132)

The changing expectations in terms of qualifications, competencies, flexibility, mobility, digital literacy and deepening specialized fragmentation are not only challenges for the workforce, but also for employers, legislators and national and transnational policies.

³² For figure 4 data from the information system about earnings was used (ISPV, 2018)

CONCLUSION

The OECD report 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 performance can be replaced by software solutions (accounting, administration) are threatened more. On the other hand, there are jobs that do not require high qualifications, yet they are not easy to be substituted artificially.

The OECD identified 13 working position groups in the Czech Republic that are threatened by automation, but only three of them decreased in the past. The question is whether people in the remaining groups are at risk of losing their jobs. The level of automation and digitalization options in these fields is important, but not the only, risk factor.

The cost of human labor itself in terms of the amount of investment needed for automation has a significant impact on the level of threat to individual occupations. The key condition for automation is the availability of people who will have the skills to work with technologies and work in an automated environment.

Another important prerequisite for automation is the existence of desirable knowledge and skills of the workforce. People who do not have the necessary skills are at risk of social exclusion. Organizations without skilled human resources will not be able to make full use of the automation potential.

The availability of manpower is not influenced only by its existence but also by mobility. Not all positions can be realised virtually. Although the threat to automation in the Czech Republic is not essential, compared to other OECD countries, it exists here as well. There are also risky regions (for example Moravia-Silesia), where automation is likely to reduce job opportunities in the Czech Republic. However, the usability of available human capital from these regions is likely to be small (inadequate competencies, low mobility).

Automation is not a process that takes place in isolation. It occurs during a time in which socio-economic disparities and differences in labour market outcomes across regions have been increasing. Policy makers need to take this broader picture into account when developing policies to respond to automation

While education and lifelong learning is an important component of any policy response to automation, it should not be the only element. Policy makers at regional and local levels also need to implement policies to help firms grow to foster the demand for jobs (OECD, 2018, p. 62).

Public policies on education, employment and support for industry and employers must be part of a single compendium. The role of schools is to prepare society (by educating the current young population) primarily for challenges in the future, therefore we cannot demand that they will be focused only on qualifications which labour market needs today. We should not support the growth of jobs that will be replaced in the future by automation. It is better to create the right conditions to successfully master the changes that the Industrial Revolution 4.0 is likely to bring. In its report, the OECD “*Job Creation and Local Economic Development 2018: Preparing for the Future of Work*” published in Paris 18 September 2018, brings a number of potentially useful strategies.

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PERSPECTIVES OF LABOR MARKET FORMATION IN CONDITIONS OF POST-INDUSTRIAL SOCIETY (INDUSTRY 4.0)

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Abstract: *In this article are out an analysis of the existing material on the development of the modern economy "Industry 4.0", the main principles of its construction, the benefits of permeation of digital technologies in all spheres of life and new problems associated with it. Outlined the results of scientific and technological progress, which form the basis of Industry 4.0, the principles of state regulation of labor relations in the conditions of postindustrial society are highlighted. On the basis of the analysis, the conclusion is made of the possibility of Ukraine to take a worthy place among the leaders of the new concept of economic development under the condition of close cooperation between the state, science, education and business.*

Key words: *postindustrial society, principles of building industry 4.0, labor relations, labor market.*

JEL Classification: O15, O31, O32

The theory of post-industrial society [1] highlights the first realization of the capabilities of an industrial society. According to this theory (D. Bell, A. Turin et al.), Industrial society (as a result of scientific and technological progress) grows into a post-industrial society characterized by the dominant role of the sphere of services, the transition of power to scientists and technocrats.

At the time of the post-industrial society, based on new technologies (mainly microelectronics), a sharp increase in output is being made; the transition from commodity to service economy takes place, elements of planning and control over technological changes are introduced.

In the social structure of such a society, the number of people involved in the service sector is growing, new layers (technocrats, scientist, technical specialists) that form part of the senior management functionaries are formed, and the leading role in the life of society is given to technicians and technicians as the basis of modern industrial production. At the heart of the world outlook of these strata of people is the scientific notion of scientific knowledge as a higher cultural value and sufficient condition of orientation of the individual in the world.

Distinguished in the history of mankind, three phases (pre-industrial, industrial and post-industrial), Daniel Bell described the features of a post-industrial society: the transformation of the value of various economic sectors, the domination of the service sector (administration, banks, transport, health, trade, education, science, art, etc.) with the decline of the industrial sector and the limitation of the value of the agricultural sector; change of the prevailing technology, the transition from energy technology to information (the emergence of robots, the development of communications); increase in the importance of planning, forecasting development, technology control; the dominance of pragmatic and technological criteria in reducing the role of ideological and ethical criteria; the flowering of "intellectual technology", that is, the purposeful use of science for the needs of practice; the transformation of the class

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structure, the nomination as a dominant non-class of owners, and a class of highly skilled professionals (economists, engineers, managers).

The term "Industry 4.0" [2] appeared in Europe in 2011 as well. At one of the industrial exhibitions in Hanover, the German government spoke about the need for wider application of information technology in production. A specially created group of officials and professionals has developed a strategy to turn the country's manufacturing companies into "smart" ones. This example is followed by other countries that are actively mastering new technologies. And the term "Industry 4.0" began to be used as a synonym for the fourth industrial revolution. Its essence lies in the fact that the material world today merges with the virtual, resulting in the creation of new cyber-physics complexes, which are combined into a single digital ecosystem. Robotic production and "smart" factories are one of the components of the transformed industry.

The fourth industrial revolution means more and more automation and robotization of all processes and stages of production: from digital designing of a product, creation of its virtual copy - to the remote setting up of equipment at the plant in accordance with the technical requirements for the release of this particular "smart" product. The manufacturer automatically orders the necessary components in the right quantity, controls their delivery, has the ability to track the way of the finished product from the warehouse to the factory and the store to the end customer. But after the sale, the company does not forget about its product, as it used to be in the classic model, but controls the terms of its use, can remotely change the settings, update the software, warn the customer about a possible malfunction, and at the end of the use cycle - take the product for disposal.

So, now they produce anything - from "smart" dummies and pans to smartphones and automated space shuttles. A few years ago, Apple began a program for processing old iPhone: the work disassembles them, removes the most valuable parts, which are then reused, and everything else is utilized, besides with minimal harm to the environment. The concept of "Industry 4.0" is often depicted in the form of a mathematical sign of infinite - it illustrates this endless cycle of interaction between the manufacturer and the product and the client.

Representatives of the German government formulated several basic principles for building "Industry 4.0", according to which companies can implement scenarios of the fourth industrial revolution in their enterprises.

The first principle is compatibility, which means the ability of machines, devices, sensors and people to interact with each other through Internet (IoT).

The second principle is transparency, which appears as a result of the interaction of mechanisms and people. In the virtual world, a digital copy of real objects, systems, functions, which exactly repeats what is happening to its physical clone, is created. As a result, the most comprehensive information is gathered about all the processes that occur with the equipment, "smart" products, production in general, and so on. To do this, you need to ensure that all of these sensor and sensor data are collected, as well as the context in which they are generated.

The third principle of "Industry 4.0" is technical support. Computer systems help people make decisions by collecting, analyzing and visualizing all of the information mentioned above. This support may also be a complete replacement of people by machines when performing hazardous or routine operations.

The fourth principle is the detailing of managerial decisions, the delegation of some of them to cyber-physics systems. The idea is that automation should be as complete as it is possible at all: everywhere, where the machine can work efficiently without human intervention, sooner or later it must be replaced by a machine. Employees are assigned the role of controllers who can join in emergency situations.

The transition of industry to these principles is accompanied by changes in business models. Instead of focusing on cost-effective manufacturing, companies are committed to introducing customized mass-produced products based on Agile's principle and are moving

into batches of the size of a single product. This saves the principle of economy: robotic production is more energy efficient, it is accompanied by less waste and shortage.

The idea is to make automation as complete as possible. Employees at the same time carry out the role of controllers.

The transformation of the productive sector is a revolution, since the changes are not superficial, but radical: the industry is rearranged from top to bottom. At the same time, business models are changing, new companies are born, and world famous brands with a long history simply disappear if they do not have time to enter the ranks of digital revolutionaries. Therefore, customers change their behavior, they want an individual approach and unique goods.

The representatives of the generation of so-called native digital, which grew up in the era of the Internet, are accustomed to the fact that they have opened a whole world of proposals: millions of print options for T-shirts, all shades of jeans, whatever the technology and furniture at a distance of one click. They try to emphasize their individual peculiarities and express their mood.

Enterprises accustomed to producing the same things have to improve. A number of benefits that have been gained as a result of the introduction of the industry 4.0 principles were not available in traditional models of the past. Loyalty of companies is rapidly increasing as a result of an individual approach and personalized and customized orders according to personal preferences of clients. Existing factories and factories turn into "smart" companies, which begin to produce unique products on an individual order. At the same time, the specific unit costs of production are reduced, they are able to produce a unique personalized product at the price of a mass standardized product.

By individual order, different things can be produced, starting with smartphones and ending with spacecraft, and in general anything. The Fujitsu Siemens plant in the German city of Augsburg produces computer systems and servers literally in one copy for a specific customer.

Costs for the production of individual products at an enterprise with a high level of automation are small, as the computer system in seconds adjusts the equipment for a specific customer. The robotizing of Tesla's electric-vehicle plants allowed the company to expand its production not in China, but in California. It turned out to be cheaper than paying for the work of Chinese workers and transporting ready-made cars. The fourth industrial revolution not only changes the business of individual companies - it affects the alignment of forces at the global level. The Tesla car manufacturer (founded in 2008) was able to overtake the capital of the leader of the second industrial revolution, Ford Motors.

Issues of Industry 4.0 in Ukraine are of considerable interest in the article [3]. About the new world trends, bearing modern information and communication technologies speak all the time and for a long time. The last decade sounds like Smart or Digital Factory and Digitalization (all and all). Where's Digital Economy. In the United States, which are the largest innovators in the world, everyone is talking about technology such as IOT, Big Data, Cloud computing, Remote & mobile access, wireless communication, 3D printing, etc.

In the article [3] it is noted that "Digitalization- as the penetration of digital technologies, automation and IT at all levels of life and economy began in the last century, and received the name of technological style 3.0. And it continues to this day. But the fact that in recent years the Germans and Americans have brought in a completely new one is a certain rethinking of how companies are doing business. The horizontal and vertical integration of IT, the combination of different technologies, the creation of new cyber-systems and artificial intelligence changes the business models and ways of doing business. It's interesting to observe how the global ratings of the world are migrating - in recent years, in the top ten richest, we see the full domination of software and service companies - and not those who produce oil, gas or metal. Although that's how it was a few years ago. "

Klaus Schwab, founder and chairman of the World Economic Forum in Geneva, published an interesting article titled "The 4th Industrial Revolution - What It Means and How to Answer". In it, he is available tells about the benefits of mass digitalization, as well as new challenges. Briefly cite the benefits in understanding Klaus Schwab and why they are not a continuation of the "3rd Revolution":

"An unprecedented (exponentially, not linear) innovation growth - with regard to their speed, volume and impact. This will greatly improve efficiency, productivity and cost savings.

The unprecedented growth of data and the possibilities of their use for new technologies already makes it easier to attract different layers of developers-users-clients and promote development in many respects.

Artificial intelligence becomes a reality - concrete examples we already see - from mass robotics and to biotechnology. All together, it will contribute to the growth of world wealth and the reduction of inequality between developed countries and others. "

According to article [3], the advantages of new technologies are:

1. Cheaper and faster integration - horizontal and vertical. This is precisely what is missing today for full control and improvement of the efficiency of Ukrainian enterprises;

2. Replacing traditional server technologies with clouds also reduces the cost of solutions and maintenance of control systems;

3. Creation and development for integrators and vendors of new niche segments and corresponding decisions;

4. Significant growth of certain traditional segments - for example, everything related to german automation should be smart. Other experts and sources clearly indicate how industrial digitalization will occur - precisely because of the mass implementation of smart devices (smart devices);

5. Accelerating the development of the market participants ACS TP: today, we are open source talking about the conservatism of our vendors and integrators (and then, respectively, and customers). Trends 4.0, rapprochement and healthy competition with IT will give a powerful boost to our market;

6. As a continuation of the previous one, it will bring new, more competitive players to the arena, as well as promote the development of export potential and domestic producers;

7. These trends will also unequivocally accelerate the reform of the education system: just as businesses look at IT as a model for imitation in the agile field, our ZOOs and educational service providers also understand that we need to reorient ourselves to on-line and interactive learning.

At the same time, new trends bring with it new challenges. Klaus Schwab writes the following: "There is a lot of fears about unemployment and the distribution of world wealth - poorer countries can still become poorer, but rich countries can expect significant upheaval in connection with the massive rotation of productions."

Therefore, the great concern in the World Health Organization (WHO) is the increase in the number of mental illnesses.

In Europe, at least 5% of the population have serious psychiatric disorders (neuroses, functional psychosis), another 15% suffer from less serious but potentially disabling psychiatric disorders.

The number of suicides is increasing: they cause 15% of deaths among adolescents and young men aged 15 to 24 years old and 19% between 25 and 34 years old; in women, the proportion of suicides in these age groups is respectively 12 and 14%. The suicide rate in individuals aged 65 and over is higher than in other age groups. This problem will deepen along with the aging process. It is not for nothing that in 2018 the UK became Minister for Suicide Prevention.

The reasons for increasing the number of suicides are:

- stressful lifestyle in the modern world;

- weakening of family ties, which leads to a decrease in social support and an increase in social isolation;
- Unemployment for a long time;
- Increase in social violence, the manifestation of which is an increase in the number of rapes and deliberate killings.

Since the key factor in development is talent and professional staff, they are already washed away by rich countries. Also, wealthy countries at the level of property rights own all the new technologies. Accordingly, poor countries are already becoming raw material and human resources for the rich.

The threat of cyber security will grow - a lot of polls in the world point to managers' concerns about new threats of cyber attacks.

There are other threats, but in general, Klaus Schwab notes that the speed and benefits of the innovations that the Fourth Industrial Revolution, and the rate of growth of discontinuities and negative phenomena associated with it, are difficult to predict and understand to the end. One thing is clear: those who consciously approached and plan the necessary changes at the level of industries, state, and nation will win.

Many countries in the world have already started their way in the 4th industrial revolution. Platforms similar to the German Industrie 4.0 exist in different countries. States have long been, albeit with less government interference, developing the Digital direction in all areas. In Industrial Automation, their Industrial IoT Initiative (IIoT) has long united dozens of well-known brands in a consortium of the same name. And today they have teamed up with the Industrie 4.0 platform. France launched the The Industry of the Future initiative - and similarly to the Germans at the state level. It includes 34 initiatives aimed at various spheres of the country's economy. India and China have their powerful initiatives. Major conferences devoted to the 4th industrial revolution go all over Eastern Europe. Other neighbors, how Turkey has been holding this year's conference on the topic of the supply chain and attracting investors to their industrial parks within the framework of the European initiative of the Factory of the Future. Even Africa, on the site of the World Economic Forum, is devoted to a number of articles - some of the noisy statements "Africa should become the hub of the 4th Industrial Revolution." The authors are aware that demand, economic and social problems can be solved today much faster - for example, the problem of vaccination is already solved with the help of drones, mobile communication helps in other health care tasks, by passing timely necessary data about patients. But the main thing - Africa has the greatest potential for growth and in 2050 it will be the youngest continent in the world.

Taking into account the trends and pace of development of the leading countries of the world, Fast Future experts compiled a list of 20 new specialties that will arise in the next two decades:

1. Specialist in the production of organs. The development of science will make possible the production of living organs and even individual systems of the human body, so professionals in this field will need. This also includes professionals who will work in repositories and enterprises to repair damaged grafts.

2. Specialist in Nanomedicine. Achievements in the development of nanotechnology in the field of subatomic mechanisms and treatment methods will contribute to significant changes in health care, and will require specialists in the field of nanomedicine who will practice new treatment methods.

3. Specialists in the cultivation of genetically-modified crops and breeding livestock using genetic engineering. In the future, farmers will use methods of genetic engineering to increase the yield and production of proteins useful for human health. Scientists are already working on the cultivation of tomatoes with the vaccine and the receipt of therapeutic milk from cows, goats and sheep.

4. Wellness consultant for the elderly. The aging population of the planet requires specialists who will be able to help older people care for their health and well-being. In their

work such consultants will apply various methods of modern medicine and developments in the field of medicines, prosthetics, psychology, natural remedies, diet and fitness.

5. Surgeon to increase memory. A new specialization of surgeons whose role is to increase the resource of human memory. One of their main tasks will be to help those whose memory is literally "overloaded" and who can not learn new information.

6. Specialist in the ethics of "new science". With the development of cloning and other emerging areas of science, a new class of ethics experts will be needed to deal with these disciplines and help the public decide on whether or not to pursue certain developments. The question is not whether we can do this, but whether we should.

7. Astronauts, space guides and architects. Virgin Atlantic and other companies are already promising to develop space tourism, which may require space guides and pilots, as well as architects who will design an infrastructure for space. Among the current projects of the Sasakawa International Space Center for Space Architecture (SICSA) of Houston is the greenhouse on Mars, lunar outpost and space exploration.

8. Experts of vertical farms. By 2020, it will be possible to substantially increase the production of food through the construction of vertical farms in urban skyscrapers. Managers and employees of such enterprises must have knowledge in a range of disciplines, in particular in engineering science and commerce.

9. Specialist in combating climate change. When the effects of climate change are getting stronger, there is a need for engineers who will help to weaken or even turn negative effects. Among the technologies that they can use, for example, the installation of giant umbrellas reflecting sun rays and dropping of iron sawdust into the ocean (which should promote the proliferation of plankton and sea algae that will remove carbon dioxide from the atmosphere).

10. Specialist in quarantine. Many countries may not be prepared for the sudden and rapid spread of a deadly virus. There will not be enough medical personnel to solve problems. When the number of deaths will increase, and whole areas will have to be isolated, one has to monitor compliance with quarantine conditions.

11. Weather Police. The goal is to track and block possible unauthorized attempts to affect the weather. In particular, it concerns the practice of intercepting clouds to cause rain that affects other areas, even at a distance of millions of miles. The weather police should monitor who will be allowed to intervene in natural processes, for example, shooting clouds with silver iodide to cause precipitation.

12. A virtual lawyer. The Internet plays an ever-increasing role in everyday life, and in such circumstances, lawyers are in demand, which will resolve disputes between people from different countries and regions where different laws apply.

13. The avatars manager is a virtual teacher. In the process of studying at the elementary level, the teacher should come to the aid - or even to change - the intelligent avatars or computer characters who would act as the individual interactive assistant of the student. Follow the correct configuration and work avatars for students should special managers - curators.

14. Developers of alternative modes of transport. In the future, there will be a need for designers and manufacturers of new generation vehicles, for the production and operation of which alternative materials and fuel will be used.

15. Specialists in addressing (narrowcaster). As the content on television, radio and the Internet become more personalized, it will be necessary to attract professionals who will work with producers and advertisers on the creation of news, entertainment conferencing and information tailor-made for individual interests.

16. Specialist in disposing of unnecessary information. With the increase in the amount of information stored on computers, the task of quickly and reliably removing unnecessary data arrays is urgent, in order not to become a victim of unauthorized access and theft of personal information.

17. Specialist in organizing virtual space. Professionals in this area will help to organize the "electronic" side of the life of a modern person. They will be responsible for the efficient work of all applications and e-mail, on the orderly storage of data, and will manage the online profiles.

18. Time Broker (Time Bank Trader). A time bank is a mutual community in which any participant can earn time units by rendering service to another (eg, washing a car or walking a dog) and using it to pay for a service that the community performs in its favor. A broker is the organizer of operations on such a peculiar exchange.

19. Social worker in social networks. A social worker for those who can not integrate in the social network or suffered as a result of some difficulties in the virtual community.

20. Specialist in personal branding. It is planned to expand the role of stylists and image-makers of stars. Such a specialist will work on creating a personal "brand" of the client, using social networks and other means. In addition to creating an image in everyday life, his questions will include the "development" of individuality in blogs, social networks and other resources of the Network.

Ukraine is still determined. In a recent WEF report, it was not among the 43 countries that are the first beneficiaries of the 4th industrial. Although Russia, Kazakhstan and Poland are there. But it seems that the movement has gone. After the last Davos all rushed to flag 4.0 - IT, business schools and politics, as always, are the most dynamic. The Kyiv International Economic Forum, scheduled for October, will also be held under the slogan of the 4th industrial. But will they talk about specific things that are already needed by our industrialists? We doubt that even the latest iForum, the largest Internet forum in Ukraine, which already claimed a lot of these technologies, did not mention the Ukrainian industry in any way.

At the same time, 99% of the players in the market for industrial automation are simply "sleeping" - even large international brands present in Ukraine, do not know which side to approach the trends of 4.0 and if any. Meanwhile, large customers - the first innovators from our metallurgy and food industry - are already alarming - decisions on a number of new directions that are already needed - are not available in Ukraine.

It is also important to understand that in the context of Industry 4.0 we are talking about a set of factors driving modern production. Today, not only about other taxation or the conditions of attracting investments, not only about technoparks, but also about completely different things that are related to the culture of innovation, development and cooperation - all this is unlikely to be the case solely of parliamentarians.

Industrial production of the future is considered in work [4]. A group of scientists and specialists [5] outlined nine developments (outcomes) of scientific and technological progress, which form the basis of Industry 4.0, namely:

1. Large data and analysis (Big Data and Analytics) [6,7];
2. Autonomous Robots are works that are capable of performing tasks without human intervention [8];
3. Simulation, which industry 4.0 will actively engage not only in the stages of designing production business processes, separate new production equipment or new products, but also in the production process itself, for example, during the testing and adjustment of equipment, etc. [5 , 9];
4. Horizontal and Vertical System Integration, as in Industry 4.0 everything should be interconnected into a single information space;
5. The Industrial Internet of Things will link all components of production to a single real-time information exchange network [9];
6. Cybersecurity (Cybersecurity) provides for activities related to the protection of storage and processing sites, networks for their transmission [9,10];
7. Clouds. A large number of smart devices will generate a large amount of different information that must be securely stored, processed quickly and accessible to any device from

different access points instantly. To this end, cloud technologies are best suited for the moment, with their productivity only rising, providing almost instant access and data processing [5; 9];

8. Additive Manufacturing (Additive Manufacturing). The basis of such production is 3D printing, with which already prototypes of future finished products are being created and simple details or finished products are produced. Such printing has a wide prospect in the production of individual orders of small batches of products, allows you to reduce inventory and costs for logistics services, etc. [5; 9];

9. The expanded (or virtual) reality (Augmented Reality) in Industry 4.0 will be used by a person (employees of enterprises) for learning, making various decisions, etc. [5, 9].

Thus, the basis of Industry 4.0 is the information tools and technologies in any way they manifest. In Ukraine, information technology (IT) is one of the priority areas of the economy, in particular, due to the fact that the volume of exported products and services in this sector of the economy, according to experts, in 2017 was about \$ 2.5 billion (according to other estimates - about \$ 3 billion), most of which belongs to outsourcing companies [11; 12]. The number of IT / companies is over 1000 units and there are about 100 research & development centers [11; 12]. By the number of employed IT specialists (about 90 thousand people) and the number of annual graduates from IT / specialties (about 15 thousand people), Ukraine is a leader among the countries of Central and Eastern Europe [12; 13]. Ukrainian engineers have high competitiveness in the foreign labor market [14], which is confirmed, in particular, by the following: according to the latest ranking of hundreds of the best outsourcing companies in the world.

According to the International Association of Outsourcing Professionals (IAOP), every tenth company has a representative office in Ukraine [15; 16].

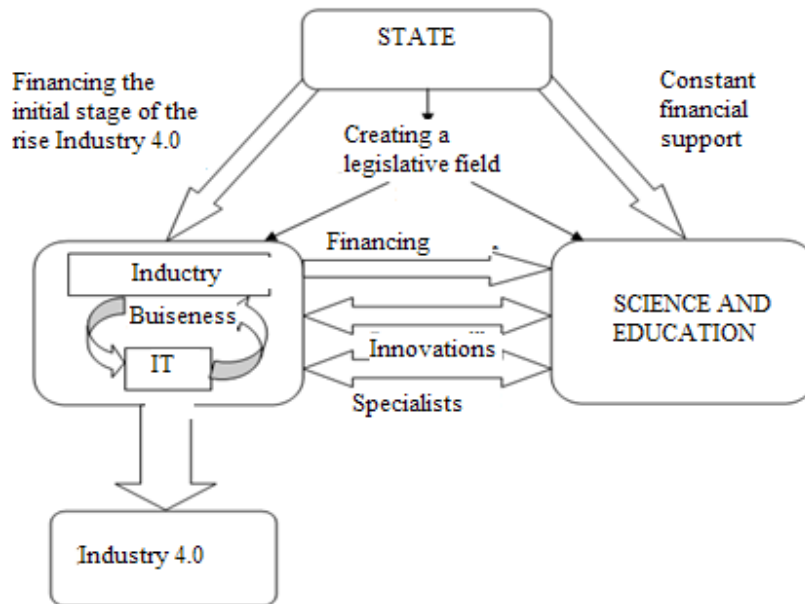
If we consider that the main driving force of Industry 4.0 is IT, then Ukraine has sufficient potential to occupy one of the leading places among the leaders of this new concept of economic development. However, this requires a constant interaction of public authorities; industrial enterprises; enterprises that are leaders in their industry; IT companies; universities; scientific innovation centers (technoparks), research centers, etc. Such an interaction can be created on the example of Germany, where at the initial stage (creation of the basis for the implementation of Industry 4.0 in life) the main source of funding is the state, and in the future all projects within the industry 4.0 will be financed exclusively by business.

There is a need for the training of relevant competent specialists and their further development. In our opinion, in the fourth industrial revolution, IT specialists, engineers from different fields (mechanical engineering, electrical engineering, etc.), logistics specialists, economists-analysts occupy one of the main places. For qualitative training of such specialists it is necessary: 1) to formulate qualification requirements for graduates of institutions of higher education in the context of Industry 4.0; 2) to develop and carry out training in accordance with curricula and programs that reflect the latest trends in the development of the world economy; 3) to take measures at different levels to increase the interest of entrants in the specialties that are important in Industry 4.0, but are not popular among young people; 4) to continuously improve the qualifications of the teachers through, inter alia, internships in the leading international and domestic industrial (industrial) and IT companies; 5) Update the hardware and software of the educational process, etc. All this requires significant financial investment.

As for the domestic IT market, here, for the successful launch of Industry 4.0, along with outsourcing companies (which actually produce innovative products or part of some global project for a foreign customer and for Ukraine, such products are transformed only in the form of export revenues), it is necessary to support and develop companies that are oriented on the domestic market and are able together with the industrial enterprises to create a finished domestic innovative product within the industry 4.0. Of course, such a domestic product will bring Ukraine significant image benefits, as well as significant cash inflows.

Consequently, for the emergence and development of Industry 4.0 in Ukraine there should be constant cooperation between the State, Business, Education and Science (see Figure 1).

Fig. 1. Conceptual scheme of interaction in the triad "State" - "Education + Science" - "Business" for the emergence and development of the Fourth Industrial Revolution in Ukraine [4]



The state must create a legislative framework, make initial investments related to Industry 4.0, industrial production and IT / companies, which in turn, together with the State, should keep financially supporting the preparation of industry-specific 4.0 specialists from different fields. Between Business and Education and Science there should be constant cooperation between specialists and scientists, exchange of innovations, etc. But without state regulation of labor relations, the further development of post-industrial society is simply impossible. Principles of their regulation are highlighted in [17]:

1. The principle of a systematic approach to employment regulation;
2. The principle of decentralization and giving entities the maximum legal, organizational and economic independence is relevant today, because its implementation will maximize the energy of self-development of the employment system, its separate components [18];
3. Principle of state legal protection of the diversity of forms of employment, which provides for the freedom of choice by individuals of the sphere, type, form of employment; alternative to full, part-time employment, self-determination of the individual, self-realization with taking responsibility for the choice of oneself. Social vulnerability of unemployed individuals, according to sociological research, is due to low incomes, the impossibility of employment in their specialty, the loss of qualification and the feeling of uselessness [19];
4. State regulation of labor relations in a situation where the latter develop under the pressure of market mechanisms, the detennantration and the flexibility of employment, should be based on the principle of deideologization. Under it means the presence of concepts, ideas that reflect the interests of certain social groups, the presence of ideologues, creators, generators of these concepts;
5. The principle of problem-target orientation of regulation of labor relations, which provides for solving the problems of specific social groups and categories of the population. Specialists developing state regional employment regulation programs must take into account

the types of people's reaction to unemployment, namely: protective, when workers avoid realistic assessment of the situation (not trying to look at the situation realistically); chaotic job search; job search in conditions of limited awareness; productive dependence (a person delegates responsibility for his labor fate to his neighbors, uses their resources, etc.) [20, p. 39-45];

6. State regulation of labor relations should be based on the principle of awareness and informatization, which involves carrying out by state authorities continuous monitoring of problems, needs of society, citizens of certain regions.

CONCLUSIONS

Industry 4.0 is the industrial production of the future, which is already taking place today. Therefore, Ukraine needs to be actively involved in world processes that are associated with a new trend of economic development, in order to take a worthy place among the developed countries of the world. Although the purpose of Industry 4.0 is the innovative shift in industrial production, its impact will be felt in all sectors of the economy. There is no doubt that such changes will affect the sphere of trade and logistics in the first place. In addition, the need for highly skilled workers leads to appropriate changes in education and science in the training of relevant professionals.

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INDUSTRY 4.0 AND SMALL AND MEDIUM-SIZED BUSINESSES

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Abstract: *The Fourth Industrial Revolution is an irreversible process that is currently shaping the business environment. Industry 4.0 is not an option, it is a process, and this must be recognized by small and medium-sized businesses. They must adapt their business to the given global trend. Digitization and robotization is a threat to many small and medium-sized enterprises, but also a great opportunity. The aim of the contribution is to point out the possible impacts of industrial revolution on small and medium-sized enterprises in the conditions of our economy. We are thinking about the impact of the revolution on the creation and extinction of jobs in the economy. Behind the preparedness of SMEs to cope with these new challenges of the globalization environment. Above the possibilities of using network initiatives in the industrial revolution process.*

Key words: *small and medium-sized enterprises, Industry 4.0, clusters, jobs*

JEL Classification: *O15, O31, O32, O33, O35*

1. INTRODUCTION

Small and medium-sized enterprises are characterized by a strong specification, especially above all by a high degree of flexibility and the ability to adapt faster to changing market conditions, compared to large enterprises. The importance of small and medium-sized enterprises is constantly increasing in the conditions of the Slovak Republic, but also in other EU countries. Small and medium-sized businesses are characterized by a transparent organizational structure that allows enterprises to realize direct management and information flows without significant impact on negative aspects. For the national economy, small and medium-sized enterprises represent significant potential because they have a number of important functions (eg social, economic, export, import, development, etc.). Strážovská a kol. (2016), However, the importance of small and medium-sized enterprises already exceeds the national level and has an international dimension. Small and medium-sized enterprises represent the basic economic support of the EU, but they are also a key source of job opportunities. They are an irreplaceable source of growth, contributing to the flexible introduction of new products, increasing innovation activities, developing a competitive environment, bringing forward progressive solutions, creating new job opportunities, and thereby mitigating unemployment. They create jobs with relatively low capital costs, and their performance is more cost-effective. They are quickly adapting and responsive to change. They are also a major factor in co-operation with large businesses. As small and medium-sized businesses grow faster and work more intensively than large businesses. They produce specialized products and also provide specialized services that do not produce large businesses, because their production is inefficient for them. They are better suited to the needs of the spatial economy, and given the relatively small segments of the market, they have more prospective sales outlets than larger businesses that require more market space. They also have better use of technology transfer of results of innovative processes and research.

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Table 1: Definition SME

SME Definition				
Enterprise category	Ceilings			
	Staff Headcount (number of persons expressed in annual work units)	Turnover	Or	Balance sheet total
Medium-sized	< 250	≤ € 50 million		≤ € 43 million
Small	< 50	≤ € 10 million		≤ € 10 million
Micro	< 10	≤ € 2 million		≤ € 2 million

Source: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

Industry 4.0. we can designate gradual or gradual changes in technology. It can also be described as a logical development that creates a new concept of production in business entities. It is an attempt to break the demand for new and modern technologies that accelerate the development of robotics and modern, fully automated control systems that are independent of human service. The aim is to ensure faster and more efficient production of more precise, more special, reliable and especially cheaper products with an emphasis on better use of material inputs as well as ecology. The essence is the replacement of manual labor by robotization, automation. However, there will still be production areas where complete automation, such as agricultural production, will not be possible. Digitization and robotization are irreversible and unstoppable processes. The impact of digitization and robotization will gradually show up in the quitting of jobs. At the same time, however, new jobs will be created in different sectors of the national economy. It should be remembered that twice as many jobs ends as will emerge. Also the inevitable consequence of the process of digitization and robotization will be the emergence of new professions and the disappearance of other professions. So, in the future, everyone should have digital skills in the future.

Table 2: Number of business entities by individual legal forms and size categories of enterprises as at 31.12.2017

	business	tradesmen	free occupations	self- employed farmer	Together	
					Abs.	share in %
microenterprise (0 - 9)	203 092	322 580	19 198	5 246	550 016	96,9%
small businesses (10 - 49)	12 813	1 312	25	9	14 159	2,5%
medium-sized enterprises (50 – 249)	2 900	55	1	0	2 956	0,5%
large businesses (250 a viac)	661	1	0	0	662	0,1%
Together SMEs (0 - 249)	218 805	323 947	19 124	5 255	567 131	99,9%
Together with business entities	219 466	323 948	19 124	5 255	567 793	100,0%

Source: Register of Organizations of the Slovak Statistical Office, processed by the SBA

The ongoing changes in economies and their actual dynamic implementation in practice greatly influence the existence of micro, small and small enterprises in the economy. The issue of digitization, robotization, automation and technological innovation significantly affects the functioning of micro, small and medium-sized enterprises in individual economies. Business entities employing fewer than 10 employees are endangered. Official statistics of the Slovak Republic state that such business entities in the Slovak Republic are 96.9%. It is a high proportion of business entities that are directly at risk of digitization, robotization and automation. The problem is that the jobs created by these businesses in each region are extinguished on the labor market. For job creation, these businesses are a key part of the economy. It is therefore justified to consider all aspects, ie Industry 4.0, in terms of this economic stratum. And European Small Business Act, the main principle of which is "First to Think in Small!", has been in the European space for a long time too.

Small and medium-sized enterprises are an important part of the economy of the Slovak Republic because they create new job opportunities and thus positively affect the level of employment in the economy. Over the last ten years, the share of SMEs in job creation has increased substantially. In 2017, small and medium-sized enterprises (SMEs) accounted for 73.8% of employment in the corporate economy and 59.1% of total employment in the Slovak economy. Thus, we can say that Slovakia continues to be among the countries with a higher share of small and medium-sized enterprises in employment (Table 3).

Table 3: Number of employed persons in small and medium-sized enterprises in Slovakia in 2016 and 2017

Size categories of enterprises	2016	2017		Index
		abs.	%	
FO - entrepreneurs	634 000	636 500	33,8%	100,4
microenterprises (0-9)	227 486	252 385	13,4%	110,9
small businesses (10 – 49)	229 601	220 700	11,7%	96,1
medium-sized enterprises (50 – 249)	277 695	278 263	14,8%	100,2
large businesses (250 and more)	477 200	493 683	26,2%	103,5
together with SMEs	1 368 782	1 387 598	73,8%	101,4
together with business entities	1 845 982	1 881 280	100,0%	101,9

Source: processed on the basis of ŠÚ SR data

2. IMPACT OF INDUSTRY 4.0 ON SMALL AND MEDIUM SIZED

We must point out that digitization is not an option, but it is an irreversible process. A process that greatly affects the present and future of SMEs. The degree of digitization and robotization depends on the type of profession. There are a profession in the economy that does not get along without it, but there are also professions more connected with physical work where robotization and digitization are less needed. Digitization, robotics, and all the shades of technical innovation will gradually become part of every aspect of life. SMEs should not understand digitization and robotization as a problem or an obstacle to their development but rather new opportunities and opportunities for their further progress. At present, small and medium-sized enterprises suffer from a considerable lack of information on the overall course of the Fourth Industrial Revolution processes. This is because they have little or no knowledge of the national strategies of Industry 4.0 and their implications for

SMEs. This implies that it is necessary to ensure that SMEs are better acquainted with the objectives of the National Industry 4.0 strategy, through professional organizations. SMEs have the right to know what these processes will mean for businesses. What threats do this imply or what are the opportunities. On the other hand, strategies should pay more attention to micro, small and small enterprises, which play a crucial role in the economy, for example, in terms of employment, where they account for at least 50% of jobs.

Negative of the digitization and robotization process for small and medium enterprises:

- excessive digitization may be an obstacle to SMEs',
- requires continuous training,
- small businesses have limited financial resources, so they are too expensive for them.

Of course, the process of digitization and robotization also brings to SMEs the number of positive contributions they can make in SMEs:

- to improve marketing activities, for example, in the knowledge of the market,
- to improve processes related to website traffic, warehouse tracking, database administration, and more.
- simplifying and improving the quality of corporate education and training of employees,
- simplifying procurement procedures,
- simplifying and improving communication,
- speeding up consumer feedback, and so on.

3. CONCLUSION

Micro-enterprises, small and medium-sized enterprises account for 99% of all enterprises in the economy. They provide two-thirds of jobs in the private sector and contribute more than half to total added value. In view of these facts, their role in the national economy is irreplaceable. And in the fourth industrial revolution, they will also have a significant position in the economy in terms of job creation and new innovative ideas. It will also contribute to the digitization and robotization process, which will create new jobs. But even so, it is assumed that new workplaces will emerge more slowly than they will. Twice more jobs will cease to exist. One of the options as a way of transitioning SMEs to Industry 4.0 is to manage enterprise clusters as well. Within these business networks, in the form of clusters, SMEs can face the pitfalls of the fourth pre-revolutionary revolution, or take advantage of all the opportunities that this upcoming revolution offers to businesses.

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CHARACTERISTICS OF SPECIALIST TEMPORALITY IN THE CONTEXT OF THE IV INDUSTRIAL REVOLUTION

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Abstract: *Fourth industrial revolution associated with network technologies makes us reconsider the competences of employees in different industries and makes new demands on human resource management. Many professional standards highlight such an important quality of specialist as the ability to organize their own present and anticipate their future. Temporal organization of an individual is one of those constructs because it is a major component of the regulatory abilities of an individual. The article deals with the mechanism of forming individual temporality as a professionally significant characteristic of an employee in the era of the IV industrial revolution. The study of individual temporal organization is seen as a resource of overcoming difficult situations, as well as potential that allows an individual to act constructively. The authors identified the differences in manifesting temporality indicators by specialists with different attitudes to their organization. Summarizing the empirically obtained data, the authors conclude that there are distinct differences in showing individual temporal organization by specialists with different levels of organizational loyalty.*

Keywords: *professional competence, temporality, temporal organization, self-organization, organizational loyalty.*

JEL Classification: J24, J28, O15, M14

1. INTRODUCTION

New platforms for digital-based production are changing the entire system of global economic, trade, social and political relations, which allow scientists to talk about the fourth industrial revolution. If the basis of the third revolution was the automation of production, the fourth industrial revolution is associated with network technologies, affecting self-identification, personal space, professional success criteria, and the amount of time spent on work and leisure.

The upcoming changes will make it necessary to reconsider the competencies of specialists in different industries, as a result the methods of forming new personality traits will become of fundamental importance.

The unique feature of the fourth industrial revolution is the increasing integration of a number of different scientific disciplines, which changes the requirements to forming cognitive abilities, skills of solving complicated problems, managing resources.

Only in the conditions of digital technologies and the development of a single digital learning environment there can be a simultaneous formation of an effective set of personal qualities, called the skills, and competencies of the XXI century.

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There is a gradual change of cultural and educational paradigms and meanings. In many scientific fields, research is conducted to find constructs that enable individuals to adapt to changes and develop productively. The temporal organization of an individual is one of these constructs, being the leading component of individual regulatory abilities that determine his/her successful socialization [3]. Many professional standards state that an ability to organize their own present and anticipate the future is a professionally important quality for specialists in various industries.

The analysis of philosophical, psychological and pedagogical literature allows us to conclude that in these sciences, there is no complete concept of temporal organization of an individual, and the indicators and criteria for assessing temporality are not worked out.

The variety of approaches to analyzing this phenomenon is largely explained by a variety of paradigmatic commitment of the authors to different schools. [3] Each definition of individual temporal organization includes identifying phenomenological features and structural elements, which makes it difficult to understand the essence of the phenomenon, mechanisms and rules of its development.

Nowadays in psychology as a science, because of practical demand of society, it is relevant to study individual temporal organization as a resource for overcoming difficult situations, as well as the potential for an individual to act constructively [3].

The problem of individual temporal organization is studied in the following several directions today:

- analyzing individual life through consideration of individual's life way (Sh. Buller, B. G. Ananyev, N.V. Loginova, N. N. Tolstykh);
- subjective experiencing time and building a life strategy based on the relationship between the past, present and future (K. A. Abulkhanova-Slavskaya, M. O. Alfeyorova, B. G. Ananyev, L. I. Antsiferova, S. L. Rubinshtein, V. F. Serenkova, O. Yu. Strizhitskaya and other);
- attitude to time (R. A. Akhmerov, E. I. Golovakha, A. A. Kronik, T. A. Nestik);
- perception of time (D. G. Elkin, B. I. Tsukanov, S. V. Leonov, Yu. V. Karyagina);
- time management in the conditions of professional activity (N. N. Abrosimova, A. A. Aldysheva, G. A. Arkhangelskiy, L. D. Dikaya, D. N. Zavalishina, O. V. Kuzmina, Yu. K. Strelkov and other);
- relationship between social behavior and time management (S. A. Bezgodova, N. A. Bershtein, N. Yu. Grigorovskaya, F. Zimbardo, K. Levin, T. A. Nestik, J. Nyutin).

There are a number of works in psychology devoted to the content of an individual temporal competence (A. Maslow, A. K. Bolotova, O. V. Kuzmina, D. M. Melnikova, S. A. Ruban, I. A. Yaksina and other.). Few works are devoted to studies of an individual life path in the process of overcoming difficult life situations (L. I. Antsyferova, A. V. Libin).

An important psychological category, closely related to the processes of human orientation and adaptation in the surrounding world, is self-organization of lifetime as a way of individual organization of life [5]. The unit of analysis for self-organization of lifetime is the semantic structure of the temporal organization of life [5; 6].

Within the psychology of labor, orientation in time is a characteristic of professional consciousness (thinking) (L. P. Enkova, P. A. Korchemny, O. S. Sovetova, E. A. Shilova). The principle of time analysis, according to P.A. Korchemny is the basis of any activity. A person keeps an object in mind as the current present, realizes and thinks over alternative actions and their consequences as the future, reproduces the possessed experience as the past [2]. According to L. P. Enkova temporary organization of professional activity contains meta-contextual temporal experience of the subject of labor, temporary perspective of professional

activity, professional eventfulness as a temporary structure (potentiated, realized and currently relevant events of professional life) [1].

Individual temporal organization, considered by us in terms of anthropological approach, is an integral unit, including psychophysiological laws of the human body, manifested in biological rhythms, subjective perception of time units. It also includes the social norms and existing traditions related to the temporary organization of life of both an individual and the community as a whole.

An ability to use working time efficiently is required for success. Management identifies the levels of organizational time as the duration norms and the activity cycles [7]. Despite this, the study of temporal parameters in the organization faces a number of difficulties. Studies are often carried out without taking into account the specialists' individual temporal characteristics [4]. Individual specifics of time management largely depend on people's attitude to their organization.

2. PROBLEM FORMULATION AND METHODOLOGY

The aim of our empirical study was to find the differences in the way specialists with different attitudes to the organization show indicators of temporality and to identify the indicators of individual temporal organization that affect the organizational loyalty of specialists.

A number of reliable and valid methods were used for diagnostics. The study of indicators of individual temporality was carried out using such methods as "Temporary competence of an individual" (O. V. Kuzmina), "Semantic differential of an individual" (L. I. Wasserman et al.), "Diagnostics of individual self-organization — DOS-39" (A. D. Ishkov), "The Values of Time" (O. V. Kuzmina). The attitude to an organization was analyzed by the degree of employee loyalty to their organization. In diagnostics, the researchers used "The methods of studying loyalty" (S. S. Baranskaya).

The study involved 78 employees working in the town administration of the municipality "Tavdinsky town district". The survey was taken in an individual form.

Statistical data was processed using descriptive statistics, non-parametric criterion of U-Mann-Whitney differences and regression analysis. To process the data computer program SPSS STATISTICS 17 was used.

3. PROBLEM SOLUTION / RESULTS / DISCUSSION

Based on the result of the organizational loyalty research, employees were divided into three groups: employees with high organizational loyalty, employees with medium organizational loyalty and employees with low organizational loyalty. The employees with medium organizational loyalty were excluded from further data processing due to their small number.

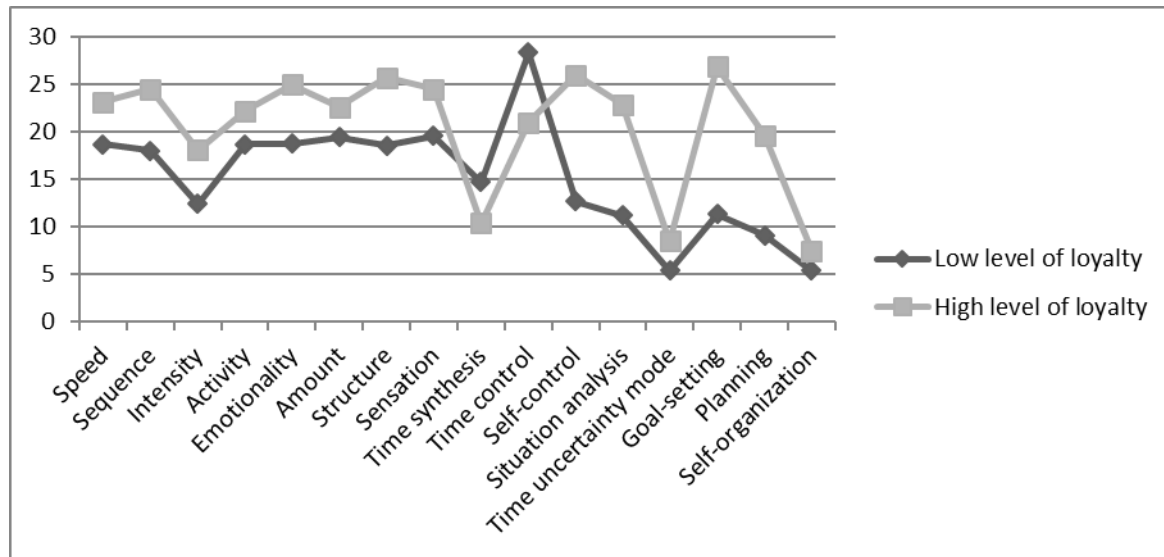
Figure 1 presents statistically significant differences in the intensity of individual temporality indicators among specialists with high and low levels of organizational loyalty. The value of the U-Mann-Whitney test is given in the text of the article.

People with high organizational loyalty are more likely to appreciate the speed ($U = 79.5$, with $p = 0.016$), the sequence of performed activities ($U = 58.5$, with $p = 0.003$) than specialists with low loyalty. People who are loyal to the organization they work for, unlike disloyal ones, appreciate emotional intensity ($U = 45$, with $p = 0.001$), semantic content ($U = 77$, with $p = 0.013$), clarity and orderliness ($U = 80$, with $p = 0.016$), logic and structuredness of events ($U = 35$, with $p = 0.001$).

Highly loyal people to a greater extent than disloyal ones build their present based on the analysis of experience ($U = 57$, with $p = 0.003$) and self-control ($U = 63$, with $p = 0.004$). They carry out goal setting ($U = 36$, with $p = 0.001$) and planning ($U = 50$, with $p = 0.001$). Self-organization of activity ($U = 50$, with $p = 0.001$) is more typical for them.

Highly loyal specialists more accurately perform analytical activities in new situations ($U=49.5$, $p=0.001$) and work more successfully in situations of time uncertainty ($U=58$, with $p=0.003$).

Figure 1: Indicators of temporality among specialists with high and low levels of organizational loyalty



The revealed differences gave grounds for multiple regression analysis, which allows identifying causal relationships between organizational loyalty of employees and their temporality indicators. Using the method of regression analysis, we identified which indicators of temporal organization of activities contribute to or, impede the development of employee organizational loyalty, that is, are statistically reliable predicates of loyalty. Statistical characteristics allowed to consider the regression model to be significant (R-square 0,422; corrected R-square 0,282; $F=3,013$ with $p=0,001$). Table 1 presents the statistical characteristics of the significant regression variables.

Table 1: Regression characteristics (indicators of organizational loyalty is a dependent variable)

Predicates in multiple regression analysis	B	Standard error	t -test	Significance value
Speed	-0,645	0,256	-2,522	0,014
Intensity	0,869	0,321	2,708	0,009
Structure	0,608	0,316	1,924	0,051

Table 1 shows that statistically significant predicates of organizational loyalty are speed, intensity and structure. It can be said that the situation in which employees value the speed of work performance, intensity and structuredness of activities forms the organizational loyalty of employees.

The authors also found out how employee loyalty affects their temporal indicators. They conducted a regression analysis, in which the indicators of individual temporality were used as a dependent variable, and their organizational loyalty was used as an independent variable. The data obtained as a result of processing allowed to state that the regression model includes such dependent variables as self-organization, intensity, time synthesis, time control, self-control, time uncertainty mode, goal setting, situation analysis, planning and can be called significant.

Table 2: Significant regression characteristics (indicators of individual temporal organization is a dependent variable)

Predicates in multiple regression analysis	B	Standard error	T-test	Significance value
Intensity	152	0,49	3,166	0,003
Time synthesis	-141	0,045	-3,120	0,003
Time control	-0,197	0,067	-2,941	0,004
Self-control	0,390	0,138	2,823	0,006
Time uncertainty mode	-0,233	0,069	-3,35	0,001
Goal setting	0,067	0,28	2,352	0,021
Situation analysis	0,007	0,022	3,220	0,002
Planning	0,048	0,019	2,524	0,014
Self-organisation	0,043	0,020	2,199	0,031

The data presented in Table 2 allow the authors to conclude that the organizational loyalty of employees determines manifesting such indicators of temporal competence as self-organization, intensity, time synthesis, time control, self-control, goal setting, situation analysis and planning. The operational-technological component is most noticeable.

4. CONCLUSION

Thus, summarizing the data obtained empirically, the conclusion can be made that there are strongly marked differences in the indication of individual temporal organization among specialists with different level of organizational loyalty. Such temporal characteristics of the labor process as the speed of work, intensity, temporal structuring of activities stimulate developing the organizational loyalty of specialists. Moreover, the loyalty itself determines an individual's desire to set goals and plan the time of activities, control the time and develop self-organization at work. Organizational loyalty stimulates the employees' desire to work independently under the conditions of time uncertainty.

The obtained data expand psychological knowledge of mechanisms of organizational loyalty development in the context of economic and social changes and the development of individual temporality as a professionally significant characteristic of a specialist. Which seems to be an important component in the era of the IV industrial revolution.

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GENERÁČNÉ ROZDIELY V KONTEXTE TRHU PRÁCE A VYUŽÍVANIA MOBILNÝCH APLIKÁCIÍ

GENERATIONAL DIFFERENCES IN TERMS OF LABOUR MARKET AND MOBILE APPLICATIONS

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Tibor ZSIGMOND⁴¹

Abstrakt: Cieľom článku je preskúmať zvyklosti generácií X (narodení medzi 1965 - 1980) a Y (narodení medzi 1981 - 1995) v súvislosti s používaním mobilných aplikácií. Článok obsahuje 4 grafy a 2 tabuľky. Prvá časť obsahuje úvod. Prvá podkapitola (1.1) sa zaoberá s generačným marketingom. Tiež sa venuje skúmanej problematike z teoretického uhľa pohľadu, predstavuje charakteristiky jednotlivých generácií. Ďalšia podkapitola (1.2) popisuje mobilný marketing a mobilné aplikácie. Potom je opísaná metodika práce a metóda skúmania. Sformulovali sme 2 hypotézy. Tretia časť obašuje výsledky nášho dotazníkového prieskumu. Posledná podkapitola (3.1) zhrňa výsledky testovaných hypotéz. Posledná časť obsahuje úsudky a záver.

Kľúčové slová: X generácia, Y generácia, generačný marketing, mobilný marketing, užívateľské zvyky

Abstract: The main objective of this study is to survey the usage habits related to mobile applications among generations X (born between 1965 and 1980) and Y (born between 1981 and 1995). This paper contains 4 figures and 2 tables. The first part includes the introduction. The first subpart (1.1) deals with generational marketing. It also presents the two generations in general and describes their shopping habits. The next subpart (1.2) is about mobile marketing and mobile applications. After that the research methodology is described. We formulated 2 hypotheses. The third part contains the results of our own questionnaire research. The last subpart (3.1) summarizes the results received by testing our hypotheses. The closing part summarizes the findings and suggestions.

Key words: X generation, Y generation, consumer usage habits, mobile marketing, generational marketing

JEL Classification: D12, M31, M39

1. ÚVOD

V predchádzajúcom desaťročí prešla technológia veľkými zmenami, do každodenného života bežných ľudí boli integrované nové zariadenia. Vzťah medzi človekom a jeho telefónom sa úplne zmenil, takisto aj funkcie, na ktoré je ho možné využívať. Telefonické zariadenia používame nie len na samotné telefonovanie, ale aj na internet, sledovanie filmov, počúvanie hudby a na zábavu. Zavedenie internetu do mobilnému telefónu otvorilo nové perspektívy pre používateľov i obchodníkov. Objavila sa mobilná forma online nakupovania. Dnes už ľudia online nakupujú nielen elektroniku, oblečenie a iné tradičné výrobky. Zvýšil sa dopyt aj po softvéroch a virtuálnych obsahoch, ktoré sú veľmi rozmanité. Z uvedeného dôvodu sa budeme venovať len úzkemu segmentu, t. j. mobilným aplikáciám a službám, ktoré poskytujú.

Skúmaním spotrebiteľských návykov spojených s online mobilnými obsahmi sa doteraz zaoberalo len málo domácich a stredoeurópskych štúdií, preto by sme svojím výskumom

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chceli prispieť k tematickému priblíženiu danej témy. Inovácia pre mladšie generácie je samozrejmosťou, ale pre spoločnosti a obchodníkov sú dôležité nielen mladšie vekové skupiny. Je tiež potrebné zohľadniť spotrebiteľské správanie aj generácie (X), keďže sú prítomné na trhu v najväčšom počte z hľadiska kúpyschopného dopytu.

1.1 Generačný marketing

„Generačný marketing skúma väčšie - hlavne aktívne - vekové skupiny na základe ich charakteristických zážitkov, hodnôt, požiadaviek a očakávaní.” [18] Podľa Smitha a Clurmana [16] k pochopeniu správania sa spotrebiteľov treba preskúmať tri determinanty. Prvým z nich je fáza života. Náš okruh zodpovednosti a naše potreby sú odlišné v týchto jednotlivých fázach, preto potrebujeme rôzne výrobky a služby. Druhým faktorom sú aktuálne okolnosti, t. j. také udalosti, ktoré priamo ovplyvňujú kúpnu silu jednotlivca. Po tretie – a najdôležitejšie – sú tzv. koherentné zážitky (spoločné zážitky, napr.: vojny, voľby, katastrofy). Tieto zážitky definujú (určia) do najväčšej miery hodnotovú hierarchiu a zvyky jednotlivých generácií. Sú to zážitky, ktoré ovplyvňujú predstaviteľov generácie skoro v každom segmente života. Uvedený jav sa premieta aj do oblasti nákupných zvyklostí. Základom koherentných zážitkov – popri politických, hospodárskych a inovatívnych udalostiach – môže byť aj umenie. [1], [16], [19]

Predstavitelia generácie X sa zoznámili s internetom až v dospelosti a počas svojej pracovnej kariéry ho boli nútení denno-denne požívať. V ďalšom do ich života vtrhli nové elektronické prostriedky - ako sú napr.: smartfón, tablet a iné – často však pri ich používaní využívali pomoc svojich detí. Sú kritickí voči reklamám, produktom a službám. Svoje spotrebiteľské návyky a záujmy sa snažia utajiť aj v online prostredí. Je ťažké ovplyvniť ich názory, je pre nich charakteristická lojálnosť k značke. Pri nakupovaní sa sami rozhodujú a menej počúvajú názory svojich predkov. Počas nakupovania venujú pozornosť predovšetkým pomeru ceny a hodnoty. Možno vyhlásiť, že mínajú viac ako nasledujúca generácia, lebo disponujú stabilnejším príjmom. Nemínajú len na seba, ale predovšetkým na svoje deti a na rodinu. Pred a počas nákupného procesu zbierajú informácie o vlastnostiach tovaru a o tom, prečo sa daný tovar pre nich oplatí kúpiť. Práve preto je rozhodujúcou úlohou marketingových odborníkov, aby ich racionálne presvedčili o špecifickosti tovaru alebo služby, a tak ich nahovorili na nákup. K zákazníkom je nutné sa priblížiť nenútene, úprimne a je adekvátne využiť aj spôsoby internetovej reklamy. Pozitívne reagujú na e-mailové a multimediálne reklamy. Okrem toho sa k nim dá priblížiť aj sponzorovaním rôznych podujatí, využitím PR prostriedkov. Občas môžu byť úspešné aj osobné odporúčanie (ústna reklama), ale väčšinou veria len vlastným očiam a skúsenostiam. Podľa najnovších prieskumov členovia generácie X nakupujú počas jedného roka o 20 percent viac tovaru ako mladšia generácia Y. Podľa názorov jednotlivých odborníkov je tomu tak vďaka istejšímu finančnému zázemiu. Dodávajú však, že po uplynutí niekoľkých rokov ich mladšia generácia v tomto segmente pomaly, ale isto predbehne. [2], [14], [15], [16], [17]

Generácia Y je najpočetnejšia zo všetkých. Vo veľkom počte sú prítomní na sociálnych sieťach (napr.: Facebook, Instagram, Twitter atď.). Túto generáciu ovplyvnil skôr internet ako televízia, s ktorou sa stretli už doma. Lepšie sa vyznajú v technológii ako ich rodičia, alebo ich starší nadriadení. Dokážu sa sústrediť na viac vecí v tom istom čase a sú schopní používať súčasne aj viac informačných kanálov. Radi používajú rôzne druhy technológií na riešenie zložitejších pracovných úloh. Často robia poznámky do svojich mobilných telefónov, napríklad počas jednaní. Sú schopní vyfiltrovať cenné informácie z veľkého počtu informácií. Ľahko sa prispôbia technologickým zmenám. Sú menej verní značkám, lebo internet im poskytuje širokú škálu možností. Ťažko sa dajú oklamať, lebo sú dobre informovaní. Všeobecne sú sebeckí, veľa utrácajú na seba. Oblubujú jedinečné reklamy a marketingové riešenia, ktoré sa zakladajú na pravdivých udalostiach. Užívajú si nakupovanie. Nakupujú

častejšie ako ich predkovia, ale využívajú akcie, teda mňajú menej. Na základe jedného prieskumu [12] 89 percent generácie Y nielen že má smartfón, ale denno-denne ho používa aj pre internet. Radi používajú aj mobilné aplikácie. Lahko sa prispôbia technologickým zmenám. Vo viacerých prípadoch používajú smartfóny aj pri aj počas návštevy kamenných obchodov, aby získali viac informácií o produktoch. Viac ako jedna tretina členov generácie Y si zdieľa svoje mienky a názory po online nakupovaní. Takto informujú aj ostatných potenciálnych kupujúcich. Počas ich nakupovania nehrá dôležitú úlohu kvalita, ale cena. Pomocou internetu si vedú rýchlo porovnať ceny viacerých konkurenčných firiem a nakupujú tam, kde je daný výrobok lacnejší. Niektoré firmy sa snažia dočiahnuť členov generácie Y aj hlasovými odkazmi. Blogy a testovacie stránky majú na nich tiež veľký vplyv. Popri internete sú dôležité aj reklamy v počítačových hrách. Na členov tejto generácie majú veľký vplyv rodičia a starí rodičia. [2], [6], [12], [14], [15], [16], [17]

1.2 Mobilný marketing

Mobilný marketing - bezkáblový marketing – zahŕňa v sebe všetky marketingové aktivity, ktoré prebiehajú cez mobilný telefón. Často ho nazývajú tiež aj m-marketingom. Jeho vznik je spojený s rozšírením mobilných telefónov. Dnes už môžeme hovoriť o pojme tzv. „mobil behaviour“, čiže o spôsobe správania sa spojeným s mobilným prostriedkom. Mobilný marketing mnohí pokladajú za najdynamickejšie sa rastúci spôsob marketingovej komunikácie. Mobil marketingová komunikácia nevyužíva hlavnú funkciu mobilného telefónu: telefonovanie. Hlavnými prostriedkami mobilnej marketingovej komunikácie sú: SMS, MMS, advergaming, logá a obrázky, hlasové tóny, cell broadcastingová technika, aplikácie špeciálne grafické kódy (QR kódy), spoločenská média, vírusové videá a vírusový marketing. [4], [5], [10], [13]

Aplikácie sú programy (softvery), ktoré sú vykonať určité úlohy na základe požiadaviek užívateľa. V odbornej literatúre sú rozlíšené 3 základné druhy aplikácií. Najviac sú rozšírené natívne aplikácie. Tieto sa dajú získať (stiahnuť) z digitálnych distribučných platforiem (napríklad Apple AppStore, Play Obchod). Sú rýchle, vyspelé a sú schopné využívať aj vstavané funkcie (napríklad fotoaparát GPS, dotyková obrazovka). Často posielajú aj upozornenia, oznámenia pre užívateľa, a dajú sa používať aj v offline prostredí. Ich nevýhodou je, že vyžadujú väčšiu investíciu. Ďalšiu skupinu tvoria tzv. webové aplikácie. Tieto sa dajú všeobecne získať (stiahnuť) z webovej stránky firmy (podniku). Ich otvorením si vlastne užívateľ otvorí mobilnú verziu webovej stránky firmy (podniku) pomocou prehliadača. Ich vytvorenie je lacné, ale nevýhodou je, že sú pomalšie a nedajú sa získať (stiahnuť) z digitálnych distribučných platforiem. Do tretej skupiny patria hybridné aplikácie, ktoré sú vlastne kombináciou prvých dvoch aplikácií. [3], [8], [9], [11], [20]

Podniky dodnes uprednostňujú klasické výberové spôsoby, lebo tie sú úspešné. Vývojom internetu a technológie najnovšie využívajú aj výhody internetových pracovných portálov (napr. Profesia.sk) a sociálnych médií. Dá sa predpokladať, že v budúcnosti im v tom pomôžu aj mobilové technológie (napr. aplikácie). [7]

2. CIEĽ A METODOLÓGIA

V centre pozornosti nášho prieskumu sú spotrebiteľské zvyklosti jednotlivcov spojené s využívaním mobilných aplikácií. Na náš prieskum sme si vybrali generácie X (1965-1980) a Y (1981-1995). Vychádzajúc z vekového rozdielu horeuvedených dvoch generácií môžeme predpokladať, že ich vkus a zvyklosti sú do určitej miery rozdielne.

Výskum sme realizovali za pomoci online dotazníkov a aj v printovej forme, ktoré boli doručené vybraným zástupcom generácií - metódou snehovej gule. Náš dotazník obsahoval 31 otázok, medzi ktorými boli zatvorené aj otvorené otázky.

Naše hypotézy sú nasledujúce:

H1: Mladšia generácia častejšie používa online komunikačné aplikácie

H2: Osoby, ktoré vlastnia zariadenie s operačným systémom iOS, kupujú častejšie mobilné aplikácie ako osoby, ktoré majú zariadenie s operačným systémom Android.

K preskúmaniu hypotéz sme museli stanoviť v každom prípade hypotézu H0, ktorá predpokladá, že medzi nami skúmanými premenlivými faktormi nie je spojenie. Naše hypotézy sme preverili aj pomocou softvéru SPSS.

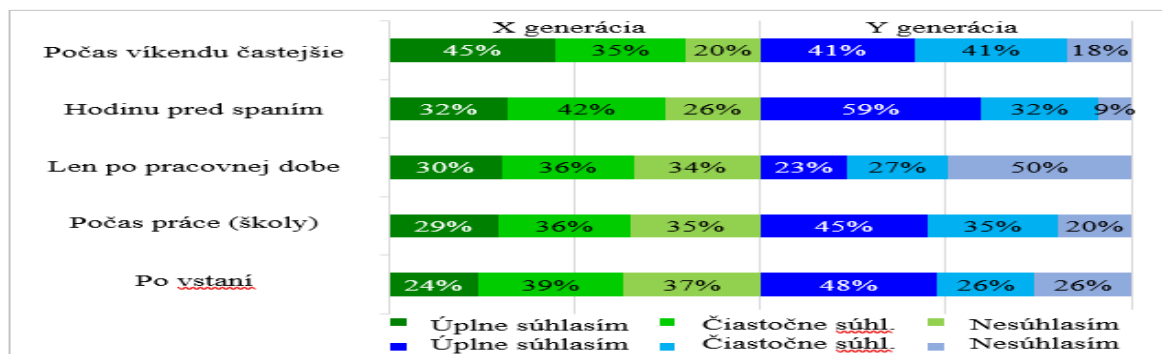
3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

Nami pripravený dotazník vyplnilo 238 osôb, ale po vylúčení chybné vyplnených dotazníkov a pre lepšiu porovnateľnosť sme nakoniec skúmali len mienku 224 osôb. Predstavitel'ov oboch generácií (X a Y) sme skúmali v rovnakom počte – 112-112 osôb. Výsledky našich demografických otázok sme uviedli na začiatku primárneho prieskumu.

Medzi vyplňujúcimi je podiel žien vyšší (55%), ako mužov (45%). Vzhľadom na typ bydliska je podiel ľudí žijúcich v meste 56, zatiaľ čo žijúcich v obci 44 percent. Väčšina respondentov (68%) pracuje ako zamestnanec. 14 percent sú študenti, ale to nie je prekvapením, pretože časť generácie Y ešte stále študuje na univerzitách. Podiel nezamestnaných je nízky (4%), ale to sa dalo očakávať, keďže v súčasnosti je miera nezamestnanosti na Slovensku nízka. Do tejto kategórie boli zaradení tiež aj ľudia na materskej dovolenke. Výška mesačného čistého príjmu respondentov sa pohybovalo vo veľmi širokom rozsahu. Vzhľadom na vzdelanie väčšina ľudí (46%) absolvovala stredoškolské štúdium s maturitou. Na druhom mieste (43%) sú absolventi vysokých škôl. Podľa nášho názoru to nie je prekvapením, pretože v dnešnej dobe kariéra a vhodné pracovné miesto sa stávajú čoraz dôležitejšími.

Väčšina respondentov vlastnila smartfón (99%) a nielen, že poznala pojem mobilnej aplikácie (99%), ale počas svojho života už aj používala aspoň jednu aplikáciu (99%). Väčšina ďalších respondentov denno-denne používa aplikácie (viac ako 80%), pričom jedno užívanie trvá menej ako pol hodiny (55%). V prípade obidvoch generácií je viac rozšírený operačný systém Android (82%). Z našej analýzy vyplýva, že členovia mladšej generácie častejšie používajú aplikácie počas svojej práce (45%) ako staršia generácia (29%). Ďalej členovia generácie Y vo väčšej miere súhlasili s tvrdením, že jednu hodinu pred spaním (59%) a jednu hodinu po vstaní (48%) používajú nejakú aplikáciu.

Obrázok 1: Vyhodnotenie tvrdení súvisiacich s používaním aplikácií



Zdroj: Vlastne spracovanie na základe dotazníkového prieskumu

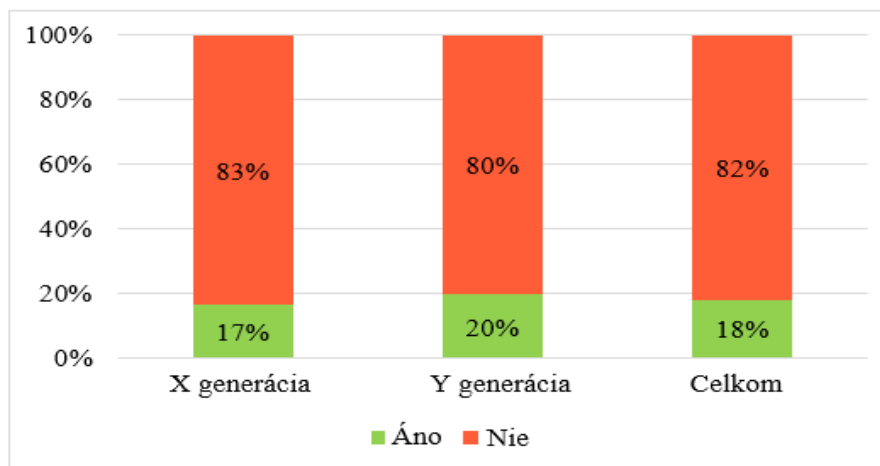
Obidve generácie považujú aplikácie za dôležité (68 a 70%). Príslušníci generácie X ich používaním získajú informácie (53%) a usporia čas (52%), kým pre členov generácie Y sú kontakty a priateľské vzťahy (66%), v čom im pomôžu smartfóny. Kým staršia generácia používa skôr klasické funkcie, ako SMS a telefonovanie (86%), mladšia generácia uprednostňuje online komunikáciu (86%) - cez aplikácie (napr.: Messenger, FB, Viber, atď.). Väčšina generácií X aj Y vyhlásila, že denne používa funkciu budíka (80 a 81%).

V prípade obidvoch generácií je nízky počet tých, ktorí cez aplikácie kupujú diaľničnú nálepku alebo cestovný lístok (72% X a 75% Y – nikdy). Pomer využívatel'ov čítačiek QR-kódov (69% X a 53% Y – nikdy) ako aj aplikácií podporujúcich športovanie a zdravú životosprávu (68% X a 48% Y – nikdy), bol tiež nízky. Aplikácie podporujúce nakupovanie online (AliExpress, Wish) sa dostali tiež na zoznam najmenej používaných aplikácií (54% X a 37% Y – nikdy). V tomto prípade sa však nedalo očakávať, že počet tých, ktorý denne nakupujú, bude vysoký.

Vysvitlo aj to, že ústna reklama má veľký význam pre obidve generácie (obe viac ako 70%). Najväčšia časť respondentov tvrdila (50% X a 43% Y), že ohľadom používania aplikácií ich nič neovplyvnilo. V prípade mladšej generácie boli internetové reklamy oveľa účinnejšie ako u staršej generácie (41% vs. 26%). Pomerne malý bol počet tých, ktorí sa už v nejakej aplikácii sklamali (15% zo všetkých respondentov). Najčastejším dôvodom nespokojnosti bolo nesprávne fungovanie aplikácie (56% zo všetkých respondentov tejto otázky). Podľa skúseností je málo tých, ktorí hodnotia aplikácie v obchodoch (14% X a 20% Y).

Mnohí nevedia rozlíšiť platené a bezplatné aplikácie (33%). Viac ako štvrtina odpovedajúcich tvrdí, že platené aplikácie majú viac funkcií (26%), pričom len ich malá časť kúpila už vôbec platenú aplikáciu.

Obrázok 2: Pomer kupujúcich/nekupujúcich aplikácií

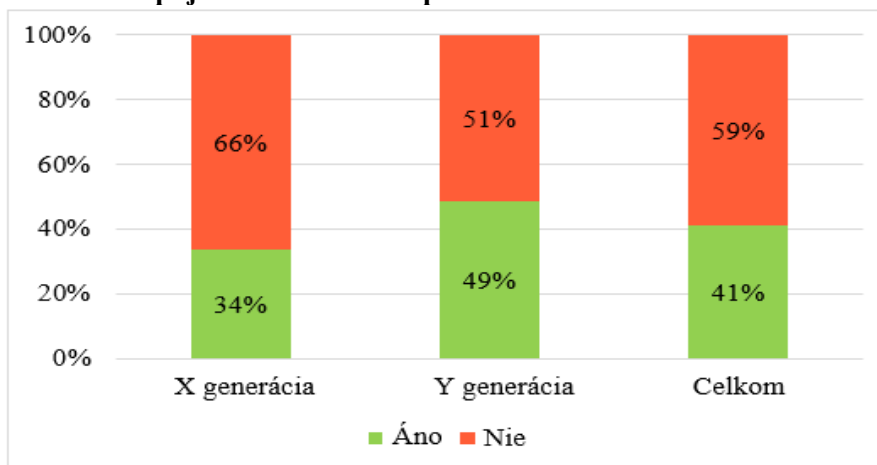


Zdroj: Vlastne spracovanie na základe dotazníkového prieskumu

Z grafu vyplýva, že menej ako 1/5 respondentov (18%) už kúpila nejakú mobilnú aplikáciu. Pri pohľade na obe generácie je zrejmé, že pomer kupujúcich aplikácií je o niečo vyššia u mladšej generácie. Podľa nášho názoru to vyplýva z toho, že členovia mladšej generácie sú obklopení technológiami od svojho detstva. Sú inovatívni, kreatívni a s radosťou experimentujú s technologickými inováciami ako členovia generácie X. Myslíme si, že tento pomer sa v budúcnosti zmení a nákup aplikácií sa stane čoraz populárnou v okruhu oboch generácií. Kým mladšia generácia kupuje najčastejšie hudbu alebo aplikáciu spojenú s hudbou (13 osôb), staršia generácia skôr navigačné aplikácie a mapy (13 osôb).

Počet tých, ktorí kupovali cez aplikáciu nejaký tovar, už bol vyšší, hlavne u generácie Y. Podľa Szőke [17], pre generáciu Y sú dôležité názory takých vzdialených ľudí alebo skupín, ktorí zdieľajú svoje názory o produktoch cez blogy alebo sociálne siete. Oproti tomu však pre generáciu X sú prvoradé názory predajcov a fyzický kontakt s produktom pred nákupom. V prípade oboch generácií tvoria skupinu najčastejšie kupovaných fyzických produktov oblečenie (24 osôb - X, 37 os. - Y) a elektronika (17 os. - X, 40 os. - Y).

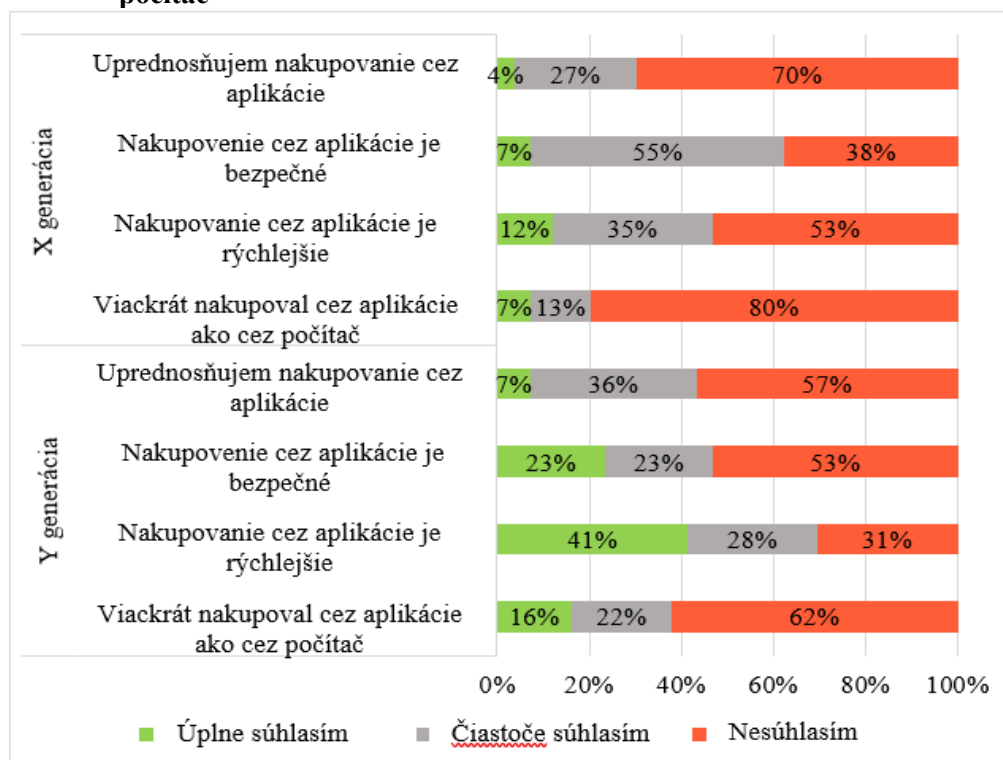
Obrázok 3: Pomer kupujúcich tovaru cez aplikácie



Zdroj: Vlastne spracovanie na základe dotazníkového prieskumu

Môžeme vyhlásiť, že väčšina bola spokojná s priebehom procesu objednávanie (87% X a 85% Y) a s kvalitou objednaného produktu (89% X a 74% Y). Podľa získaných odpovedí sa dá povedať tiež, že väčšina ľudí ešte stále nepokladá za výhodnejšiu objednávanie cez mobil ako cez počítač.

Obrázok 4: Vyhodnotenie tvrdení súvisiacich s nakupovaním cez mobilné aplikácie alebo cez počítač



Zdroj: Vlastne spracovanie na základe dotazníkového prieskumu

Väčšina respondentov si myslí, že aplikácie v budúcnosti nám ešte viac uľahčia život (34%) a že samotné aplikácie budú stále lepšie a vyspelejšie (29%). Súčasne však budú jednoduchšie a prehľadnejšie (27%).

3.1 Overenie hypotéz

V prvej našej hypotéze sme tvrdili, že generácia Y používa častejšie online komunikačné aplikácie ako generácia X. Tu sme použili Pearsonov Chi-kvadrát test, nakoľko sme skúmali vzťah dvoch ordinálnych premenných (generácie, častosť užívania). Hodnota miery voľnosti je 4, signifikancia 0,05 a kritická hodnota 9,488. Výsledky z programu SPSS:

Tabuľka 1: Hodnoty vypočítané pomocou program SPSS – 1. hypotéza

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24,114 ^a	4	,000
Likelihood Ratio	26,803	4	,000
Linear-by-Linear Association	17,577	1	,000
N of Valid Cases	220		

	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Ordinal by Ordinal Gamma	,592	,101	4,878	,000
N of Valid Cases	220			

Zdroj: Vlastne spracovanie na základe dotazníkového prieskumu

Hodnota Khi-štvorcovej je 24,114, teda vyššia ako kritická 9,488. Na základe testu sme zamietli H₀ hypotézu a konštatovali, že medzi dvoma premennými je spojitosť. Keďže medzi dvoma premenlivými je signifikantný vzťah, je potrebné vypočítať aj súčiniteľ Gamma. Použitie tohto súčiniteľa je vhodné v prípade keď skúmame úzkosť vzťahu medzi dvoma ordinálnymi premennými. Túto hodnotu sme dostali pomocou programu SPSS. Získaná hodnota v našom prípade (0,592) je stredne silná, a vykazuje pozitívny vzťah medzi dvoma premennými. Na základe výsledkov u generácie Y je vyšší počet tých, ktorí denno-denne používajú aplikácie. V tomto prípade sme našu hypotézu akceptovali.

V druhej hypotéze sme tvrdili, že osoby, ktoré vlastnia zariadenie s operačným systémom iOS, kupujú častejšie mobilné aplikácie ako osoby, ktoré majú zariadenie s operačným systémom Android. V tomto prípade sme skúmali dve nominálne premenné. Tu sme použili Fisherov test. Hodnota signifikancie (α) je opäť 0,05. Výsledky sú nasledovné:

Tabuľka 2: Hodnoty vypočítané pomocou program SPSS – 2. hypotéza

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3,109 ^a	1	,078		
Continuity Correction ^b	2,226	1	,136		
Likelihood Ratio	2,764	1	,096		
Fisher's Exact Test				,101	,073
Linear-by-Linear Association	3,094	1	,079		
N of Valid Cases	208				

Zdroj: Vlastne spracovanie na základe dotazníkového prieskumu

Na základe výsledku testu P (úroveň empirickej signifikancie) je 0,101 ktorá je vyššia, ako a úroveň signifikancie ($\alpha = 0,05$). To znamená, že nemáme dôvod predpokladať vzťah medzi dvoma premennými – teda ich môžeme pokladať za nezávislé. Hoci v prípade tabuľky empirických údajov je počet členov s operačným systémom iOS vyššia, podľa testu je to vecou náhody.

4. ZÁVER

Naše návrhy sme zoštylizovali na základe získaných výsledkov. Podľa odpovedí sme zistili, že pre väčšinu respondentov je pojem aplikácie známa, nevedia však presne, v čom sa líšia platené aplikácie od bezplatných. Tvorcovia platených aplikácií by mali jednoznačne oboznámiť ľudí s tým, aké sú výhody platených aplikácií voči bezplatným. Ďalej programátori by mali vyvíjať také platené aplikácie, ktoré sa líšia od bezplatných nielen v tom, že neobsahujú reklamy. Sú potrebné také platené aplikácie, ktoré obsahujú viac funkcií, sú vyššej kvality, sú bezpečné a výrobca ich často aktualizuje. Ďalej môžu byť úspešné také aplikácie, ktoré na dlhšiu dobu upútajú pozornosť užívateľa a nie sú nudné.

Podľa výsledkov našej analýzy internetové reklamy značne ovplyvňujú ľudí. Preto si myslíme, že tvorcom nových aplikácií sa oplatí využívať internetové reklamy na popularizáciu svojich nových produktov. Na základe Page, Williams [14] a vlastných výsledkov si myslíme, že pre získanie mladšej generácie sú vhodné online komunikačné aplikácie (napr.: Messenger). Preto tvorcovia nových aplikácií by mali hľadať rôzne možnosti kontaktovania členov generácie Y cez tieto kanály.

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MANAŽMENT RIZÍK PROJEKTOV V KONTEXTE KONCEPCIE INDUSTRY 4.0 V PODMIENKACH VÝROBNÝCH PODNIKOV NA SLOVENSKU

PROJECT RISK MANAGEMENT IN THE CONTEXT OF INDUSTRY 4.0 IN CONDITION OF MANUFACTURING ENTERPRISES IN SLOVAKIA

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Abstrakt: Slovenská republika je charakteristická malou a otvorenou ekonomikou, v ktorej až 80% HDP tvorí export produktov automobilového a elektrotechnického priemyslu. Vplyvom svetových trendov a zvyšujúcej sa konkurencieschopnosti sú Slovenské podniky nútené implementovať prvky koncepcie Industry 4.0. Prispieva k tomu i aktívna podpora zo strany Európskej únie a vlády SR formou rôznych projektov orientovaných na výskum a vývoj v krajine. Koncepcia Industry 4.0 podporuje digitalizáciu a aktívne využívanie výpočtových technológií. Podniky sú nútené inovovať produkty, zlepšovať výrobné procesy a neustále využívať nové inovačné technológie. Uvedené zmeny sa zvyčajne realizujú v podnikoch prostredníctvom krátkodobých projektov, z ktorých sa očakáva návratnosť investícií. Na druhej strane realizované projekty prinášajú mnoho rizík, ale aj jednotlivé príležitosti. Cieľom príspevku je vytvoriť model manažmentu rizík projektov, ktorý vychádza z integrácie požiadaviek stanovených v medzinárodných normách ISO 31 000:2018, ISO 21 500:2012, ako i potrieb implementácie prvkov koncepcie Industry 4.0. Ide o snahu dosiahnuť účinnejšie riadenie rizík projektu, ale i vytvoriť opatrenia na splnenie stanovených cieľov a zabezpečiť úspešnú realizáciu krátkodobých projektov v kontexte koncepcie Industry 4.0 v podniku.

Kľúčové slová: riziko, projekt, manažment rizík, manažment rizík projektov, Industry 4.0

Abstract: The Slovak Republic is characterized by a small and open economy in which up to 80% of GDP. 80% of GDP consist the export of automotive and electrotechnical products. Slovak enterprises are forced to implement new trends. Industry 4.0 is one of them. Implementation of Industry 4.0 is supported by many organization nowadays (for example European Commission, Government of the Slovak Republic, ...). Those institutions prepare various projects, which are focused on support R&D in Slovakia, modify enterprises processes, etc.. The Industry 4.0 concept greatly supports the digitization and active use of computing technologies. Businesses are forced to innovate products, improve their manufacturing processes, and use new technologies. These changes are usually implemented as short-term projects in companies with expect return on investment. Short-term projects bring many risks but also opportunities. The aim of the contribution is to develop a project risk management model based on the integration of the requirements, which are described in the international standards ISO 31 000: 2018, ISO 21 500: 2012 and the implementation needs of the Industry 4.0 concepts. This model may bring more effective preparation of preventive measures to meet the set goals and ensure the successful implementation of short-term projects in the context of the Industry 4.0.

Key words: risk, project, risk management, project risk management, Industry 4.0

JEL Classification: M21, G32, L52, L26

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1. ÚVOD

V globálnom podnikateľskom prostredí je súčasným trendom technologický vývoj stanovený v koncepcii Industry 4.0, nazývaný aj ako štvrtá priemyselná revolúcia. Industry 4.0 sa orientuje na niekoľko zásadných zmien, ktoré zasahujú do procesov celej spoločnosti. Na jednej strane je to proces digitalizácie a na druhej strane je to robotizácia. Ide o prienik nových zariadení v podobe umelej inteligencie a nových parametrov, ktoré umelá inteligencia vytvára pre celú spoločnosť. V neposlednom rade je to veľký posun poznania v spoločenských vedách.

Mnoho podnikov si pod koncepciou Industry 4.0 predstavuje vysoké investície, ktoré majú nízku návratnosť. Zvyčajne sa Industry 4.0 realizuje prostredníctvom krátkodobých projektoch zmien, ktoré prinášajú v relatívne krátkom čase úsek aj vysokú návratnosť investícií. Koncepcia sa začína v podniku uplatňovať už v samotnom zlepšovaní jednotlivých procesov, ale aj efektívne nastavenom systéme neustáleho zlepšovania (Masar, 2017).

Na vplyv priemyselnej revolúcie Industry 4.0 reagovalo aj Ministerstvo hospodárstva SR s koncepciou „Inteligentného priemyslu“ (Smart Industry), ktorú pripravilo a vytvorilo spoločne pre verejný sektor, priemysel a akademickú obec. Navrhnutá koncepcia predstavuje začiatok celoštátnej iniciatívy, ktorej cieľom je transformovať a posilniť priemysel pomocou najnovšieho technologického rozvoja, a tiež pomôcť Slovensku sa prispôsobiť zmenám, ktoré táto transformácia prinesie (Koncepcia inteligentného priemyslu 2015).

Podľa Siváka (2018) princípy Industry 4.0 aplikované do priemyslu a služieb si vynúti zmeny v stanovených zásadách analýzy rizika, predikcie scenárov vývoja krízových situácií, plánovania opatrení na odvrátenie, resp. zmierenie následkov ohrozenia. Budú vyžadovať zvládnutie nových prístupov k multikriteriálnym, viacodborovým či medziodborovým metódam a procesom (Sivák, 2018).

2. SÚČASNÝ STAV PROBLEMATIKY VO SVETE

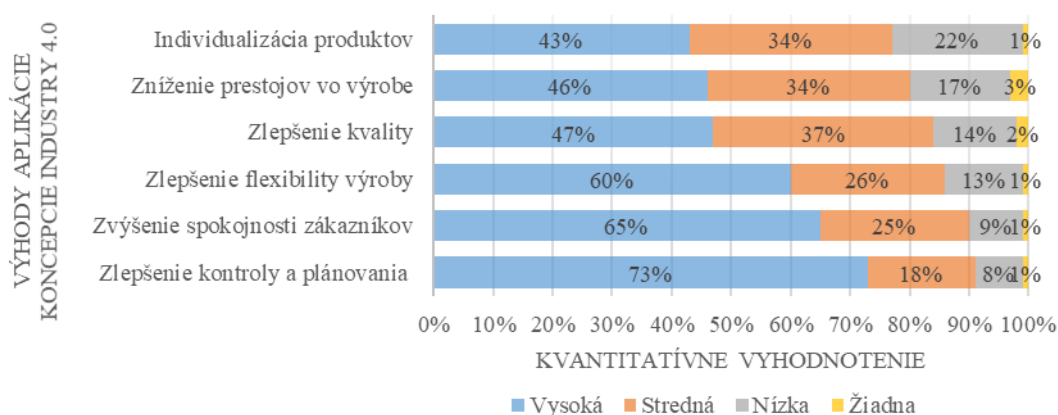
V súčasnosti sa v zahraničí realizujú rôzne prieskumy s orientáciou na posúdenie súčasného stavu implementácie prvkov koncepcie Industry 4.0 v podnikoch. V roku 2016 rakúska spoločnosť PWC uskutočnila prieskum, ktorej hlavným cieľom bolo posúdiť možné problémy, ako i výhody implementácie prvkov koncepcie Industry 4.0. Z uvedeného prieskumu stanovila nasledujúce závery (PWC 2016, Mikesova 2016):

1. Koncepcia Industry 4.0 zmenila celú spoločnosť a stala sa neoddeliteľnou súčasťou agendy vrcholového manažmentu.
2. Predpokladá sa, že do roku 2020 rakúske podniky investujú cez 4 miliardy eur do implementácie prvkov koncepcie Industry 4.0.
3. Počet tzv. digitalizovaných podnikov sa za 5 rokov strojnásobí.
4. Implementácia prvkov koncepcie Industry 4.0 smeruje k vyššej produktivite, efektívnemu využívaniu zdrojov a nákladov.
5. Integrácia a využívanie tzv. robustných dát, pre zefektívňovanie procesov v organizáciách.
6. Digitalizácia jednotlivých portfólií produktov a služieb sa stáva kľúčovým faktorom úspechu podnikov.
7. Digitalizácia produktov a služieb prinesie navýšenie zisku jednotlivých rakúskych podnikoch rádovo až o 3 miliardy eur ročne.

8. Konceptia Industry 4.0 vytvorí nové účinné podnikateľské modely a koncepcie naprieč celým podnikateľským prostredím vo všetkých odvetviach.
9. Spolupráca medzi podnikmi uľahčí ľahšie porozumenie požiadavkám zákazníkom.
10. Konceptia Industry 4.0 prinesie viaceré príležitosti pre zlepšenie konkurencieschopnosti rakúskym podnikom.

Súčasťou spracovaných výsledkov z prieskumu bolo aj zhodnotenie jednotlivých výhod z implementácie prvkov koncepcie Industry 4.0. Medzi najväčšiu výhodu považovali podniky **zlepšenie kontroly a plánovania**. Bolo to spôsobené najmä väčším implementovaním informačno-komunikačných technológií do výroby, čím sa zlepšila kontrola vstupov, výstupov a celého výrobného procesu (obr. 1).

Obrázok 1: Výhody z implementácie prvkov koncepcie Industry 4.0 pre podniky



Upravené podľa: PWC 2016

Za ďalšiu výhodu, ktorá vplýva na celkové využitie koncepcie Industry 4.0 považovali podniky **zvýšenie spokojnosti zákazníkov**, ktorá má priamy vplyv aj na zlepšenie plánovania a kontroly vo výrobnom procese. Ak sa podarí zlepšiť kontrolu, následne i plánovanie celého výrobného procesu, dokáže sa predísť mnohým chybám, ktoré nie je možné zachytiť štandardnými výstupnými kontrolami vo výrobnom procese. Zvyčajne sa tieto chyby prejavajú až u zákazníka, čím sa naruší celkový vzťah zákazníka a výrobcu. Ďalšou výhodou bolo **zlepšenie flexibility výroby**, čo taktiež súvisí s plánovacím procesom. Ak je podnik schopný efektívne naplánovať svoje zdroje, dokáže ich aj efektívne využívať vo svojich výrobných procesoch. Medzi ďalšie výhody patrili **zlepšenie kvality**, **zníženie prestojov** a **individualizácia projektov**.

V roku 2018 realizovala spoločnosť Ernst a Young prieskum v Indii, z dôvodu vyššej úrovni implementácie prvkov koncepcie Industry 4.0 než v európskych krajinách. Z pohľadu celkových výsledkov prieskumu, možno jednoznačne povedať, že manažéri v indických podnikoch považujú za prioritu vytvárať tzv. **digitálne podniky**, následne neustále sledovať požiadavky zákazníkov a kladť väčší dôraz na kybernetickú bezpečnosť používaných informačno-komunikačných technológií.

Medzi najväčšie problémy pri implementácii prvkov koncepcie Industry 4.0 v indických podnikoch patrili (E&Y, 2018):

- **Agilita a rýchly vývoj nových technológií** – v súčasnom globálnom prostredí dochádza k pomerne rýchlemu nárastu výskumu a vývoja nových technológií. Vznikajú však početné

problémy s ich priamym prepojením a kompatibilitou na už existujúce jednotlivé zariadenia.

- **Znalostné medzery, týkajúce sa používania nových technológií u zamestnancov** - zamestnanci sa mnohokrát s novou technológiou v podniku ani nestretli, preto sú nútení neustále vzdelávať sa v používaní nových technológií, čo vyvoláva odpor a mnohokrát aj stratu motivácie.
- **Rýchla morálna amortizácia produktov** – nakoľko dochádza k nárastu výskumu a vývoja, niektoré produkty už nespĺňajú jednotlivé požiadavky a svetové trendy. Dochádza k rýchlemu morálnemu opotrebeniu (podľa prieskumu až 3,68 násobne vyššie ako pred koncepciou Industry 4.0).
- **Vysoké vstupné investičné náklady na vybudovanie „digitálneho podniku“** – informačná technologická základňa na vybudovanie tzv. digitálneho podniku je veľmi finančne náročná. Kvôli vysokých vstupným investíciám si malé a stredné podniky mnohokrát nemôžu dovoliť zaoberať sa implementáciou prvkov koncepciou Industry 4.0.

3 SÚČASNÝ STAV PROBLEMATIKY NA SLOVENSKU

V roku 2017 spoločnosť „Sova digital a Revue priemyslu“ prostredníctvom prieskumu spracovala výsledky o súčasnom stave využívania koncepcie Industry 4.0 v podnikoch na Slovensku. Prieskumu sa zúčastnili malé, stredné a veľké podniky, ktoré realizujú svoje podnikateľské aktivity na Slovensku. Z pohľadu odvetvia sa zúčastnilo 53% podnikov z oblasti strojárkeho a automobilového priemyslu a 13% z oblasti elektrotechniky.

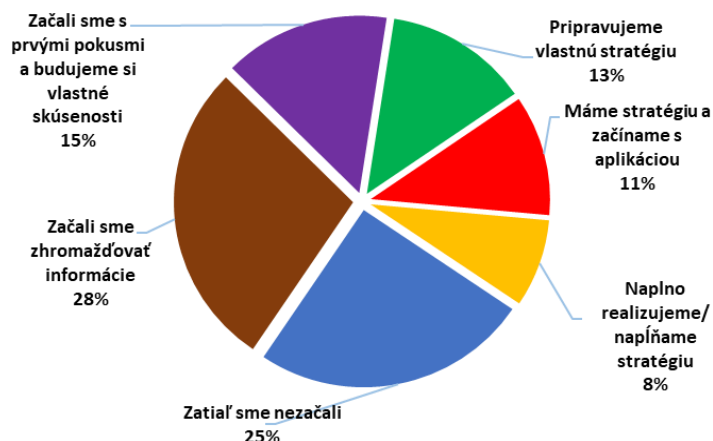
Obrázok 2: Percentuálny podiel vnímania prínosov koncepcie Industry 4.0 majiteľmi a manažérmi podnikov v roku 2017



Upravené podľa: Sova, 2017

Z prieskumu vyplýva (obr. 2), že 66% majiteľov a manažérov podnikov videlo dôležitosť v implementácii prvkov koncepcie Industry 4.0, 21% majiteľov a manažérov podnikov tvrdilo, že je potrebné riešiť a zaoberať sa koncepciou Industry 4.0, ale nevideli v tom nič dôležité pre ich budúcnosť, iba 2% majiteľov a manažérov podnikov považovali koncepciu Industry 4.0 za bezvýznamnú. Koncepcia môže priniesť podniku na Slovensku množstvo výhod, ak ju budú vedieť správne implementovať a využívať výhody digitálneho podniku.

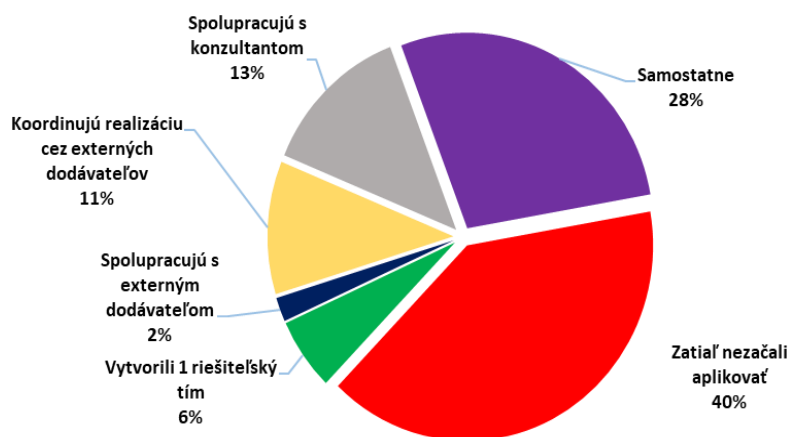
Obrázok 3: Percentuálny podiel úrovne prípravy implementácie koncepcie Industry 4.0 v podnikoch v roku 2017



Upravené podľa: Sova, 2017

Ďalej z prieskumu vyplýva (obr. 3), že 25% podnikov v roku 2017 ešte s implementáciou prvkov koncepcie Industry 4.0 ani nezačalo, 28% podnikov postupne zhromažďovalo informácie a uvažovalo o možnostiach implementácie ako aj o výhodách, ktoré prináša nová koncepcia, iba 11% podnikov aktívne začínalo implementovať prvky koncepcie Industry 4.0. Uvedené výsledky môžu byť spôsobené najmä nízkou mierou informácií o samotnej koncepcii, o možnostiach implementácie prvkov koncepcie, či konkrétnych výhodách ako aj možnostiach riadenia projektov súvisiacich s implementáciou Industry 4.0.

Obrázok 4 : Percentuálny podiel úrovne aplikácie koncepcie Industry 4.0 v podnikoch v roku 2017



Upravené podľa: Sova, 2017

Následne z prieskumu vyplýva (obr. 4), že podniky na Slovensku mali z pohľadu aplikácie koncepcie Industry 4.0 mierne nedostatky v porovnaní s ostatnými krajinami. Až 40% podnikov ešte nezačalo aplikovať koncepciu 4.0, 23% podnikov sa snaží koncepciu implementovať svojpomocne. Práve nedostatok skúsenosti a svojpomocná implementácia koncepcie vedie k najčastejším chybám, ktoré môžu vyvolať problémy smerujúce k odporu a nechuti využívať koncepciu. Pozitívne je možné hodnotiť záujem majiteľov a manažérov podnikov o koncepciu Industry 4.0 a ich implementáciu do svojich procesov. Industry 4.0 prináša nový trend digitálnych podnikoch a tzv. smart podnikoch. Orientuje sa na priame

prevzatie jednotlivých opakujúcich sa činností, ako aj jednoduchých činností strojmi a fyzikálno-kybernetickými procesmi. S týmto nepriamo súvisí vznik nových pracovných pozícií a potrebu vysoko kvalifikovanej pracovnej sily, ktorá bude schopná tieto technológie aktívne ovládať.

4. CIEĽ A METODOLÓGIA

Hlavným cieľom príspevku je na základe analýzy súčasného stavu implementácie prvkov koncepcie Industry 4.0 v podnikoch vo svete a na Slovensku vytvoriť model manažmentu rizík projektov v kontexte koncepcie Industry 4.0. Spracovaný model vychádza z integrácie požiadaviek stanovených v medzinárodných normách ISO 31 000:2018, ISO 21 500:2012 a potrieb koncepcie Industry 4.0.

Na splnenie stanoveného cieľa boli použité metódy: analýza a dedukcia. Vytvorený model manažmentu rizík projektov môže byť využiteľný v podmienkach implementácie prvkov koncepcie Industry 4.0 v prostredí výrobného podniku. Grafický rámec modelu bližšie špecifikuje jednotlivé kroky a dôležité charakteristiky procesu manažmentu rizík projektov, ktoré sú potrebné na efektívne posúdenie a riadenie rizík projektov v kontexte koncepcie Industry 4.0.

Postup vytvorenia modelu pozostáva z nasledujúcich fáz:

- popis modelu manažmentu rizík projektov,
- vytvorenie grafickej schémy modelu manažmentu rizík projektov,
- popis využiteľnosti vytvoreného modelu.

5. VÝSLEDKY

Na základe analýzy súčasného stavu implementácie prvkov koncepcie Industry 4.0 v podnikoch vo svete a na Slovensku, ako aj požiadaviek stanovených v normách ISO 31000 a ISO 21500 bol vytvorený model manažmentu rizík projektov za účelom efektívnej a úspešnej realizácie projektov aplikovaných v podmienkach koncepcie Industry 4.0 v Slovenskej republike. Navrhnutý model vhodne prepája požiadavky stanovené v medzinárodných normách a pozostáva z 3 hlavných krokov využiteľných v projektovom riadení (obr. 5):

1. Vytváranie súvislostí pre tvorbu projektov.
2. Posudzovanie rizík projektu.
3. Tvorba opatrení na zníženie rizík projektu.

Podporné kroky sú v navrhovanom modeli definované nasledovne:

1. Vytváranie súvislostí pre tvorbu projektov:
 - a. vytvorenie súvislosti pre potreby procesu manažmentu rizík projektov,
2. Posudzovanie rizík projektu:
 - b. identifikácia rizík projektu,
 - c. schválenie identifikovaných rizík projektu,
 - d. analýza rizík projektu,
 - e. hodnotenie rizík projektu,
3. Tvorba a aplikácia stratégií pre efektívne riadenie rizík projektu:
 - f. opatrenia na zníženie negatívnych rizík projektu,

g. opatrenia na využitie pozitívnych rizík projektu.

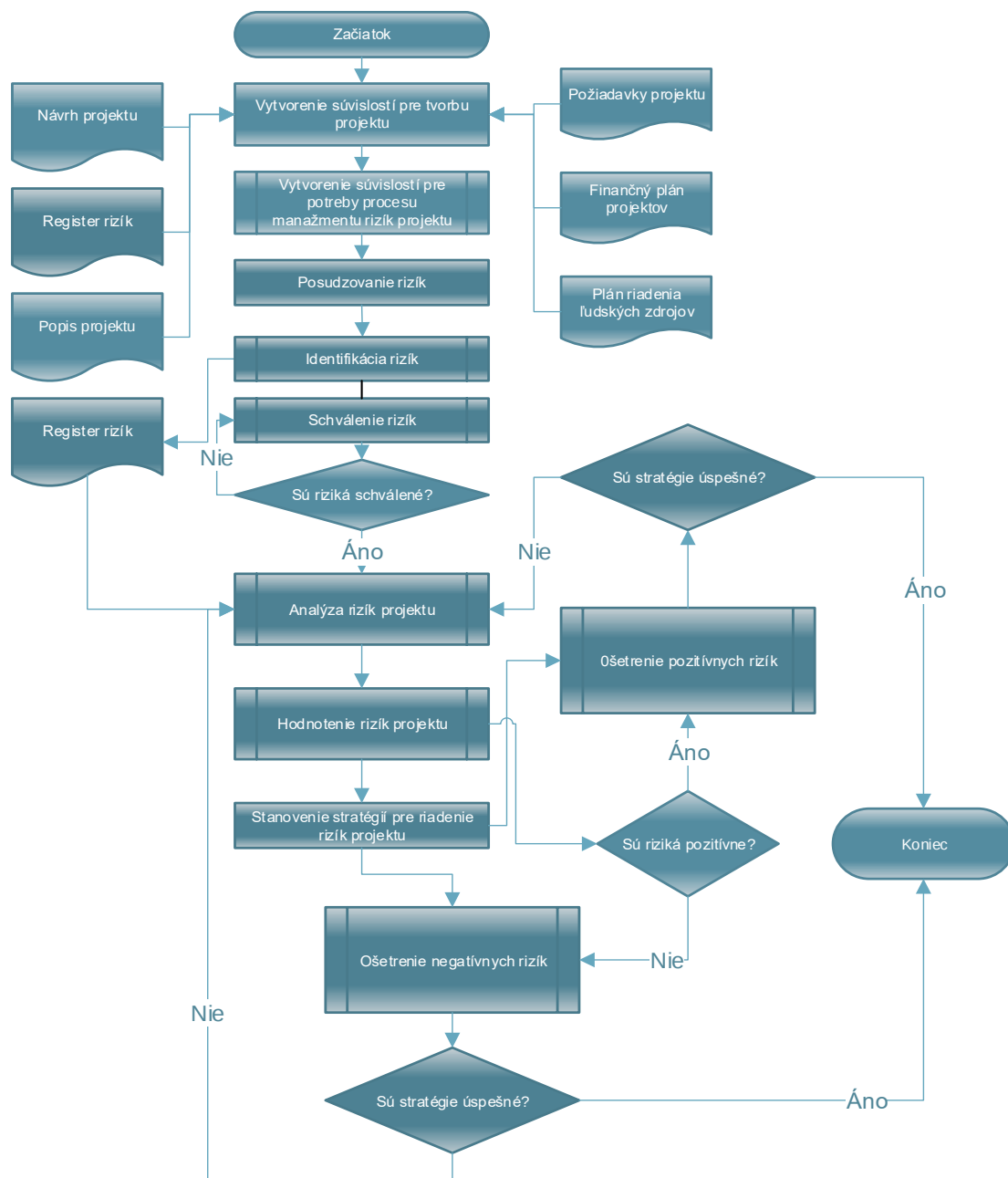
Vytváranie súvislostí pre tvorbu projektov - je fáza, ktorá je nevyhnutná na správne určenie jednotlivých projektových rizík (ako hrozieb tak aj príležitosti) a na vhodné stanovenie preventívnych opatrení, prostredníctvom ktorých je možné hrozbu znížiť, alebo príležitosť využiť. V tejto časti je potrebné venovať pozornosť aj návrhu projektu, opisu projektu, cieľom projektu, finančnej analýzy a personálneho zabezpečenia projektu.

- a) Pri návrhu projektu je potrebné pripraviť návrh podľa charakteru organizácie v ktorej sa bude projekt realizovať. Potrebné je aj uviesť skúsenosti s realizáciou podobných projektov.
- b) Pri opise projektu je potrebné definovať a vysvetliť údaje a informácie o projekte. Ide o popis projektu najmä z pohľadu aktivít projektu, finančných ukazovateľov a špecifikácií prostredia, v ktorom podnik realizuje svoje aktivity.
- c) Pri stanovení cieľov projektu je potrebné definovať a popísať hlavný účel, pre ktorý bol projekt pripravený. Popis má byť jednoduchý, stručný a výstižne spracovaný, aby bolo možné odmerať úspešnosť realizácie projektu, pričom by mali byť zahrnuté i špecifické ciele projektu pričom treba dbať, aby špecifické ciele projektu boli vždy v súlade s požiadavkami organizácie v ktorej sa projekt realizuje.
- d) Pri personálnom zabezpečení je potrebné bližšie špecifikovať ľudské zdroje, ktoré sú nevyhnutné na realizáciu projektov, určiť zodpovednosť, personálnu štruktúru a spôsob komunikácie.

Vytváranie súvislostí pre tvorbu projektov z pohľadu riadenia rizík je fáza na základe ktorej sa vytvoria jednotlivé súvislosti, ktoré sú nevyhnutné na aplikovanie procesu manažmentu rizík projektov. Ide najmä o:

- stanovenie popisu a špecifikácií spôsobov, metód a techník na základe ktorých sa budú riziká identifikovať a hodnotiť,
- vytvorenie databázy rizík, ktorá dokumentuje riziká z predchádzajúcich podobných projektov (poučenie z minulosti),
- určenie kategórie rizík, pre účel zatriedenia do príslušnej kategórie,
- určenie veľkosti pravdepodobnosti, na základe ktorej sa budú môcť riziká posúdiť z pohľadu ich výskytu,
- určenie veľkosti dopadu, na základe ktorej sa budú môcť riziká posúdiť z pohľadu ich následkov,
- vytvorenie matice rizík, na základe čoho bude možné riziko hodnotiť.

V etape posudzovania rizík by sa mala pozornosť venovať identifikácii, analýze a hodnoteniu rizík projektu. Je potrebné identifikovať čo najviac rizík, ktoré môžu projekt ovplyvniť negatívne (hrozby), tak i pozitívne (príležitosti). Vo fáze analýzy rizík projektu je nevyhnutné riziká bližšie analyzovať tzn. popísať a charakterizovať ich príčiny vzniku. Pri hodnotení rizík projektu je potrebné riziká hodnotiť na základe stanovených kritérií a hodnôt vytvorených v etape vytvárania súvislostí pre tvorbu projektov. Následne je nevyhnutné stanoviť pravdepodobnosť výskytu a následky projektových rizík, ktoré sa celkovo vyhodnotia a zaradia v matici rizík.

Obrázok 5: Model manažmentu rizík projektu v kontexte koncepcie Industry 4.0

Zdroj: Vlastné spracovanie

V tretej etape stanovenie opatrení pre riadenie rizík projektu je potrebné posúdené riziká projektu rozčleniť na pozitívne a negatívne. Pričom pri neakceptovateľných rizikách je nevyhnutné stanoviť stratégiu, na základe ktorej sa manažéri pokúsia negatívne riziká znížiť, preniesť, obísť a prijať a príležitosť zvýšiť, akceptovať, zdieľať a využiť.

Medzi možné výhody využitia navrhnutého modelu manažmentu rizík projektu možno zaradiť: zvyšujúca sa podpora pri projekte neustáleho zlepšovania, podpora pri znížení rizík projektov, zvýšenie šancí na využitie príležitostí, zapojenie celého tímu, rešpektovanie aktuálnych trendov, rešpektovanie regionálnych charakteristík, rešpektovanie úrovne projektového manažmentu v krajine, jednoduchšia a ľahká modifikácia procesu podľa požiadaviek a charakteristík projektu v podniku.

Medzi nevýhody využitia navrhnutého modelu manažmentu rizík projektu možno zaradiť: nedostatky v oblasti aplikácie, kedy sa proces zameriava len na projekty z oblastí Industry 4.0 či orientáciou modelu výlučne na riziká projektov vo výrobnom podniku.

Navrhnutý model manažmentu rizík projektu by mal akceptovať viaceré významné zásady, napr.: akceptácia rozvoja projektového riadenia v krajine, ktorá vždy rozhoduje o tom, či je možné proces riadenia aplikovať alebo nie, prehľadne a jednoduché spracovanie modelu, prispôsobivosť súčasným súčasným trendom v oblasti riadenia rizík, projektového riadenia, plnenie zákonitosti, ktoré vyplývajú z projektového riadenia v konkrétnom podniku (Karanja, 2017).

4. ZÁVER

Prínosom príspevku je vytvorený model manažmentu rizík projektov, ktorý vychádza z integrácie požiadaviek stanovených v medzinárodných normách ISO 31 000:2018, ISO 21 500:2012 a potrieb implementácie prvkov koncepcie Industry 4.0. Navrhovaný model je možné rozšíriť o potrebné charakteristiky v závislosti od druhu a typu projektu. Zároveň je model ľahko modifikovateľný a využiteľný v podmienkam akéhokoľvek podniku.

Navrhnutý model manažmentu rizík projektov môže byť nástrojom manažérov pre efektívne riadenie rizík projektu v podniku v kontexte koncepcie Industry 4.0. Jeho aplikáciou je možné dosiahnuť kvalitnejšiu prípravu plánovacej etapy projektu ako i stanovenie preventívnych opatrení na splnenie cieľov projektu. Model vhodne zabezpečuje i úspešnú realizáciu projektov, naplnenie očakávania projektu a dodržanie stanoveného rozpočtu projektu pri implementácii prvkov koncepcie Industry 4.0. Nielen projektoví manažéri, ale aj vrcholoví manažéri podnikov, by sa mali snažiť o aplikáciu manažmentu rizík projektov a vytvárať pozitívny postoj k riadeniu rizík v rámci podnikovej kultúry.

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VPLYV KONCEPTU PRIEMYSEL 4.0 NA SPOLOČNOSŤ THE IMPACT OF INDUSTRY 4.0 INITIATIVE ON SOCIETY

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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 skúmať vplyv konceptu Priemysel 4.0 na zmeny v spoločnosti. Nasledujúce úlohy boli identifikované pre realizáciu nášho cieľa: definovať kľúčové pojmy (koncept Priemysel 4.0, internet vecí), analyzovať vplyv Priemyslu 4.0 na pracovný a súkromný život. Výskumné metódy použité v príspevku: teoretické všeobecné metódy vedeckého poznania: indukcia, dedukcia, analýza, syntéza dostupných bibliografických odkazov, vedecká abstrakcia pri generalizácii výsledkov.*

Kľúčové slová: *internet vecí, legislatíva, Priemysel 4.0, spoločnosť*

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 examine impact of Industry 4.0 initiative on society changes. Following tasks have been identified for the realization of our objective: to define key words (Industry 4.0 initiative, Internet of things), to analyse the impact of Industry 4.0 on work life balance. 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: *internet of things, legislation, Industry 4.0, society*

JEL Classification: *I30, J40*

1. ÚVOD

Európa stojí na počiatku novej priemyselnej revolúcie, priemyselná výroba vstupuje v súčasnosti do novej etapy. Prvá priemyselná revolúcia odštartovala parným strojom, použila paru na mechanizáciu výroby. Prvý parný stroj skonštruoval už koncom 17. storočia Denis Papin, zdokonalil ho Thomas Newcomen a ďalej James Watt. Prvý cyklus trval viac než 100 rokov. Prvá priemyselná revolúcia znamenala nahradenie ľudskej práce prácou mechanickou a uvedená premena sa týkala na začiatku najmä Veľkej Británie, jednalo sa o prechod od ručnej výroby v manufaktúrach k strojnej výrobe s využitím vodného pohonu a parných strojov. Začiatok 20. storočia je spätý s deľbou práce, masovou výrobou pomocou elektrickej energie, pásovou výrobou. Genialita Henryho Forda spočívala v spojení charakteru práce s automatickou linkou podávania hotových dielov, s vysokou produktivitou práce a následne s vysokou mzdou. Druhá priemyselná revolúcia prepukla v Spojených štátoch amerických v znamení významnej elektrifikácie výroby a zahájení masovej produkcie, trvala menej než 80 rokov a použila elektrickú energiu a pásovú výrobu k vytvoreniu sériovej výroby. Tretí cyklus trval menej ako 50 rokov. Tretia priemyselná revolúcia začiatkom 70. rokov 20.

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storočia bola spojená s automatizáciou výroby, uplatnila elektroniku a informačné technológie pre automatizáciu výroby. Výroba bola riadená počítačom. Tretiu revolúciu charakterizuje elektronizácia a robotizácia výroby, zavedenie riadiacich systémov na softvérovej báze. Štvrtá priemyselná revolúcia sa vyznačuje nástupom kyberfyzikálnych systémov, ktorých takmer každá súčiastka je napojená na internet. Rok 2020 bude prezentovaný prostredníctvom Internetu vecí (IoT) aplikovaným do výroby, spolupracujúcimi robotmi, prvkami umelej inteligencie a ďalšími technológiami. Počítačom riadená výroba bude pokračovať avšak so zjavným zrýchlením procesov. Štvrtú priemyselnú revolúciu nazývame aj digitálnou revolúciou.

Každá revolúcia má svojich hrdinov. Nositeľmi prvej boli banskí a strojní inžinieri, druhá vyniesla na výslnie vynálezcov, konštruktérov a manažérov výroby, tretia IT špecialistov. Štvrtú ovládnu experti schopní prepojiť IT, mechanickú a inžiniersku stránku výroby.

2. CIEĽ A METODOLÓGIA

Predložený príspevok má teoretický charakter. Hlavným cieľom príspevku je skúmať vplyv konceptu Priemysel 4.0 na zmeny v spoločnosti. Pre realizáciu tohto cieľa boli určené nasledovné úlohy: definovať kľúčové pojmy (koncept Priemysel 4.0, internet vecí), analyzovať vplyv Priemyslu 4.0 na pracovný a súkromný život. Výskumné metódy použité v príspevku: teoretické všeobecné metódy vedeckého poznania – indukcia, dedukcia, analýza, syntéza dostupných bibliografických odkazov, vedecká abstrakcia pri generalizácii výsledkov. Štúdiá má význam pre terminológiu sociálnej sféry – pre oblasť sociálnej politiky a trhu práce a politiky zamestnanosti.

3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

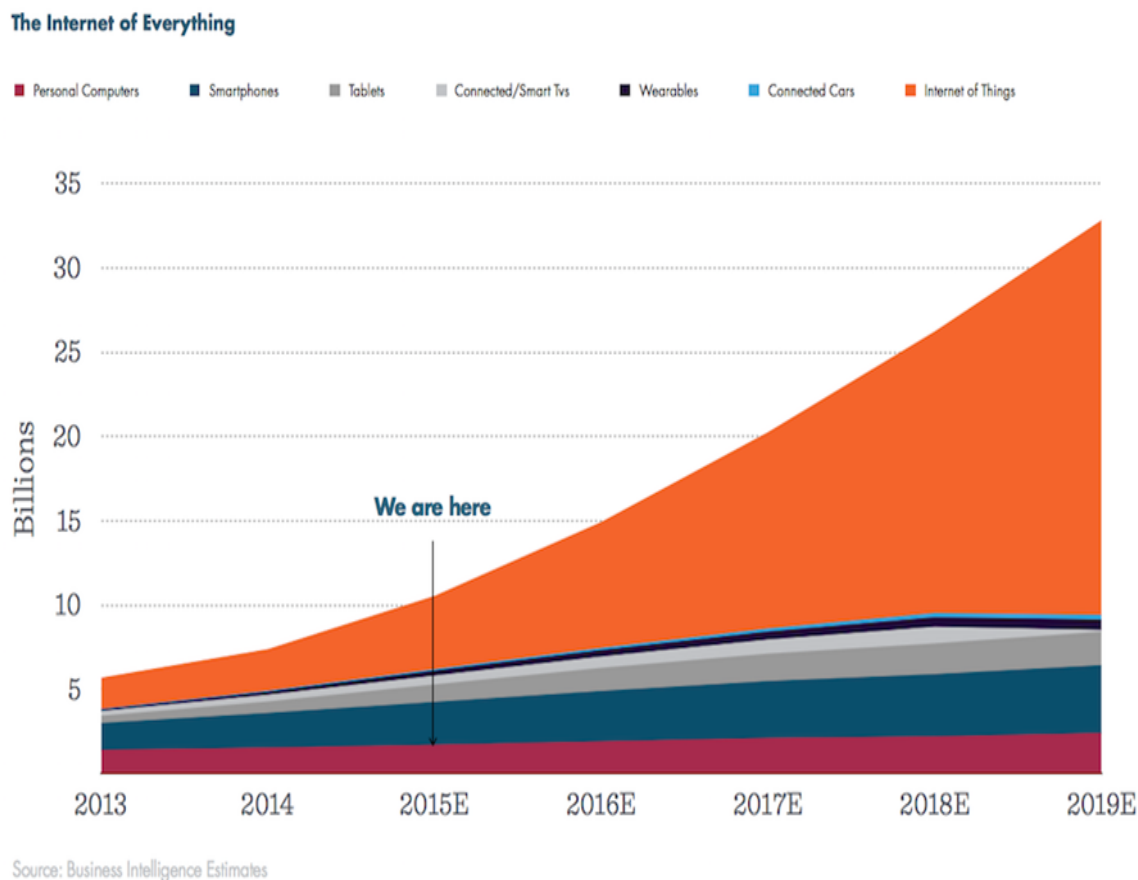
Charakteristika Priemyslu 4.0, internet vecí

V *Priemysle 4.0* ľudia, stroje, zariadenia, logistické systémy a produkty budú navzájom komunikovať a spolupracovať, aby sami spoločne optimalizovali výrobný proces. Každý stroj, súčiastka i vyrábaný dielec si budú strážiť svoj stav a on-line o ňom informovať. Rovnako tak si budú pamätať svoju históriu a predvídať možné poruchy a samy si plánovať servisné zásahy. Koncept Priemysel 4.0 so sebou prinesie decentralizáciu riadenia výroby. Vytvorí sa vzájomné väzby medzi strojmi, vyrábanými dielmi a výrobným prostredím. Do uvedených väzieb budú zapojení aj dodávatelia, distribútori a zákazníci. Konečný efekt sa prejaví v nižších nákladoch na výrobu výrobku, roznamitosti výrobkov, pružnosti firiem a skrátení inovačného cyklu. Hlavné zmeny, na ktorých je koncept Priemyslu 4.0 postavený zahŕňajú: komunikačné prepojenie, tzv. internet vecí, schopnosť identifikácie prostredia prístrojmi, používanie inteligentných robotov, zber extenzívnych dát, využívanie umelej inteligencie na isté vlastné rozhodnutia prístrojov (Bruchaník, 2016).

Vzájomnú komunikáciu v rámci systému (kyberneticko-fyzikálneho systému CPS) nám umožňuje internet vecí (IoT). *Internet vecí* je sieť fyzických objektov – zariadení, vozidiel, strojov a iných predmetov so vstavanou elektronikou, softvérom, senzormi a pripojením k sieti, ktorý umožňuje týmto objektom zber a výmenu údajov (pozri Obrázok 1). Praktickým príkladom je monitorovanie srdcových implantátov, biočipy na hospodárskych zvieratách, autá so zabudovanými senzormi, zariadenie pre monitoring patogénov v jedle alebo prevádzka zariadení v teréne, ktoré pomáhajú záchranárom pri pátraciach a záchranných akciách (<http://industry4.sk;2018>). S internetom vecí sa spájajú (Pease, Buck, Goldová, Cejnarová, 2013): smart planéta (environmentálne senzory...), smart mestá (systémy pre riadenie premávky...), smart energia (výstupné senzory a senzory napätia...), smart budovy (senzory pohybu...), smart doprava (elektromobilita a vysokorýchlostné vlaky...), smart priemysel (roborika...), smart zdravotníctvo (biosenzory, telemedicína...), smart životný štýl (pračka a sušička...)

Obrázok 1: Veľkosť internetu vecí na trhu so zariadeniami

Size of the IoT Device Market



Zdroj: <http://industry4.sk/technologie/#1>

Zásadný krok k internetu vecí urobila v roku 2012 Internet Society. Vydala nový štandard internetových protokolov. Svet má vďaka tomu k dispozícii vyše 340 sextiliónov IP adries. Tie nové nebudú primárne určené pre ľudí, ale pre veci. Podľa odhadov spoločnosti Cisco Systems bude do roku 2020 pripojených na internet okolo 50 miliárd zariadení, z ktorých miliardy budú zabudované do predmetov každodennej potreby (pozri Obrázok 2) – do oblečenia, mobilných telefónov, súčiastok áut a pod. (Pease, Buck, Goldová, Cejnarová, 2013).

Pre zapojenie predmetov do internetu treba vhodný technický nástroj. Ako najperspektívnejšia sa v súčasnosti ukazuje technológia RFID – rádiový frekvenčná identifikácia. Každý predmet má implementovaný čip, ktorý bezdrôtovo odosiela data do siete. Predpokladá sa, že v budúcich rokoch bude k internetu pripojené takmer každé zariadenie. Tento trend sa nevyhne žiadnemu priemyselnému odvetviu a žiadnej oblasti každodenného života (Pease, Buck, Goldová, Cejnarová, 2013).

Obrázok 2: Nárast internetových pripojení do roku 2020

Zdroj: <http://industry4.sk/technologie/#1>

Technická revolúcia zmení spôsob, akým žijeme

Internet vecí prinesie zmeny do nášho pracovného a súkromného života. Roboty sa objavujú na miestach, kde sa ľuďom nechce pracovať. Napríklad mzda v poľnohospodárstve býva podpriemerná, námaha je stále veľa, spoločenské ocenenie podpriemerné. Prvým krákom sú stroje vybavené GPS autopilotom, ďalšia generácia postrekuje a pleje, lebo bezpečne rozpozná burinu od plodiny (Janků, 2013). Štvrtá priemyselná revolúcia má potenciál k zvýšeniu hladiny svetových príjmov a k zlepšeniu kvality života obyvateľstva po celom svete. O tom, aké zmeny sa v súvislosti s naplnením cieľov Priemyslu 4.0 očakávajú v sociálnej oblasti je zatiaľ informovanosť dosť nízka. Podľa Fleischa (2013) technológie dajú možnosť ich obyvateľom zúčastňovať sa na správe spoločnosti. Mobilné komunikačné technológie umožnia v budúcnosti oveľa väčšiemu počtu ľudí prístup na internet. Profesor Fleisch hovorí o demokratizujúcom účinku internetu vecí, z ktorého môže profitovať čoraz väčšia časť menej prosperujúcich vrstiev spoločnosti.

Výzvou je nájsť konkurencieschopné riešenia pre realizáciu Priemyslu 4.0 tak, aby rozšírili ponuku na trhu práce o dobré pracovné miesta – t.j. o kvalifikované pracovné miesta, ktoré podporujú potrebu ďalšieho vzdelávania a sú zárukou zdravého pracovného prostredia. Sú vyžadované také formy odbornej prípravy a kvalifikácie, ktoré zvýšia blahobyt populácie (Kagermann, et al., 2013). “Zručnostná” medzera bude prekážkou k vytvoreniu jednotného digitálneho trhu. 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). Pri personálnych zručnostiach budú mať najvyššiu prioritu: časový a osobný manažment, adaptabilita a schopnosť prispôbiť sa zmenám, schopnosť pracovať v tíme, sociálne zručnosti, komunikačné schopnosti (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). Na preklopenie “zručnostnej “ medzery bude potrebné zaviesť nové flexibilné formy práce. Celkovo sa flexibilita prejaví v troch rovinách:

- 1) externe (outsourcovanie, kontrakty na prácu a služby, využívanie agentúr dočasného zamestnávania),
- 2) interne (kontrakty na dobu určitú, práca na skrátený úväzok, modely flexibilného pracovného času),
- 3) vzťahy medzi zamestnancami a firmou (zvýšené využívanie práce z domu – home office, mobilná práca, virtuálne tímy naprieč krajinami) (RUZ, 2017).

Spoločnosti strácajú potenciál značného objemu, keď nevyužívajú ľudské zdroje (Koišová, Masárová, Gullerová, 2018). V súvislosti Priemyslu 4.0 a pracovných miest sa budeme musieť vyrovnáť s tým, že dôjde k posunu z hľadiska kvalifikácie. A v tom vidia odborníci najväčšie úskalie Priemyslu 4.0 tzn. v nedostatku kvalifikovanej pracovnej sily. Robotník už nebude vykonávať ťažkú manuálnu prácu, ale bude vykonávať dohľad nad zariadením (robotom). Zmení sa náplň jeho práce a určite aj pracovné prostredie, ktoré bude komfortnejšie. Obavy zo straty pracovných miest nie sú na mieste. Aj v prvej, druhej a tretej priemyselnej revolúcii sa iba ukončili niektoré profesie, súčasne však vznikli nové pracovné pozície (Weissler, 2016).

Podľa Arthura (2013) budú mať ľudia viac času, väčšinu práce za nás budú vykonávať stroje. S touto situáciou sa bude musieť spoločnosť vyrovnáť. Jedným z riešení môžu byť nové pracovné pozície, napríklad v sociálnych službách – pre dobro spoločnosti ako celku. Možno budeme mať kratší pracovný deň a dlhšiu dovolenku, čo by mohlo umožniť, aby sa práca, ktorá zostane, lepšie rozdelila medzi ľudí.

Priemysel 4.0 v legislatíve

Koncept Industry 4.0 má pôvod v Nemecku a súvisí s analýzou vlády ohľadom dôsledkov nových technológií na hospodárstvo krajiny. Cieľom je vrátiť priemyselnú výrobu späť do Európy, prirodzene na technologickej úrovni, ktorá produktivitou môže konkurovať lacným krajinám.

Ministerstvo hospodárstva Slovenskej republiky zverejnilo v roku 2016 *štátnu koncepciu na tému Priemysel 4.0 s názvom Inteligentý priemysel pre Slovensko*. Pri tvorbe stratégie sme si brali príklad z nemeckej koncepcie Industry 4.0. V Nemecku bola koncepcia do značnej miery iniciovaná automobilovým priemyslom. Slovenská koncepcia ponúka holistický pohľad (pohľad na celý priemysel) z využitím skúseností z Českej republiky a Rakúska. Ústrednou myšlienkou je transformácia priemyslu v tradičnom ponímaní na nový typ priemyslu, ktorý využíva všetky poznatky z hľadiska digitalizácie, internetovej ekonomiky, robotizácie, a prepojenia priemyslu s vedecko-výskumnými inštitúciami a vzdelávaním do jedného celku schopného existencie v slovenských podmienkach. Koncepcia si kladie za cieľ priblížiť princípy Priemyslu 4.0 podnikateľskej sfére, popisuje dôležitosť spolupráce aplikovaného výskumu a vývoja s priemyslom, zdôrazňuje význam implementácie nových technológií a materiálov a poukazuje na možnosti koordinácie efektívneho financovania pre podporu výskumu a vývoja zo štátneho rozpočtu a európskych štrukturálnych fondov (Bložon, 2016).

Následne došlo k formulácii konkrétneho *akčného plánu* s definovaným časovým rámcom a jasnými strednodobými a dlhodobými cieľmi so zameraním na prioritné oblasti ako sú energie, materiály, nanotechnológie, výrobná sféra, robotika a ďalšie.

4. ZÁVER

Udržateľný rozvoj hospodárstva je podmienený vytvorením opatrení na implementáciu Priemyslu 4.0, ktoré môže zrýchliť ekonomický rozvoj, zvýšiť mieru pridanej hodnoty rastom

zhodnotenia výrobnéj spotreby a konkurencieschopnosť slovenského priemyslu. Dôležité je podporiť investície v high-tech oblastiach, budovať proinovačnú infraštruktúru, podporovať spoluprácu podnikov s organizáciami zameranými na vedu a výskum, stabilizovať kvalitnú pracovnú silu v podnikoch, zvýšiť kvalitu absolventov škôl, vylepšiť systém duálneho vzdelávania a podnikateľské prostredie.

Spojením všetkých technológií, organizačných a komunikačných foriem do jedného konceptu vzniká nová paradigma. Základom je vývoj smerom k big data, a k vzájomne poprepájaným, inteligentným a modulárnym kyberneticko-fyzikálnym systémom (Cyber-Physical-System – CPS), ktoré navzájom komunikujú prostredníctvom internetu vecí (IoT). Produkty s prívlastkom smart budú disponovať informáciami o procese svojej výroby a budú si ukladať všetky podstatné dáta o samotnej výrobe, meraniach a špecifikáciách v jednotlivých krokoch svojho vzniku. Zmena paradigmy sa bude týkať všetkých oblastí podniku. Počas celého životného cyklu výrobku od návrhu cez konfiguráciu, plánovanie, výrobu, prevádzku u zákazníka, až po recykláciu sa Priemysel 4.0 stará o to, že sa môžu zohľadniť individuálne kritéria zákazníka i produktu a tiež uložiť, spätne vysledovať a opätovne použiť všetky relevantné dáta. Vo vízii Priemyslu 4.0 komunikujú a vzájomne na seba pôsobia ľudia, stroje, zdroje a produkty. Všetko speje k totálnemu zosieťovaniu.

Bude nevyhnutné, aby sa zamestnanci preorientovali na nové typy zamestnaní, po ktorých bude zvýšený dopyt. Z dlhodobého hľadiska je možné očakávať, že približne pätina zamestnancov zmení zamestnanie mimo oblasti, na ktorú sa pôvodne zaučali. Nové pracovné príležitosti vyplývajúce zo zavádzania automatizácie si budú vyžadovať zamestnancov s novými zručnosťami a schopnosťami, ktoré v súčasnosti nemajú. Zlepšenie kvalifikácie zamestnancov je dôležité naprieč odvetviami priemyslu a služieb, vo všetkých častiach hodnotového reťazca – od vývoja, cez produkciu až po predaj. Štvrtá vedecká revolúcia a Priemysel 4.0 ovplyvnia všetky aspekty ľudského života. Treba si uvedomiť, že sa nebude týkať len priemyslu, trhu práce, vzdelávacieho systému, ale sa stane bežnou každodennosťou.

Dodatok

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VPLYV ŽIVOTNÝCH PODMIENOK NA PRACOVNÚ MOBILITU V RÁMCI PARTNERSTVA EURES-T BESKYDY

IMPACT OF LIVING CONDITIONS ON LABOR MOBILITY WITHIN PARTNERSHIP EURES-T BESKYDY

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Abstrakt: Mobilitu na trhu práce ovplyvňujú rôzne faktory pozitívnym či negatívnym smerom. Identifikovať stimuly a bariéry v procese pracovnej mobility v prihraničnej oblasti Slovenskej republiky, Poľskej republiky a Českej republiky sa podarilo prostredníctvom získania informácií o životných podmienkach jednotlivých krajín spadajúcich do cezhraničného partnerstva EURES-T Beskydy. Získané údaje o výdavkoch na konečnú spotrebu domácností, bytovej situácie, jazykovej bariéry a platobnej mene v jednotlivých krajinách boli porovnané a vyhodnotené. Prostredníctvom komparácie sa identifikovali existujúce bariéry a stimuly v procese pracovnej mobility v prihraničných oblastiach Slovenskej republiky, Poľskej republiky a Českej republiky spadajúcich do cezhraničného partnerstva EURES-T Beskydy.

Kľúčové slová: EURES-T Beskydy, pracovná mobilita, životné podmienky

Abstract: Mobility in the labor market influences various factors in positive or negative direction. The identification of the incentives and barriers in the process of labor mobility in the border area of the Slovak Republic, the Republic of Poland and the Czech Republic has been achieved through the acquisition of information about the living conditions of individual countries belonging to the EURES-T Beskydy crossborder partnership. The data of household final consumption expenditure, housing situation, language barrier and payment currency in each country were compared and evaluated. The existing barriers and incentives in the labor mobility process were identified by comparison in the border regions of the Slovak Republic, the Republic of Poland and the Czech Republic belonging to the EURES-T Beskydy crossborder partnership.

Key words: EURES-T Beskydy, labor mobility, life conditions

JEL Classification: J08, J60, J610, J830

1. ÚVOD

Pohyb je súčasťou bežného života obyvateľstva. Každý deň sa presúvame z jedného miesta na iné za našimi povinnosťami, či už pracovnými, školskými či rodinnými. V ekonomickom ponímaní sa pohyb obyvateľstva za prácou označuje ako mobilita na trhu práce. V procese pracovnej mobility sa vyskytuje množstvo faktorov, vplyvujúcich pozitívne alebo negatívne na pracovnú mobilitu. Za pozitívne faktory sa označujú tie, ktoré proces dochádzania za prácou stimulujú. Negatívne pôsobiace faktory naopak tento proces spomaľujú, resp. brzdia.

Životné podmienky sú jedným z faktorov, ktoré ovplyvňujú mobilitu na trhu práce. V prípade, že v jednej krajine nie sú podmienky pre život obyvateľstva vyhovujúce, núti ich takáto situácia hľadať prácu v druhej krajine, najlepšie v prihraničnej. Z pohľadu prvej krajiny s nedostačujúcimi životnými podmienkami vnímame takúto situáciu ako stimul v procese pracovnej mobility do inej krajiny. Z pohľadu krajiny druhej predstavujú nevyhovujúce životné podmienky prekážku, ktorá bráni pracovnej mobilite z druhej krajiny do prvej.

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Každá minca má dve strany a preto sme sa na životné podmienky vo vybraných krajinách pozerali z dvoch perspektív. Zamerali sme sa na konkrétne vybrané životné podmienky v prihraničných oblastiach vo vybraných krajinách, a to: výdavky domácností na konečnú spotrebu, bytovú situáciu a jazykové bariéry. Prostredníctvom vymenovaných životných podmienok sme identifikovali prekážky a stimuly v procese pracovnej mobility v rámci cezhraničného partnerstva medzi Slovenskou republikou, Poľskou republikou a Českou republikou.

2. CIEĽ A METODOLÓGIA

Identifikácia stimulov a bariér v procese mobility na trhu práce v rámci cezhraničného partnerstva siete EURES-T Beskydy je cieľom tohto príspevku. V prvom kroku sme teoreticky vymedzili pojem pracovná mobilita. Spomenuli sme typy a druhy mobility na trhu práce a definovali ich. Nakoniec sme zdôraznili rozdielnosť medzi pojmami mobilita na trhu práce a migrácia na trhu práce, ktoré si populácia zvykne zamieňať. Ďalším krokom sme charakterizovali sieť EURES, ktorá sa vytvorila na uľahčenie voľného pohybu pracujúcich v Európskom hospodárskom priestore a vo Švajčiarsku. Následne sme venovali pozornosť vytvorenému cezhraničnému partnerstvu EURES-T Beskydy medzi Slovenskou republikou, Poľskou republikou a Českou republikou za účelom podporenia mobility na trhu práce medzi krajinami Partnerstva. Zásadným krokom na určenie bariér a stimulov v procese pracovnej mobility v oblasti cezhraničného partnerstva EURES-T Beskydy boli získané informácie o životných podmienkach v daných krajinách. Konkrétne sme sa zamerali na výdavky na konečnú spotrebu domácností, bytovú situáciu a jazykovú bariéru. Informácie o podmienkach na život v daných krajinách sme čerpali zo štatistických úradov príslušných krajín a Štatistického úradu Európskych spoločností, z internetových portálov, a pod. Zo získaných dostupných údajov sme spravili komparáciu životných podmienok v daných krajinách a vyvodili tak závery na určenie bariér a stimulov v procese pracovnej mobility.

3. MOBILITA ZA PRÁCOU A FAKTORY VPLYVU

3.1 Mobilita na trhu práce

Mobilitu na trhu práce môžeme vo všeobecnosti chápať ako pohyb obyvateľstva za prácou či už v rámci jednej krajiny, medzi jednotlivými krajinami, medzi rôznymi mestami danej krajiny alebo v rámci jedného podniku, pričom máme na mysli zmenu pracovnej pozície daného zamestnanca. Pracovná mobilita sa dosť často zamieňa s pojmom pracovná migrácia. Preto je vhodné uviesť zásadný rozdiel medzi týmito dvoma pojmami. Mobilita pracovnej sily predstavuje len priestorový pohyb pracovníkov, dochádzanie za prácou bez zmeny ich bydliska. Migrácia pracovnej sily predstavuje podobne ako mobilita pohyb pracovnej sily, pri ktorom dochádza k zmene bydliska pracovníkov (Jurčová, 2005).

Mobilitu na trhu práce vnímame podľa viacerých druhov či typov. Na základe druhov rozlišujeme horizontálnu, vertikálnu, vnútornú a vonkajšiu mobilitu pracovnej sily. Horizontálna mobilita na trhu práce sa prejavuje zmenou miesta výkonu práce v rámci firmy alebo mimo nej. Zjednodušene povedané, horizontálna mobilita pracovnej sily predstavuje zmenu miesta pre výkon práce, ktorá sa však nespája so zmenou náplne práce alebo odbornej spôsobilosti. Naopak pri vertikálnej mobilite na trhu práce dochádza k pohybu pracovnej sily, pričom sa náplň práce, profesie či odbornej spôsobilosti mení. O vnútornej mobilite pracovnej sily hovoríme vtedy, ak sa pracovná sila presúva v rámci určitej kategórie ako napr. v rámci podniku, odvetvia, regiónu a pod. Vonkajšia mobilita pracovnej sily sa prejavuje pohybom pracovníkov z jednej spoločnosti do druhej, z jedného odvetvia do iného, z regiónu do regiónu.

Z hľadiska typov rozlišujeme mobilitu za prácou geografickú, priemyselnú a pracovnú. Geografická mobilita pracovnej sily definuje pohyb alebo presun pracovnej sily z jedného miesta na iné miesto pričom sa sleduje geografická poloha. V jednoduchosti povedané, geografická mobilita pracovníkov predstavuje ich presun medzi mestami, regiónmi, krajmi, prípadne krajinami. Daný typ pracovnej mobility sa často prejavuje prostredníctvom absolventov vysokých škôl, ktorí za vzdelaním cestovali do mesta mimo ich trvalého bydliska a po skončení štúdia si tu našli prácu (Páleník, 2014). Druhým typom pracovnej mobility je priemyselná alebo odvetvová mobilita. Ako už z názvu vyplýva, pohyb a presun pracovnej sily sa deje medzi jednotlivými odvetvami alebo priemyslami. Pracovná sila v tomto prípade prechádza z výrobného do nevýrobného odvetvia a naopak alebo z jedného druhu priemyslu do iného. Posledným typom pracovnej mobility je pracovná, reprezentujúca premiestňovanie pracovníkov medzi jednotlivými zamestnaniami. Výkon takýchto profesií sa neviaže na určité miesto výkonu práce a zároveň predstavuje riziko uplatnenia v menších mestách. Najčastejšie ide o profesie advokátov, sprostredkovateľov realít, programátorov či prekladateľov cudzích jazykov.

Dôvodov na pohyb pracovnej sily existuje niekoľko. Avšak najčastejším dôvodom často bývajú ekonomické faktory, ktoré nie vždy súvisia s vyspelosťou danej ekonomiky. Príčiny vzniku pohybu obyvateľstva za prácou môžeme hľadať napríklad vo výške minimálnej mzdy, miere nezamestnanosti v krajine či v politike zamestnanosti. Do veľkej miery ovplyvňujú pohyb pracovnej sily pracovné a životné podmienky obyvateľov v danej krajine, zákony či sociálne dôsledky nezamestnanosti spôsobené nerovnováhou medzi ponukou a dopytom na trhu práce (Rievajová a kol., 2012).

3.2 Partnerstvo EURES-T Beskydy

V rámci Európskej únie sa presadzuje snaha o podporu pracovnej mobility medzi členskými štátmi a zároveň o odbúranie prekážok, ktoré pracovnej mobilite bránia. Uľahčiť obyvateľstvu pohyb za prácou má na starosti sieť EURES, tvorená zamestnávateľmi, odborovými zväzmi a inými subjektami. Prostredníctvom siete EURES (European Employment Services) sa vytvárajú siete cezhraničných partnerstiev medzi členskými štátmi, EURES-T. Hlavným cieľom cezhraničných partnerstiev je zvyšovanie mobility na trhu práce, pričom vynakladajú úsilie na odstraňovanie rôznych foriem prekážok vznikajúcich v súvislosti s pohybom za prácou. Na Slovensku fungujú v súčasnosti dve cezhraničné partnerstvá, EURES-T Danubius a EURES-T Beskydy (EURES Slovensko, 2013).

EURES-T Beskydy predstavuje pomenovanie pre cezhraničné partnerstvo uzatvorené dohodou medzi tromi prihraničnými krajinami, a to Slovenskou republikou, Poľskou republikou a Českou republikou. Vytvorenie partnerstva EURES-T Beskydy má za cieľ podporiť voľný pohyb pracovnej sily v hraničných regiónoch daných krajín. Významným zdrojom pre vytvorenie cezhraničnej spolupráce sa stala najmä vzájomne prepojená geografická poloha krajín a spoločná história (EURES-T Beskydy, 2008).

3.3 Vplyv životných nákladov na pracovnú mobilitu

Náklady potrebné pre existenciu jednotlivca sa líšia v závislosti od lokality, kde jednotlivec žije a pracuje, od výšky jeho príjmov či iných faktorov. Existenčné náklady jednotlivca v meste sú výrazne vyššie ako náklady, ktoré pre svoju existenciu potrebuje jednotlivec žijúci mimo mesta, napr. v menej rozvinutej časti krajiny. 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 a oblečenie.

Údaje získané zo Štatistického úradu Európskych spoločenstiev sme pretransformovali do tabuľky č. 1 a získali sme prehľad o peňažných prostriedkoch domácností vynaložených v roku 2016 na jednotlivé kategórie spadajúce pod životné náklady. V tabuľke môžeme vidieť, že najvyššiu položku v rozpočtoch domácností Slovenskej republiky, Poľskej republiky a Českej republiky tvorilo bývanie. Výdavky spojené s bývaním ako nájomné, energia, voda a plyn predstavovali z rozpočtu Slovákov až 24,4 % z celkových výdavkov. V Českej republike tvorili výdavky na bývanie obyvateľom až 25,6 % z celkových životných nákladov. Najmenší podiel výdavkov na bývanie vykazovalo Poľsko, kde táto položka činila 21,2 % z celkových peňažných prostriedkov vynaložených na životné náklady. Druhou najvyššou položkou v rozpočte domácností v krajinách cezhraničného partnerstva EURES-T Beskydy predstavovali potraviny a nealkoholické nápoje. V skúmanom roku vynaložili najviac peňažných prostriedkov v tejto kategórii Slováci, a to 17,8 % z celkových výdavkov. Poľské domácnosti vynaložili na potraviny a nealkoholické nápoje 17,1 % z celkových výdavkov a v Česku tvorili tieto výdavky 16 % z celkových výdavkov domácností. Treťou najvyššou položkou v rozpočtoch domácností bola doprava. Najviac peňažných prostriedkov na dopravu vynaložili v roku 2016 obyvatelia Poľska a to 12,1 % z celkových výdavkov, po nich obyvatelia Česka s podielom 9,8 % na celkových výdavkoch a najmenej na dopravu vynaložili obyvatelia Slovenska s podielom 7,5 % na celkových výdavkoch. Najnižší podiel na celkových výdavkoch vo všetkých troch krajinách tvoria položky ako vzdelávanie, zdravie, telekomunikácie či oblečenie a obuv. Súčet týchto kategórií mal najvyššie zastúpenie v Poľsku s podielom 14,2 % na celkových výdavkoch, na Slovensku tvoril súčet týchto kategórií 11,6 % z celkových výdavkov a najmenej vynaložených peňažných prostriedkov na spomínané kategórie vyčlenili domácnosti v Českej republike, a to 9,2 % z celkových výdavkov.

Tabuľka č. 1: Výdavky domácností na konečnú spotrebu

Kategória	Slovensko	Poľsko	Česko
Potraviny, nealko nápoje	17,8 %	17,1 %	16 %
Alkohol a tabakové výrobky	5,1 %	6,1 %	8,4 %
Oblečenie a obuv	4 %	5,2 %	3,6 %
Nájomné, energie, voda, plyn	24,4 %	21,2 %	25,6 %
Doprava	7,5 %	12,1 %	9,8 %
Vzdelávanie	1,6 %	1 %	0,5 %
Zdravie	2,6 %	5,6 %	2,4 %
Telekomunikácie	3,4 %	2,4 %	2,7 %
Vybavenie domácností	6,0 %	5,3 %	5,5 %
Kultúra a rekreácia	10,2 %	7,9 %	8,7 %
Reštaurácie a hotely	6,0 %	3,2 %	8,7 %
Zmiešané tovary a služby	11,3 %	13 %	8,0 %
Spolu	100 %	100 %	100 %

Zdroj: vlastné spracovanie podľa údajov z EUROSTAT, 2016

3.4 Vplyv bytovej situácie (prenájom bytu) na pracovnú mobilitu

Nájsť si byt na prenájom v dnešných podmienkach nie je zložitý proces. Existuje množstvo spôsobov hľadania bývania, či už prostredníctvom inzerátov v tlači, na internete a sociálnych sieťach alebo využitím služieb realitných agentúr. Náklady spojené s hľadaním bývania sa líšia v závislosti od spôsobu hľadania bývania. Využitie služieb realitnej agentúry býva nákladnejšie, pretože realitné agentúry si za poskytované služby vyberajú poplatky vo forme provízií, zvyčajne vo výške mesačného nájmu. Výška nájmu nezahŕňa poplatky za spotrebu energie, tie si platia nájomníci samostatne. Pri uzatváraní zmluvy o prenájme bytu sa platí kaucia majiteľovi bytu, zvyčajne vo výške jedného mesačného nájmu, ktorá sa spravidla po ukončení doby nájmu vracia späť nájomcovi. Kaucia slúži ako ochrana pred finančnými škodami spôsobenými napr. neplatičmi alebo poškodením bytu. Ceny za prenájom bytov sa rôznia v závislosti od lokality, kde sa byt nachádza alebo od veľkosti bytovej plochy.

Prieskum o výške nájomného za jednoizbový byt sme spravili v rámci cezhraničného partnerstva EURES-T Beskydy, v prihraničnej oblasti Slovenská republika, Poľská republika a Česká republika. Stanovili sme si podmienky na cenu jednoizbového bytu už so zariadením, pričom sme nepreferovali žiadne poschodie, či iné podmienky prenájmu ako je balkón, parkovanie či pivničné priestory. Zamerali sme sa na výšku nájmu v rôznych oblastiach Partnerstva a získali sme nasledovné údaje.

O výške nájmu za jednoizbový byt na Slovensku sme realizovali prieskum na základe internetového portálu realitnej agentúry Reality.sk, a to v okolí jednotlivých miest Žilinského kraja, ktoré patria do cezhraničného partnerstva EURES-T Beskydy. V tabuľke č. 2 sme znázornili vybrané mestá Partnerstva s priemernou výškou nájmu za jednoizbový byt. Z tabuľky môžeme vidieť, že najvyššie ceny za prenájom jednoizbového bytu sa pohybovali v oblasti mesta Žilina a v oblasti mesta Martin. V okrese mesta Liptovský Mikuláš sa cena za prenájom pohybovala od 290 EUR. Najnižšie ceny za prenájom jednoizbového bytu ponúkali majitelia v okrese mesta Ružomberok a Čadca, a to približne od 250 EUR na mesiac.

Tabuľka č. 2: Výška mesačné nájmu za jednoizbový byt – Slovenská republika

Mesto	Nájom za jednoizbový byt v €
Žilina	od 370 €
Martin	od 360 €
Liptovský Mikuláš	od 290 €
Ružomberok	od 250 €
Čadca	od 250 €

Zdroj: vlastné spracovanie podľa údajov internetového portálu Reality.sk

Prieskum o prenájme jednoizbových bytov v Poľskej republike sme robili prostredníctvom realitnej kancelárie Nehnutelnosti. Na základe prieskumu sme zistili nasledovné ceny za prenájom jednoizbových bytov. V oblasti mesta Bielsko – Biala sa cena za prenájom pohybovala od 650 PLN do 1600 PLN (približne od 156 EUR do 384 EUR). Podobné ceny za prenájom jednoizbových bytov sa pohybovali i v okolí mesta Katowice, od 550 PLN do 1600 PLN (približne od 132 EUR do 384 EUR). V oblasti mesta Czestochowa sa jednoizbový byt prenajímal od 600 PLN do 1700 PLN (približne od 144 EUR do 408 EUR). Výška prenájmu jednoizbových bytov závisí nielen od výmery bytu, ale aj od lokality, ktorú jednotlivci preferuje či od svetovej strany, na ktorú je byt situovaný.

Tabuľka č. 3: Výška mesačné nájom za jednoizbový byt – Poľská republika

Mesto	Nájom za jednoizbový byt v PLN
Bielsko – Biala	od 650 PLN
Katowice	od 550 PLN
Czestochowa	od 550 PLN

Zdroj: vlastné spracovanie podľa údajov internetové portálu Nehnuteľnosti.pl

Výšku prenájmu za jednoizbový byt v českej časti prihraničného partnerstva EURES-T Beskydy sme zisťovali prostredníctvom internetového portálu realitnej kancelárie v Českej republike, Reality-avizo.cz. Za prenájom jednoizbového bytu v okolí Ostravy si nájomníci zaplatili približne od 4300 CZK (približne 170 EUR). V okresoch miest Opava a Karviná sa ceny za prenájom jednoizbových bytov pohybovali vo výške od 4900 CZK (približne 194 EUR). V okrese mesta Zlín sa ponúkali jednoizbové byty za cenu vo výške od 5000 CZK (približne 197 EUR). Najvyššie nájomné za jednoizbové byty si stanovili majitelia bytov v okrese miest Nový Jičín od 7000 CZK (približne 277 EUR) a Olomouc od 8000 CZK (približne 316 EUR).

Tabuľka č. 4: Výška mesačné nájom za jednoizbový byt – Česká republika

Mesto	Nájom za jednoizbový byt v CZK
Ostrava	od 4300 CZK
Opava, Karviná	od 4900 CZK
Zlín	od 5000 CZK
Nový Jičín	od 7000 CZK
Olomouc	od 8000 CZK

Zdroj: vlastné spracovanie podľa údajov internetové portálu Reality-avizo.cz

3.5 Vplyv jazykovej bariéry na pracovnú mobilitu

Jazyková rozmanitosť jednotlivých národov predstavuje jeden z hlavných dôvodov v procese nízkej pracovnej mobility. Preto je dôležité vytvoriť a prijať opatrenia, prostredníctvom ktorých sa odstránia jazykové prekážky ovplyvňujúce do vysokej miery pracovnú mobilitu. Zároveň by sa mali vytvoriť opatrenia na zlepšenie jazykových zručností občanov členských štátov Európskej únie, čím by sa prispelo k vyššej mobilite na trhu práce medzi členskými krajinami. Jazyky krajín cezhraničného partnerstva EURES-T Beskydy, Slovenska, Poľska a Česka patria k západoslovanským jazykom. Základ týchto jazykov spočíva v praslovančine, jednotnom slovanskom jazyku, a vďaka nemu sa obyvatelia týchto troch krajín medzi sebou ľahšie dorozumejú.

Slovenský jazyk predstavuje pre obyvateľov iných členských štátov jeden zo zložitejších jazykov. Obyvatelia Poľska a Česka ho vnímajú inak, je pre nich jednoduchší. Okrem spoločného pôvodu jazyka tieto tri krajiny spája aj kus histórie. V rámci cezhraničného partnerstva EURES-T Beskydy sú pre obyvateľov Partnerstva organizované kurzy slovenčiny, čím sa vytvára priestor na podporu mobility pracovnej sily v smere na Slovensko. Obyvatelia Českej republiky majú k dispozícii kurzy slovenského jazyka organizované Slovenským inštitútom v Prahe. Poľskí občania majú možnosť navštevovať kurzy slovenského jazyka organizované Slovenským inštitútom vo Varšave. Okrem spomínaných možností sú pre obyvateľov Partnerstva k dispozícii jazykové kurzy usporadúvané školiteľskými firmami

priamo zo Slovenska, napr. inFORM vydavateľstvo alebo BRAINY. Výučba slovenského jazyka prebieha i v jazykových školách v Poľskej i Českej republike.

Záujem o dochádzanie za prácou do Poľskej republiky prejavujú nielen obyvatelia Slovenskej republiky a Českej republiky, ale i obyvatelia iných členských krajín. S prácou v Poľsku je spojená aj znalosť ich jazyka a k dispozícii pre zahraničnú pracovnú silu je viacero možností výučby. V prvom rade výučbu poľského jazyka organizuje množstvo jazykových škôl. V Sliezskej vojvodstve vyučuje poľštinu Jazykova Škola na Univerzite v Katowiciach alebo Ekonomická Akadémia v Katowiciach. Okrem spomínaných inštitúcií je možné navštevovať súkromné jazykové školy so zameraním na výučbu poľského jazyka, napr. Slavica Centrum Slovanských jazykov.

Zamestnávateľia v Českej republike uprednostňujú pri nájímaní nových zamestnancov aktívnu znalosť českého jazyka. Pre záujemcov o prácu zo Slovenska a Poľska je preto vhodné sa vopred informovať, či znalosť českého jazyka je na pracovisku dôležitá. Ak to povaha práce vyžaduje, záujemcovia o prácu majú možnosť vybrať si z viacerých možností poskytujúcich výučbu českého jazyka, ako napr. Kurzy češtiny pro cizince a pod.

4. VÝSLEDKY A DISKUSIA

Stupeň pracovnej mobility vychádza z existencie viacerých faktorov, ktoré pôsobia vo väčšej či menšej miere na pohyb za prácou. Životné podmienky predstavujú jednu z hybných síl v procese pracovnej mobility. Tie môžu dochádzanie za prácou podporiť alebo úplne zamietnuť. Poznanie podmienok na život v krajinách cezhraničného partnerstva EURES-T Beskydy nám pomohlo ľahšie identifikovať bariéry a stimuly v procese pracovnej mobility v prihraničnej oblasti Slovenskej republiky, Poľskej republiky a Českej republiky.

Významným podnetom pre zvýšenie mobility pracovnej sily sa stal vstup daných krajín do Európskej únie, čím sa odstránili administratívne bariéry a vytvoril sa priestor pre voľný pohyb osôb v rámci celej Európskej únie. Zrušenie hraničnej kontroly medzi danými krajinami prispelo k zvýšeniu mobility pracovnej sily nielen v regiónoch krajín partnerstva EURES-T Beskydy. Občania žijúci v jednej krajine a pracujúci v druhej krajine tak môžu dochádzať za prácou do susednej krajiny, pričom nestrácajú čas pri hraničných kontrolách, čo pôsobilo demotivačne.

Pozitívnym podnetom pre pracovnú mobilitu bolo určite vytvorenie siete Európskych služieb zamestnanosti, ktorá iniciuje zamestnancov k ich voľnému pohybu medzi krajinami Európskeho hospodárskeho priestoru a Švajčiarska. Sieť EURES disponuje databázou s voľnými pracovnými miestami a poskytuje klientom pomoc pri umiestnení sa na trhu práce prostredníctvom svojich poradcov, čím zároveň pomáha obsadiť voľné pracovné miesta z databázy. Zároveň za podnet pre zvýšenie mobility na trhu práce pokladáme vytvorenie cezhraničného partnerstva EURES-T Beskydy medzi Slovenskou republikou, Poľskou republikou a Českou republikou. Pracovnú mobilitu v tomto partnerstve podľa nášho názoru pozitívne ovplyvnila geografická poloha, spoločné hranice a predovšetkým podobný jazyk.

Pri porovnávaní výšky výdavkov domácností na konečnú spotrebu v jednotlivých krajinách sme na základe dostupných údajov zistili, že najvyššie výdavky na nákup potravín mali v sledovanom roku slovenské domácnosti v porovnaní s ostatnými sledovanými krajinami. Najvyššie výdavky na bývanie vynaložili obyvatelia Českej republiky a kategória doprava tvorila najviac výdavkov obyvateľom Poľskej republiky v porovnaní s ostatnými krajinami spadajúcimi do cezhraničného partnerstva EURES-T Beskydy. Dané skutočnosti pôsobili v procese pracovnej mobility pre jednotlivé krajiny ako stimul, ale aj ako prekážka v dochádzaní za prácou.

Pri mapovaní bytovej situácie v jednotlivých regiónoch krajín Partnerstva sme dospeli k nasledujúcim záverom. Za stimul v procese pracovnej mobility sme identifikovali výšku nájomného za byt, a to do Českej republiky, kde sa výška nájomného za jednoizbový byt v porovnaní so Slovenskom a Poľskom vyskytovala v najnižších hodnotách. Naopak, ako bariéru v procese pracovnej mobility predstavovala výška nájomného v regiónoch Slovenskej časti Partnerstva, ktorá sa v porovnaní s danými krajinami pohybovala v najvyšších cenových hodnotách. Výška ceny za ubytovanie zohráva dôležitú úlohu v procese dochádzania za prácou mimo miesta trvalého bydliska.

Podobnosť jazykov v Slovenskej republike, Poľskej republike a Českej republike predstavuje najlepšiu možnosť dochádzania za prácou do prihraničnej oblasti. Znalosť jazyka sme v tomto prípade identifikovali ako prekážku a zároveň aj stimul v procese pracovnej mobility medzi danými krajinami. V poľskom jazyku sme našli viacero odlišností oproti slovenčine či češtine, preto je potrebné sa tento jazyk viac učiť. Z perspektívy Poľskej republiky sme identifikovali jazykovú bariéru ako prekážku, či už v smere dochádzania do Poľska alebo z Poľska. V dochádzaní za prácou zo Slovenska do Česka a z Česka na Slovensko sme jazykovú bariéru označili ako stimul vďaka príbuznosti jazykov a spoločnej histórii Česko – Slovenska.

Positívnych stimulov v procese pracovnej mobility sme odhalili viac ako existujúcich bariér. Pri mapovaní a komparácii bytovej situácie v jednotlivých krajinách sme sa stretli s nasledujúcim problémom. Každá krajina používa inú platobnú menu. Preto sme ceny za prenájom v Poľskej republike a Českej republike prepočítavali na európsku menu EURO, ktorá je zároveň platobnou menou na Slovensku. V Poľsku je platobnou menou poľský zloty a v Česku je to česká koruna. Na základe tejto skúsenosti sme platobnú menu identifikovali ako bariéru v procese pracovnej mobility. Rozdielnosť platobnej meny v jednotlivých krajinách znamená pre zamestnancov poplatky za prevod zahraničnej meny na domácu menu, nižší príjem v dôsledku meniaceho sa menového kurzu, rôznorodosť ceny za statky, neustále prepočítavanie na domácu menu a podobne.

5. ZÁVER

Z daných skutočností, informácií a ukazovateľov sme konštatovali existenciu bariér i podnetov v procese pracovnej mobility medzi prihraničnými krajinami partnerstva EURES-T Beskydy. Zastávame názor, ktorý vyplýva z nášho skúmania, že zatiaľ čo určité aspekty životných podmienok znamenajú pre niektorú z krajín bariéru, pre inú krajinu predstavujú stimul pre mobilitu pracovnej sily. V určitých prípadoch sme identifikovali jednoznačné stimuly či bariéry, ktoré sa vyskytujú pri riešení pracovnej mobility. Zároveň sme zistili, že to čo je stimulom pracovnej mobility pre jednu krajinu, môže zároveň predstavovať bariéru pracovnej mobility pre druhú krajinu a naopak. Preto je podľa nášho názoru potrebné vo väčšej miere zavádzať opatrenia, ktoré by existujúce bariéry v cezhraničnom partnerstve EURES-T Beskydy eliminovali a súčasne podporili motiváciu pracovnej sily v dochádzaní za prácou do prihraničnej krajiny.

Dodatok

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THE IMPACT OF INDUSTRY 4.0 ON ECONOMIC SECURITY

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Abstract: *Fourth industrial revolution, and Lithuania's achievements in the field of digital economy is analyzed in the article. Examining the perception of Industry 4.0, it shows that Industry 4.0 and the Fourth Industrial Revolution are not identical. And if Industry 4.0 is related to the deployment of digital transformations and technology, so the Revolution covers practically all areas. Therefore, the purpose of this article is to show the Fourth Industrial Revolution impact on economic security. An analysis of the case of economic security perception has shown that economic security works as a guarantor of the country's competitiveness and the Fourth Industrial Revolution. An analysis of threats to economic security in Lithuania has shown that the object of economic security is its economic system and economic indicators, competitiveness, which determines the general rise of Lithuania in the EU and in the global context. The paper analyzes the threats to the Fourth Industrial Revolution in Lithuania, identifies possible solutions for reducing threats and improving the results of the engineering industry.*

Key words: *economic security, digital economy, Industry 4.0, country's competitiveness*

JEL Classification: *O31, K22, F50*

1. INTRODUCTION

Every country ability to develop independently and progress means the ability to independently implement and defend national interests and create a favourable environment for investment and innovation, and develop intellectual potential. The fourth industrial revolution strongly affects economic growth and social progress. The fourth industrial revolution is based on a digital platform characterized by technological convergence. Consequently, the emergence of new sectors of the economy, a competitive reform that promotes innovation, becomes an important tool for the fourth industrial revolution. With the increasing momentum of the fourth industrial revolution, the countries in which advanced digital technologies are being deployed needs to be reconsidered. Economic security is also an important tool. Therefore, the purpose of this article is to demonstrate the impact of the fourth industrial revolution on economic security.

1.1 *Lithuania's achievements in the field of digital economy*

On 18th of May 2018, The European Commission has published the 2018 Digital Economy and Society Index (DESI), according to which Lithuania ranks in 13th position out of the 28 EU Member States. Estonia is 9th in this year according to DESI, Latvia – 19th (Industry 4.0 News in Lithuania, 2018). The data presented show that in 2017, Lithuania has made progress as fast as the EU, and has achieved a very good result in terms of access to communications and the integration of digital technologies. Also, according to the index data, Lithuania's results in human capital compared to the results of last year have improved, but

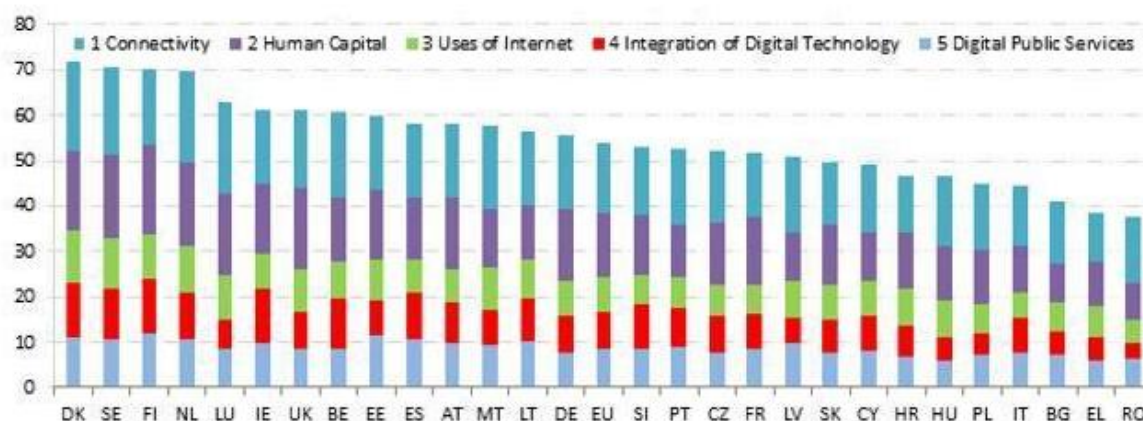
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we still didn't reach the EU average. The main reasons for this are, first and foremost, a steady decline in STEM graduates, as well as an increasing but still relatively low proportion of ICT professionals among all working people. However, in terms of digital technology integration implemented by companies, Lithuania is well above the EU average, ranked 9th out of 28 EU Member States, and the country's performance in this field is steadily improving (see Picture 1).

Figure 1: Digital Economy and Society Index (DESI) 2018 revised ranking



Source://europa.eu/rapid/press-release_MEMO-18-3737_en.htm, Digital Economy and Society Index (DESI) 2018

Among the implemented national measures contributing to the growth of integration of digital technologies in Lithuania, the National Industrial Competitiveness Commission created in 2017 could be mentioned, which is responsible for coordinating the implementation of the industry digitization initiative "Industry 4.0".

Successful industry development depends on various aspects:

- a favourable legal environment which enables the development of innovation,
- investment plan,
- market capital union,
- energy union,
- better functioning of the internal market,
- cyber and economic security.

In 2017, National Industry Digitalization Platform "Industry 4.0" (2018) was established, which was the first in the Baltic States. The purpose of this Platform is to coordinate the actions of the business, industry, academic community and public authorities in a broad dialogue between the social partners to promote the competitiveness of enterprises. The platform focuses its activities on approved 5 lines of action - digital manufacturing, digitization services, human resources, standardization, legal regulation and cyber security.

However, studies have shown that at least half of Lithuanian manufacturing companies are hardly aware of what lies behind the term "Industry 4.0". Therefore, it is important to rely on foreign research and the industry analysis conducted by researchers.

2. „INDUSTRY 4.0“ AND ECONOMIC SECURITY PERCEPTION PROBLEM

The fourth industrial revolution, devised by the German industry and labeled "Industrie 4.0", and this term is used in many countries. It is a joint platform created by business, government, industry and science to help companies innovate in their production processes.

The problems of new types of economies, including Industry 4.0, are actively discussed in foreign scientific literature (Bieliauskaite, 2016; Broadberry, S., 2013; Organisation for Economic Co-operation and Development, 2016; Rifkin, J., 2013; Reynolds, J. & R. Cuthbertson., 2014; Sailybayev A., Ongdash A. , 2018; Schwab, 2016; UK Digital Strategy, 2017; World Economic Forum, 2017).

According to Rifkin, the ideas of the "Third Industrial Revolution", "Industry 4.0" and various advancements both at the state and corporate level have been rapidly incorporated into government projects and business systems (Rifkin, 2013).

As the Global Competitiveness Report 2016-2017 states, the Fourth Industrial Revolution is not defined by any particular set of emerging technologies, but rather by the transition to new systems that are built on the digital revolution's infrastructure. As these individual technologies become ubiquitous, they fundamentally change how we produce, consume, communicate, move, generate energy and interact with each other. Recovering growth in the context of the Fourth Industrial Revolution will require the recognition that policy-makers need a shared assessment and understanding of future competitiveness sources.

One of the main ideologues of the Industry 4.0 concept in Germany, which was officially introduced in 2011, state strategy under the same name (Industrie 4.0). In addition to the general concept of Industrie 4.0 in Germany at the state level, also developed and implemented several other strategies and initiatives of similar profile and orientation. Smart Networking Strategy, on which basis, in turn, the Digital Agenda program was presented.

According to Schwab (2016) in Germany, there are discussions about "Industry 4.0", a term coined at the Hannover Fair in 2011 to describe how this will revolutionize the organization of global value chains. By enabling "smart factories", the fourth industrial revolution creates a world in which virtual and physical systems of manufacturing globally cooperate with each other in a flexible way. This enables the absolute customization of products and the creation of new operating models. The fourth industrial revolution, however, is not only about smart and connected machines and systems. Its scope is much wider.

According to Schwab (2016), 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. Indeed, all the big macro variables one can think of – GDP, investment, consumption, employment, trade, inflation and so on – will be affected. "The Fourth Industrial Revolution and Industry 4.0 are interconnected, but not the same concepts" - Professor Klaus Schwab stated in 2017 at the annual Economic Forum in Lithuania. Industry 4.0 is the introduction of digital transformation and technology. However, the Revolution involves much more and concerns not only the industry but also politics, society, culture and, above all, education. The concept of lifelong learning and digital skills should increasingly extend the limits of traditional education. In other words, Industry 4.0's challenges will only be addressed with the help of Education 4.0.

In Lithuania, Industry 4.0 should encourage and help companies in all Lithuanian industrial sectors to deploy digital technologies, share good technology take-ups, open funding channels, as well as formulate a modern education and training system, and a progressive social security system.

According to Lithuanian scientists (Vilkauskas A., 2018), Industry 4.0 inevitably touches various areas of life - smart devices help in their everyday life, advanced artificial intelligence programs are created, processes of enterprises are being automated, with the help of various robots used for performance of tasks. It also changes the product development and production cycle. When we are talking about production processes and related technologies, materials processing, manufacturing equipment and tools, we need to think about it in the context of manufacturing engineering, mechatronics and robotics. It is the tandem of these competencies

that will shape the future production process, in which specific robotic solutions will allow routine, mechanistic and automation-free routine workflows. All of these processes existed before the current understanding of Industry 4.0, but industry digitization only increased the integrity of these three engineering competencies. Industry 4.0 also changes classical engineering areas, for example, designing future products, will need to think about product design solutions that allow the product to be assembled in a robotic manner. Meanwhile, the president of the Lithuanian Confederation of Industrialists, Robert Dargis, briefly described - The Fourth Industrial Revolution (Industry 4.0), which can be called the Internet of Things. In his view, it is not enough to work on a company-wide basis in order to prepare for the new phase properly. Public institutions must understand the changes that have begun, and bureaucratic processes need to be adapted to digitalisation. Business and society have to prepare for radical changes: production speed, scale, value chain reorientation, more and more new connections between higher education and business, new interconnections between large and smaller companies. Global industrial digitization means not only innovative products and advanced production processes, but also challenges for social and economic life: changing business models, labour law, attitudes to existing and potential employees, will undoubtedly contribute to changes in society's habits and values in the future. Lithuania needs to keep pace with high technology and industry digitization, as there is hardly any other means to reach the competitive edge - only good technological preparation, progress in production processes and creativity can help Lithuanian companies remain competitive in European and global markets (Dargis, 2018).

Objects of economic security may be state, society, citizens, enterprises, institutions and organizations, territories, separate objects. The main subject of economic security is a state that carries out its functions in the field of economic security with legislative, executive and judicial power.

Foreign scientists are also examining economic security at different levels. B. Buzan (1998) points out that it is appropriate to detail the levels of the idea of an economic security - individuals, organizations, classes, states and international systems, thus creating a coherent set of economic policy measures that determine the state's economic power in the international system. Buzan (1998) pursued to deepen the understanding of security by diverging from the traditional focus on state security (national security), addressing the individual (human security), society (public security) and the international system (systemic / global security). Gečienė (2015) points out that while Buzan himself did not investigate the level of the individual's security in depth, his insights provided a significant impetus to the study of subjective security.

The United Nations Development Programs, 1994 year Human Development Report states that "for too long the concept of security has been associated with potential conflicts between countries", "job security, income security, health security, environmental security, and criminal security, all of which raise concerns about human security throughout in the world" (UNDP 1994, 3).

Meanwhile, Huber et al. (2010) examines economic security at all levels. In his view, economic security can be considered as the readiness of the country's economic situation to ensure adequate living conditions and personal development, social and economic stability, and the political military capability of the society and the country to eliminate internal and external threats. In his opinion, the concepts of economic security are not developed and adopted due to the multilateral and multiple aspects of economic security.

Siew Mun Tang (2015) states that, in principle, human security puts forward the basic premise that a security perspective is primarily a national perspective. A state-specific model, sometimes conveniently categorized as "traditional security", is the supremacy of state and national interests. Territorial integrity and sovereignty are the most important. Siew Mun

Tang examines two versions: realistic and non-realistic. According to him, realism - the dominant paradigm of international relations - brings domestic and national policies into "black boxes". The non-realist option assumes that there is no differentiation of functions, and all states will behave rationally and will pursue the same goals. With regard to the power struggles and the need to defend against the threats of liberal democracy and communism (whichever comes within the category), it is understood that security is essentially a state. Siew Mun Tang points out that economic security is one of the main pillars of human security. He points out that economic insecurity can be defined differently in different areas. Economic security embodies the philosophical basis of human security, but first of all, in the opinion of the scientist, security is protection and improvement of the quality of life of people.

According to Tamošiūnienė (2015) on the 20th century and beginning of 21st century, a whole series of concepts of economic security were formed that were used to define a synergistic approach, understanding the interests of the state, the threat to stability, defining the possibility of self-improvement, etc. Therefore, according to Tamošiūnienė (2015), the concept of security includes the minimum protection of physiological, social and economic, spiritual and situational resources, technologies, information and moral ideals necessary for vital activity and public well-being. It is expedient to study the economic security study of Tamošiūnienė more extensively because, together with Cornelius Munteanas, she presents a broader study of economic security concepts, distinguishing between macro and micro approaches.

3. ECONOMIC SECURITY AS A GUARANTEE OF COUNTRY'S COMPETITIVENESS AND THE FOURTH INDUSTRIAL REVOLUTION

The result of a competitive activity may pose threats to economic security; therefore, it is important to examine the possibilities of creating such threats and their influence on the competitiveness of the country. The country's macroeconomic policy and institutional framework have a direct impact on competitiveness. The institutional framework includes public administration, national policy, legal and governance framework, size, quality and ability of the public sector to influence legislation, as well as economic security.

When analysing economic security, the main economic threats in Lithuania should be distinguished (Lithuanian National Security Strategy (2017), Law on the Basics of National Security of the Republic of Lithuania (2018). By formulating the policy of internal security assurance, identifying its priorities and objectives, economic security is singled out separately, and in the area of the economic and financial security of the Republic of Lithuania, the tasks of the Republic of Lithuania are already being developed alongside the analysis of threats, crisis prevention and management:

- to implement a sustainable macroeconomic policy, orientated to fiscal and monetary stability and the prevention of financial and economic crises;
- active participation in the EU Single Market and in the EU Economic and Monetary Union;
- reducing restrictions on economic activity, creating conditions for free and fair competition, seeking to create a favorable environment for the development of business (especially small and medium) and innovation, foreign investments, export diversification;
- to implement measures that prevent one Lithuanian or a foreign investor from dominating in strategic sectors of the economy and preventing the inaccurate origin of capital penetration into domestic enterprises, ensuring the protection of strategic sectors of economy, enterprises and facilities;
- seek to reduce social and economic disparities between and within the regions of the country.

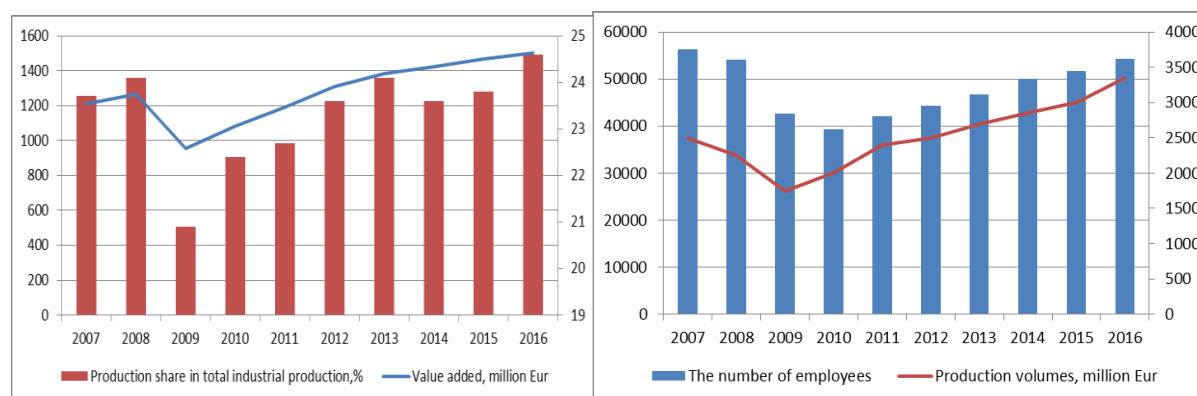
Table 1: Connection between economic security tasks and means of ensuring them

Macroeconomic policy	EU Market	Single	EU Economic and Monetary Union	Economic activity	The uncertain origin of capital and the dominance of one investor	Regional development
Implementing measures						
Financial and monetary stability	Free movement of persons, goods, services and capital		Coordination of economic and fiscal policy strategies	Free and fair competition	Protection of strategic enterprises and equipment	Reducing social and economic disparities
Financial and economic crisis prevention	Tax harmonization		Common monetary policy	Favourable business environment		
			Common currency, euro	Foreign investments		
				Export diversification		

Source: made by authors

Analysis of economic security tasks allows to state that the economic security of the country is its economic system and economic indicators, competitiveness, determines the general rise of Lithuania in the EU and in the global context. It is important to consider the impact of the fourth industrial revolution on economic growth, considering growth drivers. The impact of previous industrial revolutions on macroeconomics and society has led to significant socio-economic changes. Urban infrastructure grew and expanded rapidly, new cities were created, and the population went to live in cities. The layers of society were formed, the living conditions of the population improved, and medical progress was growing. The achievements of science and technology have been adapted to agriculture, and agricultural specialization has begun.

The Lithuanian industry, in order to keep pace with global trends, is taking on the challenges of the fourth industrial revolution and is digitizing the processes. Most people in Lithuania work in industry. According to the Department of Statistics data (2018), in 2016 238,700 people were employed in the industry, or 17.5% of all employed people in the country. The number of people employed in trade is slightly less - 233,500, or 17.2% of all of the employed people. In 2016 9,000 new jobs were created in the industry. In 2016 a maximum of 3,100 (18.8% of all vacancies) - was also recorded in this area (see Picture 2).

Figure 2: Engineering industry indicators

Source: <https://www.stat.gov.lt/en> , Data from the Lithuanian Department of Statistics, 2018

The fourth industrial revolution improves the ability of society to respond to negative externalities and stimulates potential economic growth. Lithuanian businessmen (LINRA, 2018) state that changes are needed in the fields of economics, education, social security. They point out the threats to the fourth industrial revolution: an inaccurate investment environment in Lithuania, inadequate skilled people, lagging technological readiness, a gap between EU investment in research, inadequate workforce, unfettered working conditions, and an unstable labour code. However, at the same time, possible solutions are presented for reducing the listed threats and improving the results of the engineering industry. This is a profit relief for reinvestment as a means to mitigate the impact of the industrial revolution. Faster recruitment of foreigners would make it possible to create a more attractive investment environment, it is proposed to create export guarantee fund for export, professional orientation, career planning system redevelopment, apprenticeship promotion, increase of cooperation between science and business, and industry 4.0 experiencing retraining.

4. CONCLUSION

The research has shown Lithuania's potential to become an intelligent engineering solutions and production centre of the European Union. In Lithuania, the industrial sector generates more than one fifth of Lithuania's gross domestic product and 83 percent export, therefore, the implementation of digital technologies is considered to be a very topical and priority industrial process in Lithuania, which helps to increase the efficiency of the industry, increase productivity and thus ensure the sustainability of the Lithuanian economy and increase the export volume.

It is important for Lithuanian business people to respond to changes and adopt digitalization processes quickly and efficiently.

The scale and diversity of the forth industrial revolution will also bring significant economic, social and cultural changes that will affect the economy, governments and society. The digital revolution will affect all major macroeconomic indicators: GDP, consumption, investment, employment, inflation.

However, the process and the technology require considerable investment, as well as the emphasis on economic security.

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EXAMINING THE FEASIBILITY OF INDUSTRY 4.0 FOR THE REAL ESTATE SECTOR WITH A LENS OF VALUE AND JOB CREATION

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Abstract: A fourth industrial revolution Industry 4.0 is characterized by massive implementation of Cybernetics on the road to an end-to-end value chain with Industrial IoT and decentralized intelligence in manufacturing, in production, logistics and the industry, in service of human needs. Each individual branch of industry like real estate, health, transportation, trade, agriculture, and others have been targets of digital transformation. 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. Industry 4.0 did not pass and the real estate sector: land and individual real estate objects management, land administration, real estate market infrastructure, formed by banks, real estate, valuation, insurance organizations, and trustees. As digitalization disrupts society, concern is growing about how it is affecting issues such as jobs, education, value creation, management and security. This article discusses the major features of the four industrial revolutions, the opportunities and the challenges of the fourth industrial revolution through the prism of real estate industry.

Keywords: Internet of Things (IoT), Industry 4.0; business intelligence; Cyber Physical System; value chain; sustainable development; knowledge management; real estate.

JEL Classification: L16, O32

1. INTRODUCTION

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 Century⁵⁶. A fully functioning smart territorial development is the most important factor to enhance the economy of countries in the European and other regions and promote long-term sustainable development and growth⁵⁷. 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

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⁵⁷ Territorial Agenda 2020 - Towards an Inclusive, Smart and Sustainable Europe of Diverse Regions [online]. [cit.2018-10-05]. Available at: http://www.nweurope.eu/media/1216/territorial_agenda_2020.pdf

economy delivering social and territorial cohesion (inclusive growth). Industry 4.0 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. [58]. This also include new innovative approaches to development of the circular economy; the role of strategic partnerships; the role of agreed standards for the exchange of data and components in the digital ecosystem; data security and privacy issues; loss of jobs; and digital gaps. The physical components of production and service systems are being transformed by smart, digital networking into cyber-physical systems (CPS), allowing for the management of processes in real time across great distances and customized products and services [59]. Major challenges for businesses in the Industry 4.0 environment are mass customization, effective and efficient supply chain, getting timely information of customer needs and wants, smart work environment, and the right combination of products and services. Industry 4.0 requires better management of products, just in time production, and a more efficient time to market [60]. No doubt, these are very challenging and real issues for Industry 4.0, but most studies only discuss the technological aspects and focus on only manufacturing firms, but ignore the service sector. This study addresses these issues by considering the Industry 4.0 concept and its impact on the real estate sector. The concept of Industry 4.0 is very useful for the real estate sector, as personalized service, efficient supply and value chain, agility, smart work environment, use of big data for up to date information of customer preferences, highly customized services at lower cost, and digital enhancement can really affect the customer satisfaction, loyalty, and the perceived service quality.

2. DIGITAL TECHNOLOGIES IN REAL ESTATE AND RELATED INDUSTRIES.

How exactly is the real estate landscape changing by innovative technologies? Here it is several examples bellow.

1. Inclusive spatial planning technologies. Companies in this vertical are focused on various aspects of urban, rural and community planning, including improving processes related to land release, planning approvals, protection and use of the environment, and the enhanced design of the urban environment. Examples Include: 1. Urban design software 2. Virtual reality and simulation technology 3. Mapping platforms 4. Satellite technology 5. Beacon technology. Specialized platforms, receiving the name of the PPGIS-public participation GIS/PPSS-The Public Participation support system, have provided a lot of new optimization features the best decision-making the use of certain areas with the assistance of volunteers on the principles of crowdsourcing and even crowdfunding [61].

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2. Digital design & construction technologies. Construction technology has experienced rapid changes in recent years associated with the growing use of computers, software development, automation and offsite construction [62]. Companies in this category are focused on the tools and processes used for the design, development and construction of residential, commercial and industrial real estate projects [63]. Digital and innovative construction technologies in countries can be divided in several areas: Virtual reality and simulation technology, Enhanced architecture and design software, Project and cost management tools, Smart building platforms and artificial intelligence, Construction and workforce management solutions, Building material innovation, Material sourcing platforms, Beacon technology, Project finance and investment platforms. Examples include 1) Building Information Modelling (BIM), 2) Offsite construction, 3) New cutting-edge technologies (NCETs). 4) Indoor mapping, 5) different applications like 3D cadastre and GIS-applications.

3. Search, Sale & Acquisition technologies. Companies in this category are focused on the tools, processes and business models for searching, marketing and acquiring new and existing residential, commercial and industrial real estate. Examples Include: Buyer search and discovery tools including listing portals; Agent search tools including agent lead generation and management solutions; Virtual reality and simulation technology; Online brokerage, sales and auctions; Peer-to-peer brokerage; Inspection management software; Transaction management software; Broker back-office and infrastructure; CRM and lead management solutions; Property marketing and sales solutions, including social marketing and marketing automation; Acquisition finance and investment platforms, including crowdfunding, peer-to-peer lending and on-demand finance solutions, blockchain technologies.

“Blockchain offers an open source, universal protocol for property buying, conveyancing, recording, escrow, crowdfunding, and more. It can reduce costs, stamp out fraud, speed up transactions, increase financial privacy, internationalize markets, and make real estate a liquid asset.” – International Blockchain Real Estate Association (IBREA) [64]. They have already been used to resolve land disputes, reaching consensus without the involvement of any intermediary, implementing legal relations through the smart contracts. Real estate applications have still more in common with supply chain than digital currency, so we should begin to take notice of blockchain and its potential to transform the real estate industry.

4. Leasing & Management. Companies in this category are focused on the tools, processes and business models used for the leasing and management of residential, commercial or industrial real estate, from single properties through to solutions designed for complex property portfolios. Examples Include: E-Government, Auto consulting Technologies, List and search services, Peer-to-peer leasing, Inspection management software, Transaction management software, Internet of things, Beacon technology, Multi-layered Technologies for remote sensing of the Earth, Tenant screening technology, Lease and revenue management software, Digital mortgage Technologies, Smart building platforms and artificial intelligence, In-venue marketing technologies, Broker back-office and

⁶² Dr Mehran Eskandari Torbaghan, Carlo Luiu & Dr Michael Burrow. Applications of digital and innovative construction techniques in lower-income countries. UK Government's Department for International Development (DFID) report, 2017 [online]. [cit.2018-10-01]. Available at: https://assets.publishing.service.gov.uk/media/5a7054beed915d265c511f6a/240_Construction_technologies_for_LICs.pdf

⁶³ Steven Maarbani. Real Estate Technology Threat or Opportunity? White Paper: The Future of RealTech. KPMG and Real Tech Ventures, May 2017. [online]. [cit.2018-10-01]. Available at: <https://assets.kpmg.com/content/dam/kpmg/au/pdf/2017/real-estate-technology-threat-or-opportunity.pdf>

Blockchain application in the real estate industry: Overview of projects that have been launched or are approaching deployment. iOlive platform. [online]. [cit.2018-10-01]. Available at: <https://iolite.io/static/pdf/iOlive-Whitepaper.pdf>

⁶⁴ M. Alshehri, S. Drew. Implementation of e-Government: Advantages and Challenges. [online]. [cit.2018-10-01]. Available at: <https://core.ac.uk/download/pdf/143886366.pdf>

infrastructure, CRM and lead management solutions, Property marketing and sales solutions including social marketing and marketing automation.

E-Government Technologies. These technologies have been currently considered as means of improving services and reducing costs of administrative procedures in construction, housing, registration real property rights fields, levels of organizational processes by streamlining and re-organizing operating procedures saving time and increasing the transparency, effectiveness and efficiency in the public sector [65]. They make an essential change in the whole society structure, values, culture and the ways of conducting business by utilizing the potential of ICT as a tool in the daily work. Advantages and benefits of e-government implementation are the same for both developed and developing countries [66]. E-government applications allow people, businesses, and government sectors to access to available government information 24 hours a day, 7 days a week, which improves the quality of these services.

Unlimited users auto consulting Technologies for execution of business processes on the real estate market. These transformation in-the-cloud technologies into mobile applications allow feel managers as a people without special education.

The Multi-layered Technologies for remote sensing of the Earth. They totally transformed "feedback" real property administration system, since in fact, continuously monitoring its State permit without physical surveys to detect compliance violations without physical examinations, to detect violations of compliance without leaving the area, reduce the risks of losses in emergency situations. These technologies lead to revolution in the area of cadastral engineering as well because they allow land plots surveying using SLAM methods [67].

The artificial intelligence technologies lead to an acceleration of State registration of real estate property from a dozen days for units of seconds; robots-registrars replace humans-registrars and use of expert systems and artificial intelligence, (in particular the application of neural networks) to real estate forecasting [68].

Digital mortgage Technologies. Includes the three primary value enablers — borrower collaboration, digital back office, and third-party collaboration. Fully interconnected, these enablers can position a lender to deliver an integrated mortgage solution across the product lifecycle that enhances customer experience, increases efficiencies and drives down costs in making decisions on mortgage lending, from several minutes to several hours [69].

Internet of things Technologies IoT. Things, chatting with each other, make a decision and replace facility managers [70]. For Facilities Management, IoT offers the possibility to understand in real-time what is happening throughout every aspect and component of a building and its operation, and can provide valuable contextualized data for analytics. The 'golden egg' for facilities management is the attainment of predictive instead of reactive

⁶⁵ V. Ndou, E-government for developing countries: opportunities and challenges. The Electronic Journal on Information Systems in Developing Countries vol. 18, no. 1, pp.1-24, 2004

⁶⁶ Nils Kok, Eija-Leena Koponen, And Carmen Adriana Martínez-Barbosa. Big Data in Real Estate? From Manual Appraisal to Automated Valuation. Special Real Estate Issue 2017 [online]. [cit.2018-10-01]. Available at: https://sustainable-finance.nl/upload/researches/Kok-et-al_Big-Data-in-Real-Estate.pdf

⁶⁷ E. Torres-Martinez, M. Schoeberl, and M. W. Kalb, "A Web of Sensors: enabling the Earth Science Vision," Proceedings of the International Geoscience and Remote Sensing Symposium, Toronto, Canada, June 2002.

⁶⁸ Peter Rossini. Using Expert Systems and Artificial Intelligence For Real Estate Forecasting. Sixth Annual Pacific-Rim Real Estate Society Conference proceeding, 2000 [online]. [cit.2018-10-01]. Available at: http://www.prres.net/Proceedings/..%5CPapers%5CRossini_Using_Expert_Systems_and_Artificial_Intelligence_for_RE_Forecasting.pdf

⁶⁹ Ashish Shreni, John Geertsema, Justin Wellen. The Path Ahead for Mortgage Digitization. Cognizant, 2018 [online]. [cit.2018-10-01]. Available at: <https://www.cognizant.com/whitepapers/the-path-ahead-for-mortgage-digitization-codex2480.pdf>

⁷⁰ IoT Technology Working Group. Internet of things for facilities management. Guidance notes for facility managers. British Institute of Facilities Management June 2018 [online]. [cit.2018-10-01]. Available at: <https://www.bifm.org.uk/bifm/filegrab/bifm-guidancenotes-internet-of-things-for-fm-final.pdf?type=documents&ref=6594>

maintenance to reduce downtime of assets and aid efficient labour management, amongst other benefits. This allows a facilities management professional to identify and make informed decisions on how to ensure their facilities are operated and maintained to optimal efficiency. Acting on the knowledge gathered and analysed through IoT can help encourage a reduction in operational and maintenance costs, lower energy use leading to lower greenhouse emissions, promote building user well-being and stimulate demand for further IoT technological advancements.

Across all of the categories above, Data & Analytics tools and Sustainability focused innovation are also having a significant impact. The following section expands upon both of these additional categories and lists examples of the technology solutions being developed in each category.

5. Data & Analytics. Companies in this category are focused on developing tools designed to identify, collate and analyse relevant data to enhance operational efficiency, inform decision making and improve the experience of participants across the residential, commercial and industrial real estate sectors. Examples Include: 1. Big data aggregation and management tools 2. Information crowd sourcing tools 3. Content, data and information portals 4. Tenant and visitor in-venue experience and engagement solutions 5. Tenant and visitor in-venue loyalty, transaction and value add solutions 6. Automatic valuation Technology.

Automatic valuation Technology of real estate uses Big data. These technologies have become gradually displace specialists- valuers [71].

6. Sustainability. Companies in this category are focused on developing tools and materials designed to: 1. Enhance building sustainability, 2. Enhance environmental sustainability, 3. Improve energy efficiency outcomes.

Industry 4.0 aims at digitalization all the value chain, beyond 2030 the world will evolve towards a complete digital ecosystem that encompasses the integration of research, production, services, marketing, and sales in a fully integrated digital system.

Mackinsey Global Institute (MGI) employed a simple model for assessing digitalization of USA industry based on 3 broad categories namely Digital assets (Computers, servers, networks and software), Digital usage (Usage in the form of transactions, customer and suppliers interactions together with internal processes using digitization) and Digital workers (The degree to which digital tools are put in the hands of employees to ramp up productivity) with 27 sub- indicators []. Digital usage and Digital workers were found to make the most crucial difference for increase of efficiency.

The most digitally advanced industry sectors were found to be in ICT, media, finance, and professional services—no surprises there, especially for the early-adopting technology sector, which more often than not acts as a digital pathfinder. Many industries are in the early stages of digitization with plenty of room for growth. The utilities sector and real estate were cited as a good example of an industry that could be at the forefront of future digital expansion.

Some sectors are highly digitized at one end of the scale (health care for example in diagnostics), but have a large workforce that uses only basic—or sometimes no—digital technology, ultimately slowing the overall pace of digital adoption.

Industries that are both local and labor-intensive (construction, leisure, hospitality) tend to have low digital usage, especially in their customer transactions.

Government, while having the greatest share of GDP and the highest share of employment, rated poorly across all three digitization categories. This should not come as a great surprise given the bureaucratic, regulated, and non-competitive environment in which our administrators all too often operate.

⁷¹ McKinsey Global Institute. Digital America: A Tale Of The Haves And Have-Mores. Executive Summary.

December 2015. [online]. [cit.2018-10-01]. Available at:

https://www.mckinsey.com/~/media/McKinsey/Industries/High%20Tech/Our%20Insights/Digital%20America%20A%20tale%20of%20the%20haves%20and%20have%20mores/MGI%20Digital%20America_Executive%20Summary_December%202015.ashx

The real estate sector is the largest and most valuable asset class in the world, and it has managed to operate into the present day with relatively minimal innovation. As an asset class, direct real estate appeals to a broad range of investors and is seen as a relatively low-risk asset. As sector participants, such as developers, agents and financiers, continued to profitably provide real estate product to an eager market, many argued there had been very little reason to innovate ...until now.

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. DIGITAL TRANSFORMATION AND WORKFORCE.

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.

These and many other technologies of the “digital economy of the real estate sector” entail the reduction of traditional jobs, and therefore they often encounter resistance from citizens.

It seems to the authors that in this area, under the conditions of the fourth industrial revolution, there are certain prospects for solving this problem of job cuts. All of them are associated with the creation of new jobs, but with different approaches.

The first approach is connected with the training of specialists of a wide specialization (universalism). The practice of training universal specialists emerged: simultaneously in the field of management, and in the field of economics, and in the field of physics. Graduates work in the field of designing, planning and programming the development of territories, and in the field of environmental management. In addition, specialists with knowledge of geo-information and space technologies need health care, educational organizations, logistics, and travel companies.

Graduates work in the field of cartography, geoinformatics, telecommunications, economics, state and municipal management, geoecology, landscape design, tourism, and urban planning. The second approach is connected with the expansion of the field of activity of traditional specialties but on the basis of innovative technologies. For example, the roadmap for digitalization of real estate brokers (realtors) (gradually disappearing profession) of Belarus provides for expanding their activities in managing an unlimited number of real estate objects, condominiums using a single national interactive industrial Web platform integrated with the Internet of Things IoT. Another approach is related to the transition of real estate professionals to the IT sphere as business analysts, specialists in designing artificial intelligence systems with training, and developers of mass AVM models.

It is obvious that a wide profile of land management, real estate, becomes part of the process of education of land surveyors, real estate managers using an interdisciplinary, problem-oriented approach. This approach ensures the connection of academic programs with a wide range of functions and tasks in real estate with numerous modern challenges. Different disciplines should be taught on the principle of "learning-through-performance of work." The art of problem-solving should be taught through a project-oriented approach to education with an emphasis on the development of self-education skills "learning-learning". 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 constant change. To cope with this constant change, the educational base must be more flexible.

CONCLUSION

Forget location. The new battle - ground in real estate, is technology, technology, technology.

Global technology entrepreneurs and investors have already begun turning their attention to reinventing the real estate sector, through business model innovation and product innovation. Going digital is an opportunity to reinvent core processes, create new business models, and put the customer at the center of everything. Companies are using digital tools to raise the bar in operational efficiency, customer engagement, innovation, and workforce productivity. Early examples, such as Airbnb, WeWork and Amazon demonstrate how digital disruptors can materially impact the markets in which they operate, leaving incumbents scrambling to catch up. Consumer expectations of real estate digitalization and their experience with the built environment have been elevated. As innovation in other industries continues to power ahead, consumer expectations will continue to put pressure on the real estate sector to innovate.

The volume and depth of innovation will increase, with more specialized technological solutions for nuanced real estate challenges as well as growing competition for more generalized solutions. Large real estate corporates – from agencies to developers, financiers to portfolio managers – will need to understand the latest in innovation and implement strategies to integrate those advancements into their projects and businesses in order to stay ahead of the pack. However, introducing a cost effective and impactful corporate innovation and venturing strategy into traditional real estate organisations comes with a number of material challenges.

Real estate sector specialists will begin to exit the major real estate corporates and consulting firms to build new businesses that focus on solving problems familiar to them in more agile, rewarding working environments. As dissatisfaction with the slow-moving titans increases, this exodus will begin to affect the ability of major corporates to attract and retain entrepreneurial talent at all levels.

The impact on the labor market is mixed with widespread dislocation of workers but a proliferation of digital tools that offer new ways of working, matching skills, and acquiring skills.

University graduates must have the skills to adapt to a rapidly changing labor 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 digital technologies oriented.

VÝSKUM A VÝVOJ AKO PREDPOKLAD ŠTVRTEJ PRIEMYSELNEJ REVOLÚCIE

RESEARCH AND DEVELOPMENT AS A SUPPOSITION OF THE FOURTH INDUSTRIAL REVOLUTION

Jana SOCHULÁKOVÁ⁷²

Abstrakt: *Vďaka nástupu digitalizácie prichádza štvrtá priemyselnej revolúcia, ktorá prináša nové požiadavky na priebeh a štruktúru podnikových procesov, kvalitatívne mení metódy a prístupy v manažmente, vyžiada si enormnú zmenu a rozšírenie vzdelania, schopností a zručností ľudskej pracovnej sily, prinesie výrazný posun v ekonomike. Štvrtá priemyselná revolúcia znamená prechod od fázy jednoduchšej digitalizácie k inováciám. Informačné a komunikačné technológie stoja v epicentre štvrtej priemyselnej revolúcie a sú faktorom ekonomických a spoločenských zmien. Zmeny, ktoré prinesú technologické trendy v Industry 4.0, môžu ovplyvniť výrazným spôsobom slovenskú ekonomiku. V inovačnom a technologickom napredovaní zohráva významnú úlohu výskum a vývoj. V príspevku sa zameriame práve na oblasť výskumu a vývoja. Zhodnotíme vývoj výdavkov na výskum a vývoj v Slovenskej republike v období 2010-2017.*

Kľúčové slová: *Industry 4.0, inovácie, výskum a vývoj, klastre*

Abstract: *With the onset of digitization, the Fourth Industrial Revolution, is coming new demands on the course and structure of business processes, qualitative change of methods and approaches in management, requiring enormous change and widening of education, abilities and skills of the human labor force, will bring an annual shift in the economy. The Fourth Industrial Revolution means the transition from the simple digitization phase to innovations. Information and communication technologies are the center of the Fourth Industrial Revolution and are a factor of economic and social change. Changes that bring technology trends into Industry 4.0 can significantly affect the Slovak economy. R & D plays an important role in innovative and technological progress. The contribution is focused on research and development. We will evaluate the development of R & D expenditure in the Slovak Republic for the period 2010-2017.*

Key words: *Industry 4.0, innovation, research, development, clusters*

JEL Classification: *L16, O32*

1. ÚVOD

Technologický pokrok aktuálne konceptualizovaný v teórii a hospodárskej politike ako štvrtá priemyselná revolúcia, resp. Industry 4.0, predstavuje pre slovenskú ekonomiku v nasledujúcom období jednu z najväčších výziev. Štvrtá priemyselná revolúcia predstavuje úplne novú filozofiu prinášajúcu zmeny do množstva rôznych oblastí, od priemyslu, cez technickú štandardizáciu, bezpečnosť, vzdelávanie, vedu a výskum a po trh práce a sociálny systém. Podľa Ministerstva hospodárstva Slovenskej republiky koncept Industry 4.0 treba brať ako celoštátnu prioritu, pretože Industry 4.0 pretransformuje slovenský priemysel a je predpokladom zvýšenia konkurenčnej výhody podnikov. Táto transformácia bude založená na tvorbe pridanej hodnoty z inovácie produktov a procesov, čím vznikne inteligentný priemysel budúcnosti, ako jeden z pilierov rozvoja hospodárstva Slovenska so značným vplyvom na spoločnosť.[5] V príspevku sme sa zamerali na analýzu stavu a vývoja výdavkov na výskum a vývoj a inovačných procesov na Slovensku. Fungujúci a silný národný inovačný systém a

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systém výskumu a vývoja patria k nevyhnutným predpokladom efektívneho zapojenia do procesov štvrtej priemyselnej revolúcie.

2. INDUSTRY 4.0

Strategická línia Industry 4.0 vznikla v Nemecku ako reakcia na pokles priemyselnej výroby po úniku výrobných kapacít do lacnejších krajín. Do iniciatívy sa zapojili popredné nemecké koncerny ako Siemens, Bosch, Schunk či Volkswagen. Cieľom je reindustrializovať Nemecko špičkovými technológiami, schopnými konkurovať aj tej najlacnejšej pracovnej sile. Zároveň sa vytvorí množstvo pracovných miest pre vysoko kvalifikovaných ľudí a rozšíria príležitosti pre ďalší výskum a vývoj.

V roku 2011 nemecký výskumný zväz pre vedu a ekonomiku prišiel s výskumným programom s cieľom udržať Nemecko ako krajinu na vysokej technologickej úrovni a program nazvali Industriálna revolúcia 4.0, resp. Industry 4.0. Podľa nich I 4.0 odzrkadľuje spoločenskú zmenu spôsobenú prepojením fyzického, virtuálneho a sociálneho sveta. Je to v podstate celospoločenská zmena zasahujúca oblasti priemyslu, technickej štandardizácie, bezpečnosti, vzdelávania, právneho rámca, výskumu, prepojenia, až po sociálne systémy, trh práce a nároky na pracovníkov, ich vzdelanie a špecializáciu.

Hlavná z myšlienok, prečo sa táto filozofia a teda tento pojem ujal a prečo sa začal presadzovať, je očakávaný nárast produktivity, výrobné 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. [7]

Schopnosť ekonomiky adaptovať sa na aktuálne, ako aj očakávané technologické zmeny je daná mnohými faktormi. Za jeden z hlavných môžeme považovať jej inovačnú úroveň. Inovačnou úrovňou krajiny chápeme súbor faktorov najmä vzdelanej pracovnej sily, kvalitného výskumu a vývoja, intenzity financovania, ale aj niektorých výstupových indikátorov, ako je podiel intenzívne náročných odvetví v štruktúre ekonomiky, zamestnanosti alebo exportu a úroveň produkcie duševného vlastníctva. Počnúc druhou priemyselnou revolúciou zohráva v inovačnom a technologickom napredovaní hlavnú úlohu výskum a vývoj. Dá sa preto predpokladať, že aj v rámci štvrtej priemyselnej revolúcie bude postavenie národnej ekonomiky závisieť od veľkosti a výkonnosti národného systému výskumu a vývoja a intenzity zapojenia sa do medzinárodného systému výskumu a vývoja.

3. VÝSKUM A VÝVOJ V SLOVENSKEJ REPUBLIKE

Slovensko je krajinou s konkurenčným technickým zázemím a s dlhoročnou tradíciou priemyselného výskumu a vývoja. Disponuje aktívne pôsobiacim výskumno-vývojovým personálom participujúcim na špičkových domácich a medzinárodných projektoch, má dostupnú inžiniersku a vedeckú základňu, má vybudovanú výskumno-vývojovú sieť tvorenú priemyselnými výskumno-vývojovými organizáciami, vedecko-výskumnými pracoviskami na technických a prírodovedných univerzitách, výskumnými ústavmi Slovenskej akadémie vied a zahraničnými výskumno-vývojovými centrami. Táto výskumno-vývojová základňa je dobre prepojená aj s ďalšími zainteresovanými inštitúciami ako sú priemyselné združenia, zväzy, klastre, agentúry na podporu výskumu, vývoja a inovácií, biznis inovačné centrá a inkubátory, vedecko-technologické parky, ale aj softvérové vývojové firmy.

O schopnostiach slovenských výskumníkov, vývojárov a inžinierov sa už presvedčili viaceré zahraničné spoločnosti, ktoré si zriadili na Slovensku svoje R&D centrá ako napr.: Johnson Controls, ON Semiconductor, Leoni, BSH, ThermoSolar, Sauer Danfoss, Krauss Maffei, Ness, Siemens, Alcatel-Lucent, Mühlbauer, Continental Automotive Systems, Elastogran a ďalšie. [8]

Výdavky na vedu a výskum na Slovensku od roku 2010 až do roku 2015 neustále rastú, pričom výraznejší podiel počas celého analyzovaného obdobia tvoria bežné výdavky. Percentuálny podiel výdavkov na výskum a vývoj z HDP dosiahol v roku 2015 svoje maximum a to 1,18% HDP. Navýšenie percentuálneho podielu celkových výdavkov na výskum a vývoj za rok 2015 bolo spôsobené výlučne kapitálovými výdavkami, pričom sa výrazne čerpalo zo štrukturálnych fondov. V roku 2016 nastal pokles, na výskum a vývoj sa vynaložilo 640835000 Eur, čo predstavovalo 0,79 % HPD.

Tabuľka 1: Výdavky na výskum a vývoj v SR v tis. Eur

Rok	Výdavky na výskum a vývoj			Podiel výdavkov na výskum a vývoj z HDP (v %)
	spolu	kapitálové	bežné	
2010	416 369	63 073	353 296	0,62
2011	468 439	94 799	373 641	0,66
2012	585 225	109 337	475 889	0,80
2013	610 876	97 300	513 576	0,82
2014	669 632	115 698	553 934	0,88
2015	927 272	374 186	553 086	1,18
2016	640 835	45 814	595 021	0,79
2017	748 955	72 776	676 179	0,88

Zdroj: www.statdat.statistics.sk

V roku 2016 vynaložili členské štáty EÚ na výskum a vývoj celkovo viac ako 300 miliárd EUR. Intenzita výskumu a vývoja, t. j. výdavky na výskum a vývoj ako percento HDP, zostali minulý rok na úrovni 2,03 %.

Tabuľka 2: Výdavky na výskum a vývoj spolu v tis. Eur v členení podľa regiónov

	2010	2011	2012	2013	2014	2015	2016	2017
Bratislavský kraj	208 159	242 739	317 112	346 919	311 168	384 880	319 931	383 071
Trnavský kraj	27 996	33 565	25 293	29 187	48 742	97 749	41 492	40 098
Trenčiansky kraj	47 520	26 742	30 805	31 337	55 638	52 150	57 001	95 894
Nitriansky kraj	18 776	21 298	25 209	20 186	52 768	88 226	36 876	37 349
Žilinský kraj	31 043	42 190	60 787	61 884	77 971	134 196	59 592	59 719
Banskobystrický kraj	18 775	26 320	29 938	33 126	34 814	44 540	37 743	37 334
Prešovský kraj	11 588	13 344	17 440	19 813	23 744	23 061	25 353	20 202
Košický kraj	52 507	62 238	78 637	68 419	64 782	102 467	62 843	75 285

Zdroj: www.statdat.statistics.sk

Z regionálneho hľadiska sú výdavky na výskum a vývoj koncentrované do Bratislavského kraja, ktorý výrazne prevyšuje všetky ostatné kraje. Do Bratislavského kraja smeruje viac ako 40% všetkých výdavkov. Naopak v najmenšej miere je výskum a vývoj podporovaný v Prešovskom kraji.

V tabuľke 3 vidíme zhodnotenú štruktúru výdavkov na výskum a vývoj. V roku 2017 bola skoro polovica výdavkov zo štátnych zdrojov. Slovensko zaznamenalo pomerne pozitívny vývoj v intenzite verejných výdavkov na výskum a vývoj, keď v roku 2015 sa dostalo na úroveň 120 % priemeru EÚ. Tento fakt môžeme pripísať čerpaniu zo štrukturálnych fondov EÚ a Kohézneho fondu. Otázna je ale udržateľnosť financovania výskumu a vývoja aj

v budúcich rokoch z verejných prostriedkov. Slovenská ekonomika v európskom kontexte zostáva len miernym inovátorom s pomerne značným zaostávaním vo veľkej časti faktorov inovačného rozvoja. V roku 2016 predstavovali najväčší podiel prostriedkov vynaložených na vedu a výskum podnikateľské zdroje. Záujem podnikateľského sektora o oblasť výskumu a vývoja je zo strany štátu podporovaná prostredníctvom dotácií vo forme stimulov pre výskum a vývoj. Zahraničné zdroje investovali do výskumu a vývoja najviac v roku 2015, v ktorom boli hlavným zdrojom investícií do výskumu a vývoja. V posledných dvoch rokoch ich podiel výrazne klesol.

Tabuľka 3: Štruktúra výdavkov na výskum a vývoj v %

Ukazovateľ		2010	2011	2012	2013	2014	2015	2016	2017
Podľa sektorov	Podnikateľský sektor	42,09	37,18	41,35	46,26	36,84	27,95	50,36	54,12
	Štátny (vládny) sektor	29,96	27,66	24,52	20,48	28,34	27,86	21,44	20,81
	Sektor vysokých škôl	27,64	34,95	34,03	33,10	34,42	43,79	27,71	24,67
	Súkromný neziskový sektor	0,31	0,21	0,10	0,15	0,41	0,40	0,49	0,41
Podľa zdrojov financovania	Podnikateľský zdroj	35,06	33,85	37,71	40,19	32,21	25,06	46,22	35,50
	Štátny (vládny) zdroj	49,57	49,75	41,57	38,90	41,38	31,94	40,99	49,03
	Ostatné národné zdroje	0,70	2,24	2,07	2,94	2,72	3,57	2,08	1,72
	Zahraničné zdroje	14,67	14,16	18,65	17,97	23,68	39,43	10,71	13,74
Podľa vedných oblastí	Prírodné vedy	19,92	20,72	20,48	17,71	17,77	15,94	16,27	19,56
	Technické vedy	53,59	47,68	46,92	51,01	48,77	48,02	55,77	58,14
	Lekárske a farmaceutické vedy	7,10	7,96	8,46	8,95	9,98	7,48	6,65	5,10
	Pôdohospodárske vedy	8,20	7,57	6,74	3,18	6,94	7,97	6,29	5,23
	Spoločenské vedy	6,99	8,46	7,44	7,50	10,34	17,14	9,91	7,21
	Humanitné vedy	4,21	7,62	9,96	11,65	6,21	3,45	5,12	4,77
Podľa činností výskumu a vývoja	Základný výskum	46,27	48,87	47,34	44,09	45,10	42,78	40,39	37,22
	Aplikovaný výskum	23,67	24,63	23,46	23,83	28,42	30,26	23,67	22,82
	Vývoj	30,05	26,50	29,20	32,08	26,48	26,95	35,94	39,96

Zdroj: www.statdat.statistics.sk

Viac ako polovica výdavkov je smerovaná do technických vied, necelých 20% podporuje prírodné vedy. Až do roku 2016 bola najväčší podiel výdavkov vynakladaný na základný výskum. V roku 2017 už väčší podiel smeroval do oblasti vývoja.

Z pohľadu vývoja počtu pracovníkov v oblasti výskumu a vývoja na Slovensku v priebehu analyzovaného obdobia mierne stupa, pričom je samozrejmé, že najväčší podiel tvoria práve výskumníci. Oblasť výskumu a vývoja je vo veľkej miere závislá na ľudskom potenciáli, vedomostiach a poznatkoch, viac ako iné oblasti. V oblasti výskumu a vývoja je potrebné podporovať rozvoj nehmotného kapitálu – ľudí a ich myšlienok, poznatkov, a prepájať ho na reálne hmotné výstupy a výsledky výskumu. Počet zamestnancov výskumu a vývoja, ktorými národná ekonomika disponuje, sa tak stáva hlavným meradlom výskumno-vývojového potenciálu krajiny.

Tabuľka 4 : Štruktúra zamestnancov výskumu a vývoja (v %)

ukazovateľ		2010	2011	2012	2013	2014	2015	2016	2017
Počet zamestnancov výskumu a vývoja (fyzické osoby k 31.12.)		28128	28596	28880	27823	28825	28752	33252	33467
Zamestnanci VV podľa pracovného zaradenia	Výskumníci	85,50	86,41	86,80	87,84	87,01	84,85	83,41	82,79
	Technický personál	10,10	9,38	9,53	8,72	8,93	9,89	10,42	11,78
	Pomocný personál	4,40	4,21	3,66	3,44	4,06	5,26	6,16	5,43
Zamestnanci výskumu a vývoja podľa kvalifikácie	s vysokoškolskou a vyššou kvalifikáciou	89,19	90,13	90,44	91,86	91,12	89,03	89,65	89,35
	v tom: s VŠ vzdelaním 1. stupňa	2,51	2,15	1,24	0,96	1,29	1,73	1,54	1,36
	s VŠ vzdelaním 2. stupňa	40,18	40,99	40,82	41,23	39,87	38,82	40,08	39,88
	s VŠ vzdelaním 3. stupňa	46,51	46,99	48,38	49,67	49,96	48,48	48,02	48,11
	S vyšším odborným vzdelaním	1,13	1,27	0,98	0,82	1,25	0,87	1,72	1,38
	So stredoškolským vzdelaním	9,23	8,22	8,22	6,96	7,41	9,63	8,28	8,95
	So základným vzdelaním	0,44	0,37	0,35	0,36	0,22	0,47	0,35	0,32

Zdroj: www.statdat.statistics.sk

Až 90% zamestnancov výskumu a vývoja tvoria zamestnanci s vysokoškolským vzdelaním 2. a 3. stupňa. Práve oni sú zamestnancami zabezpečujúcimi realizáciu výskumu a vývoja, výskumnými pracovníkmi a tvorcami inovácií.

Tabuľka 5: Podniky s inovačnou aktivitou

Ukazovateľ		2010	2012	2014	2016
Podiel podnikov s inovačnou aktivitou (%)	Z celkového počtu podniku v priemysle a službách	35,6	34,0	31,8	30,7
	Malé podniky	29,3	29,8	28,5	24,6
	Stredné podniky	43,6	40,0	37,9	42,7
	Veľké podniky	65,1	62,1	54,7	60,1
Podiel výdavkov na inovácie	Z celkových tržieb v inovujúcich podnikoch v priemysle a vybraných službách v %	1,2	1,8	1,3	1,6
Štruktúra výdavkov na inovácie (v %)	Vnútny výskum a vývoj	17,1	12,9	21,8	22,4
	Vonkajší výskum a vývoj	7,7	20,8	10,6	7,8
	Zaobstaranie strojov, zariadení, softvéru a budov	71,6	62,8	41,4	63,6
	Zaobstaranie ostatných vonkajších znalostí	3,6	1,8	16,6	3,2
	Výdavky na ostatné inovačné aktivity	-	1,6	9,6	3,1

Zdroj: www.statdat.statistics.sk

Podiel inovačne aktívnych podnikov zo všetkých podnikov pôsobiacich na Slovensku je 30%. Z analýzy štruktúry výdavkov na inovačné aktivity podnikov vyplýva, že prevažná časť výdavkov bola vynaložená na zaobstaranie strojov, zariadení, softvéru a budov (viac ako

60%), na vnútorný výskum a vývoj smeruje 22% výdavkov na inovácie. Keď sa pozrieme na členenie podnikov podľa veľkosti, z celkového počtu podnikov na Slovensku až 99% predstavujú malé a stredné podniky. Ale čo sa týka inovečnej activity, z malých podnikov sa len 24% zaoberá inovačnými aktivitami, zo stredných podnikov je to už viac – 42%. Veľké podniky, ktoré majú síce najmenšie zastúpenie medzi podnikmi na Slovensku, ale až 60% z nich investuje do inovačných aktivít.

4. ZÁVER

K efektívnym predpokladom úspešného zapojenia sa do procesov Industry 4.0 patrí kvalitný inovačný systém a výskum a vývoj. Podľa prieskumu realizovaného Iniciatívou zástupcov priemyslu Industry 4.0 má na Slovensku už tretina podnikov stratégiu Industry 4.0, pričom prevládajú podniky so zahraničným kapitálom. Podniky sa primárne zameriavajú na zvyšovanie výkonnosti a efektívnosti vnútorných procesov, riadenie a znižovanie podnikových nákladov a na riešenia nahrádzajúce nedostatok zamestnancov. [3] Viac ako polovica podnikov sa zameriava na inovácie prípravnej fázy výroby, logistiku, skladovanie a údržbu.

Slovensko sa zaraďuje medzi krajiny s nízkym podielom financovania výskumu a vývoja na HDP. V priebehu celého analyzovaného obdobia boli výdavky na výskum a vývoj menej ako 0,9%. Svoje maximum dosiahlo Slovensko v roku 2015 a to 1,18 % HDP. V rámci Stratégie Európa 2020 si Slovensko určilo cieľ dať na vedu a výskum jedno percento HDP. Tento cieľ je možné dosiahnuť, ak do výskumu a vývoja investuje viac podnikateľská sféra. Podnikové výdavky na výskum a vývoj dlhodobo nedosahujú priemer v EÚ. Jednou z možností vytvárania lepších podmienok na výskum a vývoj a stimuláciu inovácií sú klastre. Podniky združené v klastri sú previazané spoločnými technológiami a vedomosťami, ich členovia najvzájom spolupracujú, ale zároveň aj súťažia. Vďaka účasti v klastri vedia podniky rýchlejšie reagovať na potreby zákazníkov a vyvíjať nové technológie. Klastre majú výrazný vplyv na konkurencieschopnosť, ktorá sa stala jednou z hlavných priorít pre rozvojovú stratégiu firiem. Práve klastre ponúkajú veľa možností, ako môžu firmy nadobudnúť konkurenčnú výhodu dôležitú pre rast na slovenskom a zahraničnom trhu

Zvyšovaniu výdavkov v oblasti výskumu a vývoja na Slovensku by mala pomôcť aj vládou schválená Stratégia hospodárskej politiky s výhľadom do roku 2030, ktorej cieľom je postupné približovanie sa k znalostným ekonomikám v rámci EÚ. Jedno z odporúčaní hovorí práve o postupnom zvyšovaní výdavkov na výskum a vývoj do roku 2030 tak, aby bola dosiahnutá úroveň prvej päťky krajín EÚ z pohľadu podielu výdavkov na výskum a vývoj na HDP. Jedným z hlavných nástrojov podpory majú byť rôzne daňové úľavy. Daňové zvýhodnenie stimuluje podniky k výdavkom na domáci výskum a vývoj. V súčasnosti sú hlavne podporované podniky, ktoré prijímajú mladých pracovníkov výskumu a vývoja a podniky, ktoré zvyšujú financovanie svojich výskumných aktivít.

Dodatok

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AN EXAMPLE OF ELECTRONIC DOCUMENT AND WORKFLOW MANAGEMENT SYSTEM FOR SUSTAINABILITY TRANSITION IN THE PUBLIC SECTOR

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Abstract: Sustainability transition relies on transformation processes by changing steady practices in the field of organisational management. Public organisations always deal with a huge amount of documents. As a result of sustainability transition, public institutions focus on the shift from paper documents and paper-based processes to electronic documents and processes. However, the adoption of electronic document and workflow management system (EDWMS) is related to challenges, as not only conducive, but also inhibiting factors could be indicated. The paper analyses the theoretical perspectives on EDWMS adoption in the light of sustainability transition. The main focus is placed on the technology-organisation-environment (TEO) framework. The empirical evidence are based on a public institution case analysis, while empirical data are collected using quantitative and qualitative methods. The paper provides a practice-based decision model for EDWMS adoption emphasising transformation including economic, social and environmental dimensions.

Key words: sustainability transition, electronic document management system, electronic document and workflow management system, sustainability, TEO framework

JEL Classification: O33, M15, L30

1. INTRODUCTION

Public institutions have always been associated with a huge amount of paper documents. However, rapid growth of information technologies and the potential of these technologies for the process improvement and institutional efficiency enhancement caused fundamental changes. Public institutions started using information systems (IS) (Sprague, 1995). For managing large amounts of documents, electronic document management systems (EDMS) can be used (Sprague, 1995). The improvement of the processes can be achieved by implementing electronic workflow management systems (EWMS) (Van der Aalst, 1998). The synergy effect is based on EDMS and EWMS integration (Morschheuser et al. 1996) calling that kind of information technologies (IT) an electronic document and workflow management system (EDWMS). The present paper focuses on EDWMS.

The shift from the paper-based documents and process management to IT-based management is challenging due to the context that influences the adoption process (Zhu and Kraemer, 2005). Several theoretical frameworks have been proposed in regard to adoption of IS, however the technology-organisation-environment (TEO) framework is one of the most widely used (Gröger et al., 2014). Technological factors and improvements are important, but

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the success of the EDWMS adoption is based on end-users' acceptance of the system (Hung et al., 2009). This implies that the barriers and the determinants of adoption success are gaining relevance too (Ebrahim and Irani, 2005). Nonetheless, there is still a gap in the literature concerning conducive and inhibiting factors for EDWMS in the public sector.

The role of business and other organisations striving for sustainability is well acknowledged (Bansal, 2005; Swanson and Zhang, 2012; Baumgartner and Rauter, 2017). Fundamental sustainability challenges address the environmental, social and economic problems (Markard et al., 2012). The adoption of EDWMS requires to reconsider the paper-based processes (Gröger et al., 2014); it focuses on green aspects (Angeles, 2014) and cost reduction (Ebrahim and Irani, 2005), and also incorporates the end-users' acceptance (Hung et al., 2009). This leads to the fact that the adoption of EDWMS is related to socio-technical transition, i.e. a set of processes that lead to a fundamental shift in socio-technical systems (Geels and Schot, 2010; Markard et al., 2012). The adoption of EDWMS reflects the efforts of public institutions for a transition toward sustainability, i.e., a fundamental transformation towards more sustainable modes of production and consumption (Markard et al., 2012). However, the literature still lacks the recommendations (decisions) for the public sector on the improvement of the adoption of EDWMS towards sustainability transition.

The purpose of the paper is to provide a practice-based decision model for EDWMS adoption in public institutions seeking for sustainability transition by exploring the inhibiting and conducive factors.

The research questions are as follows: 1. What are the factors that inhibit and facilitate the adoption of EDWMS from the end-users' perspective? 2. What are the possible decisions of a public institution for the EDWMS adoption towards sustainability transition?

The paper contributes to the literature in several ways. Firstly, the paper provides insights on the frameworks for EDWMS adoption tackling the sustainability transition perspective. Secondly, the paper presents a practice-based decision model for EDWMS adoption in public institutions.

The paper is organised as follows. At the beginning, definitions of EDMS, EWMS and EDWMS are provided and the influencing factors of EDWMS adoption are disclosed. In the next section, EDWMS is described in the context of sustainability transition. Afterwards, the methodology is introduced. Subsequently, the survey results are presented. Finally, the conclusions and discussion are provided.

2. THEORETICAL BACKGROUND

2.1 Adoption of information systems for document and workflow management

Public institutions were accustomed to manage paper documents and the most important information was stored in a documented form, e.g. templates, reports, letters, memos, policy statements, contracts or agreements. At the beginning, the introduction of IT for public institutions was mostly limited to better and faster ways to generate, print, and transport text documents (Sprague, 1995). However, rapid growth of technologies provided new possibilities for public institutions: EDMS, EWMS and EDWMS could be introduced.

Generally, electronic document management is "the application of technology to save paper, speed up the communications, and increase the productivity of business processes" (Sprague, 1995, p. 29). EDMS allows to store and to manage multi-media format records, and also to share documents (Ebrahim and Irani, 2005). Sprague et al. (1995) emphasises a set of technologies aimed directly at handling documents. Thus, EDMS supports the entire life cycle of documents and allows to create, manage, reuse and store them (Gröger et al., 2014).

However, most of the processes in organisations are based on document flows, and information systems are needed for the workflow management. According to Caverlee et al. (2007), workflow management, as a core IT component, allows to implement and execute paper-based processes and tasks. Gröger et al. (2014) stress that EWMS are used for planning, management, coordination and monitoring of processes and workflows.

Seeing that documents are often linked to processes and vice versa, only completely integrated EDMS and EWMS allow to achieve the maximum value for the organisation and end-users (Morschheuser et al., 1996). EDWMS is treated as “an IS for the structured creation, management, reuse and storage of electronic documents in which process models for creation, management and execution of workflows can be stored” (Gröger et al., 2014, p. 3).

Harnessing information technologies to deal with documents and processes is one of the most important challenges facing organisations and end-users. Diversity of factors influencing the adoption of IT makes the process more confusing. Oliveira and Martins (2011) identify several frameworks in regard to adoption of IT: theory of planned behaviour (TPB) (Ajzen 1985, Ajzen 1991), technology acceptance model (TAM) (Davis 1986, Davis 1989, Davis et al., 1989), unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), DOI (Rogers, 1995), and TOE framework (Tornatzky and Fleischer, 1990). TEO represents the organisational level, DOI represents the organisational and individual levels, whereas TAM, TPB and UTAUT are at the individual level (Oliveira and Martins, 2011). Some short descriptions of frameworks are provided below. As the TOE framework is one of the most widely used (Oliveira and Martins, 2011; Zhu et al. 2003; Hoti, 2015) and the empirical research is based on the same, the TEO analysis provided is more detailed.

DOI is “a theory of how, why, and at what rate new ideas and technology spread through cultures, operating at the individual and firm level” (Oliveira and Martins, 2011, p. 111). Innovativeness is related to individual (leader) characteristics, internal organisational structural characteristics, and external characteristics of the organisation (Rogers, 1995). Derived from socio-psychological theories, TPB explains acceptance behaviour. According to TPB, behavioural intention is the proximal determinant of behaviour, while the former is determined by attitude, subjective norm, and perceived behavioural control (Hung et al., 2009). According to UTAUT, performance expectancy, effort expectancy, social influence and facilitating conditions all play a relevant role as direct determinants of user acceptance and usage behaviour play. As stated by the UTAUT framework, attitude towards using technology, self-efficiency and anxiety are not direct determinants of the intention to use technologies (Venkatesh et al., 2003). The TAM model highlights the perceived usefulness and perceived easiness of use (Davis et al., 1989).

The TEO framework identifies three aspects of organisation’s context that influence the process by which it adopts the IS: technological context, organisational context, and environmental context. Technological context describes the internal and external technologies relevant to the organisation (Oliveira and Martins, 2011); it deals with the existing technologies in use and new technologies relevant to the organisation (Zhu and Kraemer, 2005). Organisational context encompasses the descriptive attributes of the organisation such as scope, size, and managerial structure (Oliveira and Martins, 2011); elements that depict the processes and situation within the organisation in more detail can also be included (Tornatzky and Fleischer, 1990). Environmental context is the arena in which an organisation conducts its business (industry, competitors, and dealings with the government) (Tornatzky and Fleischer, 1990).

Gröger et al. (2014) proposed the research model based on the TEO framework, which is appropriate for IS adoption in universities. The model involves conducive factors, inhibiting factors, and problems and challenges. The conducive factors describe possible achievements when using of EDMS, EWMS, and EDWMS. The inhibiting factors refer to elements, which

potentially create difficulties for the technology adoption. Meanwhile, problems and challenges include the factors that describe the organisational situation. According to Gröger et al. (2014), conducive factors that represent the technological context are quality improvement, time saving, cost saving, sustainability improvement, integration efforts, cooperation/collaboration improvement, and compliance/governance. The inhibiting factors that represent the technological context include the implementation efforts, implementation and operation costs, technical know-know, infrastructure; the inhibiting factor that represent the environmental context refers to the legal aspects. Time needed, process redesign, employee acceptance, integration with the existing IS, project management, budget compliance, and process of approval are identified as problems and challenges that represent the organisational context (Gröger et al., 2014). Seeing that universities could be treated as public institutions, the conducive factors, inhibiting factors, and problems and challenges described by Gröger et al. (2014) are used in the present paper for the methodology of empirical research.

As it was mentioned before, the adoption of IS is challenging given the different factors that influence the process. Tackling the IS adoption from the process improvement and efficiency enhancement perspectives, the sustainability perspective could not be missed.

2.2 EDWMS in the context of sustainability transition

Sustainable development is the kind of development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs (WCED, 1987). At the United Nations Sustainable Development Summit on 25 September 2015, more than 150 world leaders adopted the new 2030 Agenda for Sustainable Development, including the Sustainable Development Goals (SDGs). The role of businesses and other organisations in achieving sustainable development in the world were recognised as extremely important. Organisations are expected to act responsibly and have in mind that all their activities have an influence on society and the natural environment (Baumgartner and Rauter, 2017).

The adoption of IS is closely related to the sustainability transitions, seeing that the sustainability transition refers to how the green innovations and sustainable practices (in behaviour and policy) struggle against the existing systems or regimes (STRN, 2010). According to Markard (2012, p. 296) sustainability transitions are about “long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption”. Sustainability transitions pose formidable challenges as an area of study (Ferraro et al., 2015; Markard et al., 2012; van den Bergh et al., 2011). Any sustainability transition is complex, uncertain, value-laden and political. Moreover, transitions are multi-dimensional, as they entail organisational, institutional and technological changes. Furthermore, they implicate a variety of intertemporal tensions and potential trade-offs across multiple stakeholders. These features make it a particularly interesting setting for organisational scholars to apply, scrutinise and expand existing theoretical frameworks and approaches (Garud et al., 2016).

Organisations (e.g., corporations, social movements, industry associations, NGOs, governments and regulators) individually and collectively play critical roles in sustainability transitions as they develop new products, processes, and technologies (Kaplan & Murray, 2010), establish common industry standards (Slager et al., 2012), lobby for regulatory support (Barley, 2007), engage in societal discourses and problem framing (Lefsrud & Meyer, 2012), or create collective expectations (van Lente & Rip, 1998). At the same time, organisations may also work against transitions, for instance, by maintaining the existing infrastructures, industries, technologies and institutions (Smink et al., 2015), mobilising resources against

major changes in environmental regulation (Hess, 2014), or perpetuating the established technologies by associating them with sustainability (Garud et al., 2010).

Tackling the adoption of IS, the shift from paper-based to electronic processes is of high importance. The organisations focus on the situation where new technologies are highly intertwined with user practices and life styles, business models, value chains, complementary technologies, organisational structures, institutional structures, regulations (Markard, 2012). By adopting IS, the socio-technical transition involves changes along different dimensions (including technological, organisational, and socio-cultural). Transitions involve a broad range of actors (including employees and IT companies). Socio-technical transitions differ from technological ones, because they also include changes in user (employee) practices and institutional structures (Markard et al., 2012).

3. METHODOLOGY

For the empirical research, a public institution (hereinafter – LitPI) was chosen. LitPI is well known due to its clearly expressed commitment to change the document and process management introducing EDWMS. The main argument for choosing LitPI is the mentioned commitment as well as the assumption that EDWMS adoption in LitPI relies on sustainability principles. Empirical data were collected using quantitative and qualitative methods.

Questionnaires were distributed to 232 employees, out of which 200 were returned. Of the 200 respondents, 42.5% were in the 51-60 year age group. The respondents represented a range of positions: 57.00% were employed as chief specialists, 23.00% were junior specialists and 20.00% were specialists. Data were also collected through in-depth, in-person interviews conducted at LitPI in October 2017. The interview sample comprised 6 experts (LitPI representatives) in the EDWMS adoption process. All were professionals working in the public sector for more than 8 years. Each interview lasted 30 minutes on average (ranging from 28 to 45 min) and all of them were recorded and transcribed.

Concerning the measures, a questionnaire was developed following the scientific literature. The survey was split into six sections: the first sought to determine the actions the users do using the EDWMS; the second section assessed the conducive factors of the EDWMS; the third section assessed the inhibiting factors of the EDWMS, the fourth section aimed to obtain the suggestions from respondents concerning the EDWMS development; the fifth section was devoted to data on ways the respondents learned to work with the EDWMS; and the sixth section was devoted to the demographics. The content of each section is provided below.

The set of 13 items was provided to measure *the actions the users do in the EDWMS* (the items were generated based on the EDWMS functionality). An example of item: “I use the system for task performance”. Each item was rated from 1 (strongly disagree) to 5 (strongly agree). This section also included an item concerning the value of EDWMS for end-users. The set of 5 items was provided to measure the *conductive factors of EDWMS* (items were adopted from Neal, 2008; Vanderfeesten and Reijers, 2006; Buhler and Vidal, 2005; Downing, 2006; Groger et al., 2014). Each item was rated from 1 (strongly disagree) to 5 (strongly agree). An example of item: “Unclear menu”. The set of 6 items was provided for the *inhibiting factors of EDWMS* (items were adopted from Vanderfeesten and Reijers, 2006; Groger, Decker and Schuman, 2014). An example of item: “It is simpler and easier to prepare the documents”. Each item was rated from 1 (strongly disagree) to 5 (strongly agree). The fourth section included the open question regarding the EDWMS implementation suggestions. The fifth section included 1 item concerning the way the employees learned to work with the system. The sixth section was dedicated to demographic information, namely age, work position, and working experience.

During the interview, the following three aspects of EDWMS adoption were covered: (1) conducive factors of EDWMS; (2) inhibiting factors of EDWMS; and (3) suggestions for the EDWMS adoption towards sustainability transition.

4. RESULTS

Based on the survey and interview results, a practice-based decision model for EDWMS adoption towards sustainability transition is introduced. The model is based on inhibiting and conducive factors for EDWMS adoption as well as on the suggestions for improvement provided by the respondents (see Figure 1). The survey results confirm the need and the value of the decision model for EDWMS adoption as 40.7% of respondents told that the system made their daily work more difficult. The decision model incorporates economic, social and ecological dimensions; the sustainability transition approach is employed. Further, results are presented from the decision perspective setting forth the arguments for implementing a particular decision to foster the EDWMS adoption.

Figure 1: Practice-based decision model for EDWMS adoption

<i>Factors conducive to the EDWMS adoption</i>	Decisions for maintaining and strengthening factors conducive to the EDWMS adoption	Decisions for reducing or eliminating factors inhibiting the EDWMS adoption	Factors inhibiting the EDWMS adoption
	<u>Economic, social and environmental dimensions are part of decisions</u>		
Faster document preparation process	Addressing the achievements in the field of time management	To change the technical solutions	Login problems
Simpler and easier to prepare documents	Quality improvement	To rethink and change the EDWMS architecture	Unclear menu
Simpler and easier to find a document		To provide more training	Complicated search for documents
Documents do not disappear		To use all existing modules covered by EDWMS	The need to constantly upgrade IT skills
Reduction of the number of errors in documents		To increase the speed of EDWMS	Limited use of EDWMS modules
System helps to set and achieve goals	Strengthening the EDWMS linkage with performance management	To improve the content of legal documents for EDWMS adoption	Slow system performance
Possibility to perform tasks on time		To rethink the system in order to make it less complicated	Unclear responsibilities of administrators and users
		To change the work procedures by eliminating paper documents	Complicated system functioning
			Printed copies of document

As it is seen from Figure 1, nine inhibiting factors for EDWMS adoption were revealed. For overcoming these factors, eight decisions are introduced.

There is a need *to change the technical solutions* as the survey results revealed that 44.20% of respondents experienced login problems. According to R1, sometimes it is impossible to connect to the system because “the system does not work at all”.

It is worth *to rethink and change the EDWMS architecture*: 21.60% of respondents complained about the menu arguing that it was not easy to understand it. A number of respondents (28.60%) encountered document search problems. They underlined different aspects of this problem, stating “I cannot trust the search results. They are not comprehensive” (R4) or “The search results differ. I get different information and documents than my colleague who has the same access rights” (R5). According to the survey, the biggest issue seems to revolve around one having to perform numerous actions to complete one task. The majority of respondents (71.90%) stressed this as a problem. During interviews, the fact of “numerous clicks” was also mentioned: “we need to reduce the number of actions (steps) needed to complete one task” (R3) or “sometimes I get annoyed when I need to click 3 times in order to open one document” (R5).

It is necessary *to provide more training*. Only 18.10% of respondents believed that they did not need to upgrade their IT skills constantly. Moreover, the need for lifelong learning was underlined by several experts: “The system requires that the employees update their knowledge and skills, otherwise it will be difficult to work with system” (R1) and “quite a complicated system which requires additional training” (R4).

It is proposed *to use all existing modules covered by EDWMS*. The survey revealed that 95% of respondents needed EDWMS for the meetings; 93% of respondents used EDWMS performing other tasks (contact management, employee substitution management); 83.40% of respondents used the system for controlling if and how the tasks were being performed; 66.80% of respondents used EDWMS for generating reports; 59.30% of respondents analysed the orders of institution’s director using the electronic system. Thus, it seems that EDWMS covers a lot of processes. However, the interviews disclosed that “not all modules are used. Only 50-60% of the system capacities are used. For example, not all possibilities in the module of contact management are exploited” (R6) or “the eSign services are not used” (R5).

It is proposed *to increase the speed of EDWMS*. According to interviews, the speed of EDWMS is the “hot” issue. The statements such as “EDWMS works slowly” (R3), “the system is rather slow” (R6), and “the system is used daily performing the working tasks, however it functions slowly” (R5) confirm that due to slow speed “you waste time” (R3) and “the process of document filling, coordination with the responsible staff and registration gets slower” (R4).

It is worth *to improve the content of legal documents for EDWMS adoption by setting clear rules of all actors*. The experts expressed different opinions about the clarity of responsibilities of staff dealing with EDWMS; however some experts underlined that “we still lack the clarity on the functions and responsibilities of system administrators” (R2) or “the system administrators’ duties and rights are not clear” (R6).

It is necessary *to change the work procedures by eliminating paper documents*. According to the interview results, employees make paper copies of EDWMS documents. Thus, the value of EDWMS for the organisation declines.

It is worth *to rethink the system in order to make it less complicated*. During interviews, the opinion about complicated functioning of system was expressed: “the system itself meets high quality standards, however its functioning is difficult” (R2).

Summing up, the presented decisions could serve as the means for reducing and eliminating the factors inhibiting the EDWMS adoption.

Turning to conducive factors, the research revealed seven of them. Three decisions for maintaining and strengthening factors conducive to the EDWMS adoption are incorporated in the proposed model.

The public institution has to continue its actions towards *quality improvement*. Only 53.80% of respondents agreed that EDWMS made the document preparation simpler and easier. A bit more than a half of respondents believe that the system provides support in document search process: 52.80% of respondents agreed that it was simpler and easier to find documents and 60.10% of respondents assured that the documents did not disappear. The situation concerning mistakes in documents is similar: 51.00% of respondents believed that thanks to the EDWMS the number of mistakes in documents decreased. The interview results were in line with the survey results, for example, according to (R5) “It is easier to find the documents”, but “I still spend a lot of time trying to find the documents” (R6). Summing up, the empirical results reveal that the public institution struggles with the issue of quality improvement.

It is worth to point out the achievements in the field of *time management*. More than a third of respondents (37.20%) agreed that EDWMS made the process of preparing the documents faster. The experts expressed some doubts concerning the appropriate time management: “I think that the document management systems is a good idea, however due to some reasons the processes of document preparation take a long time” (R4) or “due to a low speed of the system, the time of employees is used irrationally” (R5).

It is proposed to strengthen the EDWMS linkage with the *organisation's performance management*. According to the interview results, the EDWMS helps setting and achieving the goals. Five experts agreed that the system allowed them to reach the goals, however 1 expert had doubts: “there are no possibilities for the system to help to achieve goals” (R2). Another aspect concerning the performance management is related to the daily tasks of employees. EDWMS is used for task formulation, implementation, monitoring and control: “if you open the task card of, you can see what is the status of the task, who already read it, who is responsible for the document preparation” (R5).

5. DISCUSSION AND CONCLUSION

The adoption of EDWMS in public institutions is aimed mostly at efficiency enhancement and process improvement (Gröger et al., 2014). The paper argues that an EDWMS plays a relevant role for sustainability transition in public institutions. The main reason for choosing a sustainability approach is to reduce the negative environmental and social impacts of public institution's activities while taking into consideration the general financial situation of the country despite of not being strictly profit-oriented. In general, EDWMS means that people have to think, act and work differently (Gregory, 2005).

The adoption of EDWMS is analysed using different theoretical models; however the TEO framework is one of the most widely used. Based on the three dimensions of factors that influence the process of IS adoption, the empirical research is conducted and a practice-based decision model for EDWMS adoption is provided.

The survey findings revealed that the EDWMS potential is not fully utilised: not all functionalities of the system are employed in daily activities (for example, contract management module is not fully used). It could be related to the circumstance that dealing with the EDWMS “there will never be enough, or the right, resources, in terms of both money and staff” (Gregory, 2005, p. 85).

Solving technical issues or rethinking and changing architecture are the biggest challenges, as the overcoming of these issues is related not only to the actions of the institution, but also to the actions of IT companies – EDWMS producers. It means that the public institution has to work again on the “functional requirements”. Financial resources are also important.

Furthermore, employee training is an important factor changing the employee habits. The survey results revealed the need for more training as regards EDWMS. It is also noteworthy that the survey respondents indicated that individual learning and help of colleagues were the most popular ways of learning to work with the EDWMS. As training is a never-ending process, even when the whole system is up and running (Gregory, 2005), a public institution has to consider training as one of the primary issues.

Sustainable development requires people to change their behaviour (STRN, 2010). Employees need to reduce the amount of paper copies of documents; the public institution has to provide the organisational means to enable them to make fewer copies.

Empirical results revealed that the public institution struggles with the issue of quality improvement. These results are in line with the research findings of Gröger et al. (2014), as quality improvement was indicated as a highly important factor in relation to IS adoption. Its importance for time management is also highlighted in study by Gröger et al. (2014).

The decisions provided in the model covers social aspects (e.g. time saving), economic aspects (faster document filling) and environmental aspects (paper copies of documents) and are in line with sustainability transition.

The paper provides several practical implications. The practitioners will benefit from considering the practice-based decision model for EDWMS adoption in case they decide to choose IT for paper and process management. Moreover, as the model is based on the sustainability idea, organisations can make a step towards corporate sustainability.

The paper has certain limitations that suggest directions for future research. First, it might be impossible to generalise the outcomes of research since the case of a single organisation is presented. Second, the situation in public and private sector may differ. Finally, the inhibiting and conducive factors for the EDWMS adoption might vary according to the maturity of organisations.

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DEVELOPMENT OF PROJECT FINANCING UNDER THE CONDITIONS OF THE FOURTH INDUSTRIAL REVOLUTION

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Abstract. *The paper considers the current situation of using project finance in the Russian Federation. At present, the issues of modernizing the economy and active integration into the world financial system are quite topical. Solving these problems requires significant investments in the real sector of the economy. In the long term, project finance is one of the most effective methods of financing large-scale investment projects. Since there is still no consensus in the scientific literature on the interpretation of the term “project finance”, an overview of various points of view is made and its main characteristics are outlined. Further, on the basis of statistical data, the main trends in the development of the project finance market in Russia are revealed. A review of the Russian experience of project finance has made it possible to determine the level of prevalence and effectiveness of using this method of financing, as well as to highlight the role of the state in stimulating project financing in large-scale investment projects.*

Key words: *capital, investment project, project financing, project-company, public-private partnership.*

JEL Classification: *O160, J230, J240*

1. INTRODUCTION

In the context of the ongoing industrial revolution it is of primary importance for the Russian economy to develop an effective innovative mechanism capable of ensuring its functioning in the non-oil direction. The economic growth based on innovative strategy needs new production facilities, a new digital infrastructure, a new structure of labor market and consequently large-scale investment projects.

2. HYPOTHESES AND RESEARCH TECHNIQUES.

Within the framework of the suggested hypothesis one can assume that it is impossible to form and develop non-oil economy in Russia and labor force without a number of factors: for example, the improved system of methods of financing large-scale investment projects. It is necessary to use a system method to analyze the problem, the solution of which is based on a number of factors, and confirm the above hypothesis.

In Economics there is still no consensus on the definition of *project financing*.

A. Bari and B. Esti present a world survey of project financing in their works. As for the Russian economists, this problem is considered by V.V. Kovalyov, L.D. Kapranova, E.M. Petrikova, M.V. Terentyeva, etc.

Most of the economists think that the term *project financing* is identical to the term *specialized lending* (V.A. Moskvina, A.L. Smirnov, L.N. Krasavina, etc.) because in Russia project financing is based on bank crediting.

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2.1. Theoretical aspects of project financing.

Most of the Russian economists consider *project financing* as:

- a method of long-term project funding for large projects with the help of financial engineering based on a loan against the cash flow of the project without recourse to the borrower;
- financing an investment project by granting a long-term loan to a specially opened project company against the cash flow generated by the project (after the successful completion of the investment phase of the project or after its successful entry into the market), the only collateral for the loan being the property acquired within the framework of this project;
- a means of long-term financing of the project company set up for carrying out an investment project against the coming assets and cash.

However, such a conceptual approach does not completely reveal the characteristic features of project financing.

The analysis of existing points of view leads to a number of conclusions on the characteristic features of project financing. Firstly, project financing allows us to use several sources of debt capital. Secondly, the cash flows generated by the object of investment activities act as security for the borrower's obligations. Debt service is accomplished in sequence, all investors (companies and public authorities) being repaid.

2.2. Types of project financing.

In the world practice, there have been worked out various classifications of project financing, the most interesting in the present situation being the classification by participants: banking, corporate and with participation of the state.

In bank project financing a bank (several banks) arranges financing of the investment project on different terms: without the right of recourse to the borrower, with limited recourse to the borrower, with the full recourse to the borrower. The major factor reducing risks of the bank in such lending is availability of collateral.

Corporate project financing (or structural financing) is a situation when the project company can afford to invest the project. The main difference from bank project financing is the fact that the company already generates cash flows and financing is made against the functioning business.

Project financing with participation of the state is when the state (represented by executive authorities of different levels) uses budgetary funds and attracts the private capital for joint financing and carrying out the project in the public sector.

In practice, this type of project financing is implemented on the principles of public-private partnership.

If the state has a share in financing the project, it reduces the risks of the project and acts as additional collateral for the project, for example, for the bank.

It should be noted that the availability of project financing as a method of long-term financing in capital-intensive industries and the agricultural sector in the Russian Federation is determined by the process of abolition of state control in companies providing the infrastructure of the economy (such as housing, transport, communications), and privatization of the public sector.

In case of project financing with participation of the state, financing is carried out only after all agreements among the project participants have been reached: from selecting a project company having practical experience in fulfilling such a task and obtaining state permits to concluding agreements with suppliers and main consumers.

These agreements guarantee to all project participants - investors, creditors and the state - that the project will be implemented in accordance with the business plan.

Most often this method is used in large-scale projects connected with construction in energy industries, the agricultural and industrial complex, real estate, transport infrastructure, i.e. the branches which are priority for the development of the Russian economy today.

The main idea of project financing with the state participation is replacement of high financial costs at "classical" debt financing of high risk projects by high administrative costs of a large number of contractual agreements with a transfer of part of costs to the executive authorities.

Each of participants in the investment project fulfills certain functions.

The project company is set up especially for the project. Its main objective is to implement the investment project. As a rule, this company has neither credit history nor collateral. It is the operation of the project company that is the main distinctive feature of this type of projects. Thanks to it risks on the invested capital and financing are in a complicated manner distributed among all participants of the project and regulated on the contractual basis.

The participants do not only invest money in the project and receive profits. The investments may be made in different forms. Investors can inspire the project, set up the project company, expecting to gain income from its effective activities in one or another form.

The creditor finances the project. As it was mentioned above, the project company obtaining the credit has neither securities, nor warrantors in the traditional sense. The share of the loan capital in project financing is much higher than in the usual corporate credits. The average sum lent by the creditor amounts to 70-90% of all capital expenditures of the project. Thus, the creditor financing the investment project has higher risks. The latter makes him analyze and estimate all features of the financed project in detail and look for alternative ways of protection of the capital as well.

The state is both a participant and a regulator of this sort of the project. Such participation allows the state to solve simultaneously a number of problems, e.g. supporting branches which make a basis for modern industrial development and creating potential jobs.

Taking into account the experience of developed countries, one can assume that project financing has a high potential for modernization and stimulation of the growth of the Russian economy, which should be used actively especially in the context of the fourth industrial revolution.

3. PRACTICAL ASPECTS OF PROJECT FINANCING WITH THE STATE PARTICIPATION

The analysis of the international practice shows that the main drivers of development of project financing in the 21st century are internationalization of the global financial and investment markets and privatization of public enterprises in the majority of market countries.

As for the volume of project financing in 2016, Europe, the Middle East and Africa taken together accounted for 36%, the Pacific Rim – 28%, America – 36%; the leading sector of economy using project financing being energy industries, oil and gas projects included. The latter accounted for 25% of the volume of the global market of project financing [7]. According to the structure of project financing, the leading category was bank credits (75%), followed by the capital of the project companies (21.8%) and bonded loans (3.2%). Transactions with the state participation amount to 25% or 31 billion dollars [1].

The analysis of implementation of large-scale investment projects both in Russia and in the West shows that energy industries have a considerable share in the market of project financing. For example, in 2017 this branch in Russia accounted for 19.4% of the market (2,830.4 billion rubles). Along with energy industries, an essential share of this market is taken by transport and communications – 18.6 % (or 2,726.7 billion rubles), their level of innovative development being much higher. About 25% of enterprises of this branch claim that one of the main objectives of project financing is creating new jobs [1]. However, the number of objects in transport and communications stipulated by the Federal Targeted

Investment Program for 2016 was 375 (for the sum of 251 billion rubles) while in mining it was 0 [1].

The above statistics highlights the role of the state in project financing. Many projects are financed only at the level of the state. In Russia there has been started the Program of Project Financing (hereinafter the Program). Its activities are focused on financing the real sector of economy, so it does not cover credit and insurance companies, investment funds, non-state pension funds, pawnshops and the foreign companies [5].

In January, 2018, Vnesheconombank selected the following projects: construction of the "RUSAL" Taishet aluminum plant and completion of construction of the rolling complex of Krasnoyarsk Metallurgical Plant.

The Program can also subsidize construction of the third stage of the methanol plant "ShchekinAzot", the catalyst works "Gazpromneft-Catalyst Systems", the transport and transshipment complex "VaninoTransUgol" and production of radiopharmaceutical medicines at the Center of Development of Nuclear Medicine.

According to the General Guides of Strategic Development of the Russian Federation till 2018 and 2025 project financing is to be used also in housing construction [4].

Thanks to project financing the developer can obtain funds from banks. The main participating investors will be state joint stock banks. Before issuing the credit, they will carefully analyze economic indicators of the borrower's activities, and they will control expenses of the provided funds subsequently, thus reducing risks of their inappropriate use and emergence of uncompleted construction projects.

On one hand, for developers, project financing means guarantees of receiving funds for construction projects, and on the other - a tighter control on the part of the lender, as well as the need to pay interest on the loan whereas shareholders' money for the developer, in fact, is interest-free loans.

CONCLUSION

Thus, in recent years, the number of new large-scale investment projects based on project financing, the ones with the state participation included, has been growing in Russian.

It indicates that, firstly, the country has a favorable investment climate and, secondly, the state is ready to develop and improve the mechanism of project financing.

And, thirdly, since most of the investment projects with state participation are related to specific sectors of national economy, this indicates the state support for those sectors that are strategic for the development of the Russian economy as a whole.

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ZMENY NA TRHU PRÁCE V SR A MIGRÁCIA PRACOVNEJ SILY

CHANGES IN THE LABOUR MARKET IN THE SLOVAK REPUBLIC AND MIGRATION OF LABOUR FORCE

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Abstrakt: Štúdia sa venuje problematike zmien na trhu práce v Slovenskej republike s dôrazom na migračné toky a ich vplyv. Vo fáze expanzie hospodárstva krajiny po odznení celosvetovej hospodárskej krízy rastie dopyt po pracovnej sile, ktorý nedokáže domáce obyvateľstvo uspokojiť napriek tomu, že nezamestnanosť v krajine je stále jedna z najvyšších v Európskej únii. Problém predstavuje štruktúra nezamestnaných ale aj veľké množstvo pracovnej sily odchádzajúcej za prácou do zahraničia. Situáciu rieši krajina prostredníctvom saturácie dopytu z ostatných krajín Európskej únie či z tretích krajín napriek proti imigračnej politike, ktorú predstavitelia verejných politik prezentovali. Na základe dostupných štatistických dát prostredníctvom matematicko-štatistických metód štúdia odhaľuje korelačné závislosti vybraných ukazovateľov s následnou regresnou analýzou.

Kľúčové slová: trh práce, pracovná sila, migrácia

Abstract: The study addresses the issue of changes in the labour market in the Slovak Republic with an emphasis on migration flows and their impact. In the expansion phase of the country's economy, in response to the global economic crisis, demand for labour force is growing, what can't satisfy the domestic population, despite the fact that the unemployment rate in the country is still one of the highest in the European Union. The problem is the structure of the unemployed, but also the large amount of labour forces which leaving for work abroad. The situation solves the country with the help of saturation of demand from other countries of the European Union or from third countries despite the immigration policy presented by the representatives of public policies. Based on available statistical data through mathematical and statistical methods, the study reveals correlation dependencies of selected indicators with subsequent regression analysis.

Key words: labour market, labour force, migration

JEL Classification: F22, F23, F32

1. ÚVOD

Migrácia sprevádza ľudstvo od počiatku, no migračné toky súčasnosti sú najväčšie v novodobej histórii ľudstva. Integračné procesy a rozmáhajúca sa globalizácia nastolený trend len umocňujú, práve naplnením štvrtej slobody – voľný pohyb pracovnej sily (Adepoju, Van Noorloos, Zoomers, 2010; Habanik, Koišova, 2012; Dagiliene, Leitoniene, Grenčíková, 2014). S migráciou pracovnej sily ako ekonomickým, sociálnym a spoločenským javom sa Slovenská republika začína v plnom rozsahu stretávať po páde komunizmu. Ako problém ho začína krajina vnímať po vstupe do Európskej únie v roku 2004. Ďalšími významnými míľnikmi sú vstup do schengenského priestoru a uplynutie prechodných opatrení, chrániacich pracovné trhy starých členských krajín integračného zoskupenia v Európe. Slovensko

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dlhodobo vykazovalo charakter zdrojovej krajiny vzhľadom na migráciu (Divinský, 2009; Bahna, 2011). Vysoká miera nezamestnanosti, nízke mzdy, pomalé tempo vytvárania nových pracovných miest boli faktory, ktoré vytlačali domácu pracovnú silu (migračná teória pull a push faktorov) (Massey, 2005; Blanchflower, Shadforth, 2009; Drinkwater, Eade, Garapich, 2009). Pretrvávajúci hospodársky rast sa po prekonaní celosvetovej hospodárskej krízy od roku 2011 prejavil zvyšujúcim sa dopytom po pracovnej sile, ktorý v posledných dvoch rokoch nie je možné uspokojiť z vlastných zdrojov krajiny (Delgadová, Gullerová, Ivanová, 2017). V evidencii nezamestnaných zostávajú ľudia, ktorí nechcú pracovať, alebo sú dlhodobo nezamestnaní a stratili pracovné návyky čím sa stali nezamestnateľní. Pracovný trh na Slovensku, podobne ako v ostatných európskych krajinách, už niekoľko rokov pociťuje významný nedostatok vysokokvalifikovanej pracovnej sily (Pajnik, Campani, 2011), predovšetkým na pracovných miestach IT technológov, technických a konštrukčných odborníkov v strojárskom a elektrotechnickom priemysle, ale aj lekárov a zdravotných sestier. Dnes chýbajú vysokokvalifikovaní, kvalifikovaní i nízkokvalifikovaní pracovníci vo výrobe i službách. Slovenská republika uplatňovala čisto formálny prístup k migrácii, prijatie Koncepcie integrácie cudzincov v SR (2009), Migračná politika SR s výhľadom do roku 2020 (2011), či „kozmetické“ zmeny v oblasti zamestnávania cudzincov z tretích krajín. Antimigračný prístup deklarovali predstavitelia politik predovšetkým v roku 2015 v súvislosti s migračnou krízou v Európe. Až hospodársky vývoj posledného roka núti odbornú i laickú verejnosť zmeniť nazeranie na migráciu. Administratívne prekážky a zložitosť procesov zamestnávania cudzincov z tretích krajín otvárajú priestor pre imigráciu z chudobnejších krajín Európskej únie, kde úroveň miezd je nastavená hlboko pod priemerom Slovenska. Saturenie dopytu po pracovnej sile prostredníctvom imigrácie otvára v politických, odborných i laických kruhoch otázku, ktoré boli doteraz opomínané. To si vyžaduje dôkladnú analýzu a skúmanie s cieľom poznať straty i prínosy pracovnej imigrácie z členských krajín Európskej únie i tretích krajín. Len poznaním motívov a dôsledkov je možné riadiť migračné toky v krajine efektívne.

2. CIEĽ A METODOLÓGIA

Cieľom štúdie je prostredníctvom korelačnej a regresnej analýzy zistiť vplyv migrácie na vybrané makroekonomické ukazovatele a hodnotenie ekonomických prínosov pracovnej migrácie trh práce Slovenskej republiky.

Realizácia tohto cieľa predpokladá:

- Výber ukazovateľov ekonomického hodnotenia pracovnej migrácie.
- Spracovanie časových radov vybraných ukazovateľov.
- Spracovanie korelačných matíc a následná regresná analýza vplyvu migrácie.
- Hodnotenie ekonomických prínosov pracovnej migrácie na Slovenskú republiku.

Realizácia použitých výpočtov sa zakladá na dostupných štatistických dátach Štatistického úradu Slovenskej republiky, Ministrestva práce sociálnych vecí a rodiny Slovenskej republiky, Prezícia policijného zboru Slovenskej republiky, Eurostatu a OECD. V štúdií sú použité vedecké metódy indukcie, dedukcie, metóda vedeckej abstrakcie a komparácie, metóda analýzy a syntézy vybraných faktorov, javov a procesov. K prepočítaniu získaných údajov sme použili matematicko-štatistické metódy (regresná a korelačná analýza) a ďalšie pomocné výpočty.

Podľa IOM rozumieme pod medzinárodnou migráciou pohyb osoby alebo skupiny osôb cez medzinárodné hranice, pričom v tejto definícii nezohľadňuje čas, na ktorý odchádza do zahraničia.

Definícia dlhodobého medzinárodného migranta podľa OSN o ňom hovorí ako o osobe, ktorá mení svoju krajinu obvyklého pobytu na obdobie minimálne 12 mesiacov.

Vychádzajúc z uvedeného za pracovnú migráciu budeme považovať pohyb osoby cez medzinárodné hranice s cieľom pracovať a žiť na území iného štátu po dobu minimálne 1 rok.

Technologické zmeny a skracovanie vzdialeností dnes umožňujú pracovať v zahraničí, no v pravidelných intervaloch (denne, týždenne, dvojtyždenne, mesačne) sa vracajú do krajiny pôvodu. Tento jav literatúra označuje ako „pendlerstvo“, jeden z druhov medzinárodnej migrácie (Andrijasevic, Sacchetto, 2016).

Literatúra nie je jasná ani pri definovaní dočasnej migrácie, ktorou pre potreby našej štúdie budeme označovať pracovného migranta plánujúceho sa v budúcnosti vrátiť žiť a pracovať do krajiny pôvodu. V prípade, ak sa tak stane, hovoríme o návratovej migrácii. Za reemigráciu považujeme odchod z cieľovej krajiny, v ktorej migrant žil a pracoval a jeho migrácia do inej krajiny ako je krajina pôvodu.

Pod pojmom trh práce chápeme miesto, na ktorom sa stretáva ponuka práce s dopytom po práci. Trh práce bol posledným segmentom ekonomiky, na ktorom sa udržiavali prejavy recesie ešte aj dlho po tom, ako sa obnovil rast ekonomiky. S omeškaním po oživení ekonomického rastu sa obnovil aj rast zamestnanosti a rýchlo dosiahol až neočakávané proporcie. (Rievajová, 2009)

3. RIEŠENIE PROBLÉMU / VÝSLEDKY / DISKUSIA

Vývoj trhu práce v Slovenskej republike po odznení celosvetovej hospodárskej krízy bol posledným segmentom ekonomiky v krajine, na ktorom vidíme prejavy recesie aj potom ako bol zaznamenaný ekonomický rast. Po oživení ekonomického rastu síce s omeškaním ale za to v neočakávaných proporciách bol obnovený rast zamestnanosti.

Tabuľka 1: Vývoj vybraných makroekonomických ukazovateľov a ukazovateľov trhu práce v rokoch 2004 - 2010

	2004	2005	2006	2007	2008	2009	2010
HDP mld. € b.c.	46,10	50,42	56,27	63,05	68,49	64,02	67,58
HDP na obyvateľa v b.c. (tis. EUR)	8,57	9,36	10,44	11,68	12,67	11,82	12,45
pracovná sila tis. osôb	2 658,6	2 645,7	2 654,8	2 649,2	2 691,2	2 690,0	2 706,5
zamestnanosť tis. osôb	2 170,4	2 216,2	2 301,4	2 357,3	2 433,8	2 365,8	2 317,5
miera zamestnanosti v %	62,9	63,7	65,4	66,7	68,9	66,4	64,7
nezamestnanosť tis. osôb	480,7	427,5	353,4	291,9	257,5	324,2	389,0
miera nezamestnanosti v %	18,1	16,2	13,3	11,0	9,6	12,1	14,4
priemerná mzda v €	525,29	573,39	622,75	668,72	723,03	744,50	769
minimálna mzda v €	216	229	252	269	269	296	308
voľné pracovné miesta	14705	13607	23911	22533	11023	5027	7086

Zdroj: ŠÚ SR, MPSVaR

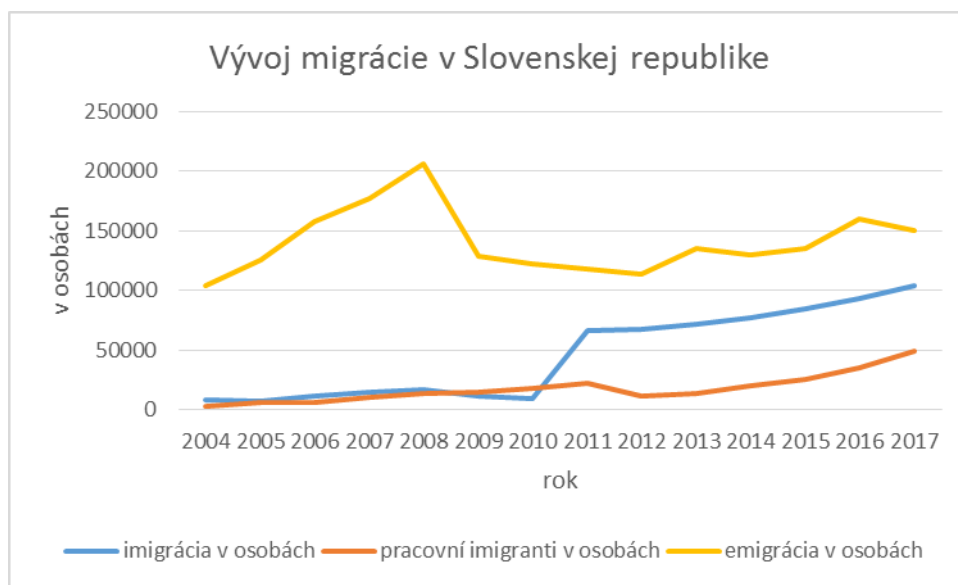
Rok 2004 bol pre Slovenskú republiku veľmi významný, vstup do Európskej únie a stabilná ekonomika v nasledujúcich rokoch prejavili na pozitívnom vývoji. Rok 2009 v číslach štatistík odzrkadľuje hospodársky vývoj vo svete. Celosvetová kríza zasahuje aj Slovensko predovšetkým v nadväznosti nemeckú ekonomiku (tabuľka 1).

Tabuľka 2: Vývoj vybraných makroekonomických ukazovateľov a ukazovateľov trhu práce v rokoch 2011 - 2017

	2011	2012	2013	2014	2015	2016	2017
HDP mld. € b.c.	70,63	72,70	74,17	75,95	78,69	80,96	81,18
HDP na obyvateľa v b.c. (tis. EUR)	13,08	13,45	13,70	14,01	14,51	14,91	15,63
pracovná sila tis. osôb	2 680,0	2 706,5	2 715,3	2 721,8	2 738,3	2 758,1	2752,9
zamestnanosť tis. osôb	2 315,3	2 329,0	2 329,3	2 363,0	2 424,0	2 492,1	2540,2
miera zamestnanosti v %	65,0	65,0	65,0	65,9	67,7	69,8	71,3
nezamestnanosť tis. osôb	364,6	377,5	386,0	358,7	314,3	266,0	212,8
miera nezamestnanosti v %	13,6	14,0	14,2	13,2	11,5	9,7	7,7
priemerná mzda v €	786	805	824	858	883	912	944
minimálna mzda v €	317	327	338	352	380	405	435
voľné pracovné miesta	6530	3689	4106	9169	27612	35284	69375

Zdroj: ŠÚ SR, MPSVaR

Od roku 2014 sa situácia začala zlepšovať čo možno vidieť aj na prezentovaných ukazovateľoch. Zamestnanosť sa po troch rokoch nezmenenej úrovne začína mierne zvyšovať a v roku 2016 je vyššia ako v predkrízovom období. V roku 2017 presahuje úroveň 71%. Nezamestnanosť sa po roku 2013 znižuje ešte výraznejším tempom. Štatistické sledovanie údajov v problematike trhu práce je metodicky nejednoznačné a spôsobuje významné rozdiely. Miera evidovanej nezamestnanosti v septembri 2018 klesla na 5,38% (UPS VaR SR). Zamestnanosť v tomto období zostala na nezmenenej úrovni 71,3%, predstavuje zamestnaných vo veku od 20 do 64 rokov. Pri celkovej zamestnanosti je ukazovateľ až o niekoľko percent nižší. Vojtovič (2013) si kladie otázku, ako je možné znižovanie nezamestnanosti v takýchto veľkých rozsahoch, keď zamestnanosť rastie v časových radoch omnoho pomalšie? Jeho štúdia podáva odpoveď o zmenách v legislatíve vedenia ľudí v databázach nezamestnaných a ďalším významným faktorom je migrácia. Rozsah migračných tokov od roku 1993 významne narastá, pričom výraznú akceleráciu môžeme sledovať práve po vstupe SR do EÚ v roku 2004.

Obrázok 1: Vývoj migrácie v Slovenskej republike v rokoch 2004 - 2017

Zdroj: VZPS, UPSVaR SR, Prezídium policajného zboru SR

Emigráciu môžeme sledovať len z obmedzených štatistických zdrojov, pretože neexistujú relevantné databázy, ktoré by rozsah emigrácie zaznamenávali. Podľa výsledkov výberového zisťovania pracovných síl vieme odhadnúť len krátkodobú pracovnú emigráciu, ktorá zaznamenáva pohyb Slovákov za prácou do zahraničia do jedného roku. Odhady novodobej pracovnej emigrácie Slovákov podľa odborníkov sa pohybujú na úrovni 240 až 320 tisíc občanov Slovenskej republiky, ktoré v dlhodobom či krátkodobom časovom horizonte žijú a pracujú v zahraničí. Ďalšie štúdie naznačujú budúce migračné trendy. Z nich vieme, že až 40% Slovákov sa domov vrátiť neplánuje. Vývoj krátkodobej emigrácie poukazuje na zmiernenie trendu pracovnej emigrácie v čase hospodárskej krízy ale i v čase pozitívneho hospodárskeho rozvoja posledných rokov.

Pozitívny vývoj ekonomiky sa prejavuje na vytváraní nových pracovných miest, ktorých obsadenie sa pre domáci trh práce stávalo stále ťažším (tabuľka 1 a tabuľka 2). Dôvodom je štruktúra pracovnej sily, ktorá kvalifikáciou nezodpovedá požiadavkám trhu práce. Ďalším je neschopnosť dlhodobo nezamestnaných zamestnať sa, opätovne si osvojiť pracovné návyky a stať sa plnohodnotnými zamestnancami. Emigrácia pracovnej sily z dôvodu významných motivačných faktorov má tiež rozhodujúci vplyv. Saturácia dopytu po pracovnej sile zo zahraničia prostredníctvom imigrácie sa aj pre Slovenskú republiku, ktorá sa vyznačuje antimigračnou politikou, stala jediným rýchlym a efektívnym riešením daného stavu.

Napriek tomu, že v migrácii tvorcovia politik vidia hrozbu ekonomickú, sociálnu i bezpečnostnú, boli situáciou s nedostatkom pracovných síl a množstvom neobsadených pracovných miest prinútení k liberalizácii a aspoň nepatrnému zmierneniu administratívnych prekážok vstupu imigrantov na slovenský pracovný trh. Inak by dôsledky boli fatálne a ohrozenie ekonomického rastu v budúcich rokoch značné.

3.1 Závislosť vybraných makroekonomických ukazovateľov a migrácie

Vyššie uvedené makroekonomické ukazovatele a ukazovatele trhu práce sme podrobili korelačnej analýze. Výsledkom je korelačná matica uvedená v tabuľke 3.

Tabuľka 3: Korelačná matica vybraných ukazovateľov z rokov 2004 - 2017

	HDP	zamestnaní	nezamestnaní	pracovní imigranti	pracovní emigranti	priemerná mzda	voľné pracovné miesta
HDP	x						
zamestnaní	0,843629	x					
nezamestnaní	-0,66821	-0,94586	x				
pracovní imigranti	0,794783	0,853274	-0,72435	x			
pracovní emigranti	0,203756	0,554069	-0,72922	0,154174	x		
priemerná mzda	0,985785	0,635136	-0,63047	0,844609	0,094141	x	
voľné pracovné miesta	0,342966	0,635136	-0,63695	0,751359	0,094141	0,389386	x

Zdroj: vlastné výpočty autorov

* hladina významnosti $\alpha = 0,05$

Zo vzájomných závislostí sú pre našu štúdiu dôležité vzťahy vysokej závislosti pracovných imigrantov a HPD, zamestnanosti a negatívna vysoká závislosť s nezamestnanosťou. Vysoká korelačná závislosť je i vo vzťahu pracovnej imigrácie a priemernej mzdy, ktorá je

významným motivačným faktorom imigrácie za prácou. So zvyšujúcou sa mzdou sa zvyšuje i záujem o prácu v našej krajine pre občanov krajín, ktorých hospodársky rast je značne nižší ako v cieľovej krajine (čo potvrdzujú migračné teórie). Pri ďalšej analýze zistíme, že pracovní imigranti pochádzajú zo Srbska, Rumunska a Bulharska, teda z krajín Európskej únie, ktorých priemerná mzda je nízko pod hladinou priemernej mzdy v slovenskom hospodárstve. Zároveň užívajú výhody členstva v Európskej únii, teda slobodu pohybu pracovnej sily. Na Slovensku majú významné zastúpenie imigranti z Ukrajiny, napriek tomu, že vstupu na náš pracovný trh predchádza mnoho administratívnych prekážok. Predstavujú však pracovnú silu, ktorá je kvalifikovaná a kultúrne veľmi blízka, čo sa prejavuje v znásobení prínosov z imigrácie pre našu krajinu. Podľa migračných teórií je ďalším motívom nízka nezamestnanosť a dostatok voľných pracovných miest v cieľovej krajine, čo sa opäť potvrdzuje vysokým koeficientom závislosti.

3.2 Regresná analýza pracovnej imigrácie a HDP

Na zistenie závislosti medzi počtom pracovných imigrantov a HDP využijeme regresnú analýzu. Počet pracovných imigrantov je nezávislá premenná X, HDP závislá premenná Y, pretože predpokladáme, že vyšší počet imigrantov prispieva k zvyšovaniu výkonnosti ekonomicky (HDP), pričom čím vyššie kvalifikovanú pracovnú pozíciu zastávajú, tým vyššiu pridanú hodnotu vytvárajú.

Tabuľka 4: Regresná analýza

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	10,113202	0,578521	17,48114	6,67E-10	8,852714	11,37369	8,852714	11,37369
X Variable 1	0,00013805	2,68E-05	5,143452	0,000244	7,96E-05	0,000197	7,96E-05	0,000197

Zdroj: vlastné výpočty autorov

Regresná funkcia má tvar $y = 10,1132 + 0,000128x$. Z regresnej funkcie vyplýva, že ak by bol počet imigrantov nulový, HDP na obyvateľa by predstavovalo hodnotu 10,11 tisíc € (hodnota Intercept – b_0). Pri raste imigrantov o jedného by HDP na obyvateľa vzrástlo o 0,138 € (hodnota X variable 1). Hodnoty P-value vyjadrujú významnosť lokujúcej konštanty a regresného koeficientu. Pvalue pre lokujúcu konštantu je $6,67 \cdot 10^{-10} < 0,05$, pre regresný koeficient nadobúda hodnotu 0,000244, čo vyjadruje štatistickú významnosť tohto koeficientu i lokujúcej konštanty. Hodnoty 95%-ného intervalu spoľahlivosti pre b_0 a b_1 vyjadrujú, že ak pribudne jeden imigrant na trh práce v SR, HDP na obyvateľa vzťastie s 95-nou pravdepodobnosťou od 0,079 € do 0,197 €.

Tabuľka 5: Korelačný koeficient, koeficient determinácie

Regression Statistics	
Multiple R	0,82942616
R Square	0,68794775
Adjusted R Square	0,6619434
Standard Error	1,19811352
Observations	14

Zdroj: vlastné výpočty autorov

Multiple R (korelačný koeficient) je rovný 0,8294, ide o vysoký stupeň tesnosti vzťahu medzi počtom imigrantov a HDP na obyvateľa v SR. Koeficient determinácie (R Square) znamená, že modelom sme vysvetlili 68,79% závislej premennej – HDP na osobu v SR, ostatná časť predstavuje nevysvetlenú variabilitu.

Tabuľka 6: ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	37,97566	37,97566	26,4551	0,000244
Residual	12	17,22571	1,435476		
Total	13	55,20137			

Zdroj: vlastné výpočty autorov

Tabuľka 6 obsahuje vysvetlenú (regresiu) a nevysvetlenú (residual) a celkovú (total) variabilitu. SS je suma štvorcov, df stupeň voľnosti a MS priemer štvorcov. Na vyhodnotenie analýzy rozptylu slúži F test. Pretože significance F je < ako hladina významnosti α (0,000244) zamietame nulovú hypotézu. Model je i na základe F testu štatisticky významný a bol zvolený správne.

4. ZÁVER

Výrazné zmeny na trhu práce v Slovenskej republike v posledných rokoch otvoril dvere pracovným migrantom napriek antiimigračnej politike tvorcov politik. Nízka nezamestnanosť, napriek tomu, že je stále v porovnaní s ostatnými krajinami EÚ výrazne vyššia, neumožňuje obsadiť voľné pracovné miesta generované ekonomikou. Obsadiť pracovné miesto sa dnes stáva stále časovo náročnejším a náročnejším. Imigranti, pre ktorých Slovensko predstavuje príležitosť vstúpiť do schengenského priestoru, zarobiť si vyššiu mzdu ako v krajine pôvodu, riešiť nezamestnanosť v krajine pôvodu či iné, využívajú pracovnú príležitosť, ktorú im naša krajina ponúka. Štúdia potvrdzuje migračnú teóriu pull a push faktorov, kde nezamestnanosť a mzdová úroveň predstavuje najväčšie motivátory pre potenciálneho migranta v procese rozhodovania. Nepriamo boli potvrdené i ďalšie migračné teórie – teória sietí, teória geografickej blízkosti či inštitucionálna teória. Výsledkom skúmania regresnej analýzy je vzťah medzi počtom imigrantov a HDP na obyvateľa, čím tvorcovia politik i laická verejnosť môže pozorovať pozitívny podiel imigrantov na tvorbe HDP. Ďalším skúmaním pracovnej imigrácie a úrovne vzdelania zistíme, že vysokokvalifikovaná pracovná sila bude zvyšovať pozitívne efekty (tvorba vyššej pridanej hodnoty) na výkonnosti ekonomiky a zvyšovať prosperitu spoločnosti.

Dodatok

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SÚČASNÉ ZASTÚPENIE JEDNOTLIVÝCH GENERÁCIÍ ZAMESTNANCOV NA TRHU PRÁCE V SLOVENSKEJ REPUBLIKE

CURRENT REPRESENTATION OF INDIVIDUAL GENERATIONS OF EMPLOYEES ON THE LABOR MARKET IN SLOVAK REPUBLIC

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Abstrakt: Každý už určite raz použil frázu „Toto by sme si za našich čias nemohli dovoliť“ alebo „To my vo Vašom veku“ alebo tiež „Táto mladá generácia...“. Generácie. To je to, čomu sme rozhodli venovať našu pozornosť a podrobne sa nimi zaoberáme v predkladanom článku. Takmer vždy má staršia generácia pocit, že dnešná mládež si viac dovoľuje, je drzejšia a menej zodpovednejšia. Je to ale skutočne tak? Každú generáciu ovplyvnili historické udalosti, situácie a vývoj danej doby, v ktorej vyrastala. Tak prečo by si jednotlivé generácie nemohli navzájom pomôcť? Vzájomnou spoluprácou využiť z každej generácie to, v čom je najlepšia, eliminovať slabé stránky a vyťažiť tak z tejto situácie maximum. Článok je venovaný charakteristike jednotlivých generácií a ich aktuálnej situácii na trhu práce v Slovenskej republike.

Kľúčové slová: generácie zamestnancov, podnik, trh práce

Abstract: Everybody has ever used the phrase „We could not afford this in our time“ or „If I were in your age“ or „This young generation“. Generations. This is what we have chosen to focus on, and we have been dealing with in detail in presented paper. Almost always the older generation thinks that youth of the day take more liberties, are courageous and less responsible. But is that really true? Every generation was influenced by historical events, situations and current trends of the time period in which this generation grew up. So why these generations could not be helpful to one of each other? By mutual effort to find and exploit in each generation its strengths and to eliminate weaknesses and to get maximum from this situation. The paper is focused on characteristics of individual generations and their current situation on the labour market in the Slovak Republic.

Key words: generation of employees, company, labour market

JEL Classification: M12, M54, L10

1. ÚVOD

Koncept Industry 4.0 bol vyvinutý s cieľom zabezpečiť dlhodobú prosperitu a konkurencieschopnosť podnikov a je určený predovšetkým na zvýšenie produktivity a zjednodušenie práce zamestnancov. Na dosiahnutie požadovaného stavu je potrebné zvýšiť automatizáciu a implementovať nové technológie, čo vedie k eliminácii ľudskej zložky v priemyselných podnikoch. Tieto fakty vedú k diskriminácii starších zamestnancov, ktorý sú možno menej flexibilný, čo sa týka využívania moderných technológií. Jedným z možných

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riešení je uplatňovanie age managementu v priemyselných podnikoch v súlade s princípmi Industry 4.0 (Vraňáková a kol., 2017).

Ak hovoríme o generáciách zamestnancov, je potrebné si ich špecifikovať a rozdeliť. My sa prikláňame k rozdeleniu generácií na „Baby boomers“ alebo tiež povojnová generácia (narodení v rokoch 1948 – 1963), ďalej to je Generácia X (1964 – 1978), Generácia Y (1979 – 1990) a Generácia Z alebo tiež „Millennials“ (1991 – 2005). V súčasnosti sa však na trhu práce nachádza prevažne Generácia X a Y a sledujeme pomalý nástup Generácie Z.

V našom výskume sme sa zamerali na generácie zamestnancov pôsobiace na trhu práce v Slovenskej republike. Každá z týchto generácií si prežila rozdielne obdobie spojené s významnými historickými udalosťami, ktoré ovplyvnili naše územie. Kým generácia X bola vychovávaná rodičmi povojnovej generácie, zažili si socialistický režim, kde nemohli slobodne prejavovať svoje názory. Tento režim ovplyvnil aj výchovu detí, preto je dnešná generácia X naučená dodržiavať pravidlá a hierarchiu, sú lojálni voči zamestnávateľovi a nie sú asertívni a pracujú tvrdo. Generácia Y je naučená diskutovať, vyjadrovať svoje názory, sledujú svoje potreby a sú viac individualisti, majú menej vytrvalosti pri práci, ale za to sú viac kreatívnejší a uvoľnenejší. Napriek tomuto si generácia Y prežila nástup moderných technológií (internet a mobil v bežných domácnostiach) oproti Generácii Z, ktorá do tohto „moderného sveta“ už vhupla a všetko bolo pre nich samozrejme od narodenia. Generácia Z sa narodila do obdobia, kedy pre nich nič nie je nedostupné, všetko si môžu kúpiť online, „vygoogliť“ a sú neustále spojení cez sociálne siete. Táto generácia nepoznala a nebude poznať, čo je to nemôť byť v spojení 24 hodín 7 dní v týždni.

Tu si však kladieme otázku, či tieto generácie naozaj tak silne dokázali ovplyvniť historické udalosti a technologický pokrok oveľa viac ako napríklad osobnostné zloženie, vzdelanie a predovšetkým rodinné prostredie, ktoré im je vštepované od narodenia. Podľa nášho názoru práve ono v najväčšej miere formuje ľudskú osobnosť. Ako je možné, že rodičia generácie X nedokázali vychovať deti (generáciu Y) „na svoj obraz“ a vštepiť im tie isté hodnoty ako majú oni? Dostávame sa do situácie, kedy na trhu práce stoja oproti sebe dve generácie, ktoré sa nechápu, stoja oproti sebe rodičia a deti, ktoré sa nechápu. A tu sme sa dostali k odpovedi, stoja oproti sebe rodičia a deti, ktoré sa nechápu! Takáto situácia tu ale bola vždy. Deti nechápali svojich rodičov a naopak. V minulosti však toto „nechápanie sa“ nebolo tak výrazné a viditeľné ako dnes, pretože deti prechovávali rešpekt a úctu k svojim rodičom, veci, ktoré sa dnes už vytrácajú.

Podľa Mgr. Dagmar Sliackej (2016) sa tieto rozdiely v jednotlivých generáciách prejavujú aj v riadení zamestnancov rôznych generácií a s pomalým nástupom ďalšej Generácie Z môžu nastať pre podniky ešte výraznejšie problémy. Dnes je v podnikoch veľa zamestnancov generácie X, ktorí zastávajú manažérske pozície alebo pozície špecialistov, určujú normy alebo spôsoby riadenia. Generácia Y sa týmto ich spôsobom riadenia bráni a prináša do podnikov novú kultúru a tak dochádza k nepochopeniu medzi týmito generáciami. X – ovia nedokážu zniesť kreativitu Y – ov, pozerajú sa na nich zvrchu ako na lajdákov, ktorých do práce treba naháňať a nútiť. Y – ovia sa zas bránia zastaranej hierarchii a nepružnému spôsobu riadenia, sú neradi obmedzovaní. Bolo by potrebné, aby generácia X zmenila pohľad na generáciu Y, pretože práve Y do podnikov prináša kreativitu a sebavedomie. V mnohých podnikoch sú rokmi zabehnuté postupy a procesy, ale nikto už nepozná ich históriu, význam a najmä dôvod, prečo sa robia tak, ako sa robia. Keď príde do podniku mladý zamestnanec generácie Y, nevie v nich nájsť logiku, ak mu ako zdôvodnenie povedia, že „sa to tak robí“ bez logického zdôvodnenia, tento zamestnanec to začne odmietať. Treba však využiť potenciál Y, ktorí majú pozitívny prístup k úlohám, pretože kde X vidí riziká, tam Y vidí skôr príležitosti a povie „nie je problém“. Samozrejme, aj opatrnosť má svoje výhody. Generácia Y však nikdy nebude tak opatrná ako X, pretože si nezažila sedemdesiate roky, kedy sa vyslovením svojho názoru mohli dostať do ohrozenia, deti generácie Y sa takmer vôbec

nemuseli obmedzovať. Na generáciu X platilo aj riadenia tlakom a direktíva, toto však pri Y nezaberie, pretože Y budú vzdorovať a z podniku odídu (nie sú tak lojálni a majú vyššiu fluktuáciu). S generáciou Z budú musieť podniky a zamestnávateľia ešte viac pracovať, pretože títo zamestnanci budú mať, resp. už majú ešte väčší problém s koncentráciou a výdržou. Generácia Z má vysoké očakávania na kvalitné technologické pracovné prostredie.

Spoločnosť PWC uskutočnila v roku 2012 prieskum medzi generáciou Z ako vnímajú zamestnanie a čo je pre nich v práci dôležité, z ktorého vzišli nasledujúce odporúčania, ako pracovať s miléniovou generáciou:

- *Snažte sa im porozumieť* – dôležité je poznať generačné rozdiely a snažiť sa ich preklenúť, využívať benchmarkingové techniky pri segmentácii zamestnancov, aby sa pochopili, čo nová generácia chce a ako sa jej túžby líšia od predstáv starších generácií,
- *Prispôsobujte benefity* – dôležité je, aby podnik vysvetlil potenciálnemu zamestnancovi, čo mu vie ponúknuť a čo od neho za to očakáva, je potrebné zvážiť prechod od peňažných prémiei k iným atraktívnym benefítom, väčšinu mladých ľudí láka možnosť prispôsobenia si benefítov,
- *Komunikujte s nimi korektne* – existuje výrazný rozdiel medzi predstavou a realitou, čo sa týka príslubov ohľadom zosúladenia osobného a pracovného času,
- *Poskytujte im možnosť rozvoja* – dajte im možnosť napredovať a získať skúsenosti prostredníctvom častejšieho zadávania rôznorodých projektov alebo napr. prostredníctvom job rotation, miléniová generácia túži pracovať v zahraničí a to je potenciálny zdroj pre podniky, ktoré sa orientujú na globálny rast; zároveň je dôležité využiť každú možnosť zostaviť tímy zo zástupcov rôznych generácií,
- *Dajte im vedieť, ako sú na tom* – miléniová generácia sa dožaduje a váži si pravidelnú spätnú väzbu, je potrebné im poskytnúť objektívnu spätnú väzbu v reálnom čase a zdôrazniť im pozitívny prínos alebo zlepšenie v kľúčových kompetenciách,
- *Dajte im slobodu* – miléniová generácia chce flexibilitu, pracuje dobre, keď má jasné inštrukcie a konkrétne ciele, ak viete, čo chcete, dokedy, prečo a kde, dajte im slobodu a možnosť flexibilne si rozložiť pracovný čas, tejto generácii záleží na tom, či pracujú z domu alebo z kaviarne, je potrebné stanoviť termíny a ak ich dodržia, nie je potrebné sa znepokojovať taktikou, ktorú použili, resp. nad časom, kedy pracovali,
- *Umožnite im učiť sa* – táto generácia chce získavať skúsenosti, chcú príležitosti pre rozvoj, popri iných formách vzdelávania je efektívne zapojiť aj mentoringové programy
- *Umožnite im rýchlejší kariérny postup* – v minulosti kariérny postup závisel od seniority pozície a počtu strávených rokov v podniku, miléniová generácia však rozmýšľa inak, dôraz kladie na dosiahnuté výsledky a nie na dĺžku praxe, sú frustrovaní časom, ktorý sa vyžaduje na postup v kariérnom rebríčku, chcú postupovať rýchlejšie – tu existuje riešenie, napr. pridanie nových kariérnych úrovní, či „označení“, ktoré môžu neraz postačovať na splnenie očakávania mladých ľudí,
- *Počítajte s tým, že mladí budú odchádzať* – fluktuácia miléniovej generácie bude vyššia než pri iných generáciách, dôvodom je, že veľa mladých ľudí pri hľadaní zamestnania pristúpi na kompromis a neskôr, keď nájdu svoju „prácu snov“ z pôvodného zamestnania bez výčítiek odídu.

Pochopenie generácií môže podľa Mgr. Kataríny Krištofičovej (2011) pomôcť podnikom a organizáciám, ale aj samotným manažérom k zefektívneniu riadenia a prístupu k svojim zamestnancom. Môže sa odrážať vo všetkom, čo práca s ľuďmi zahŕňa, teda od výberu zamestnancov, cez motiváciu, zadávanie úloh, rozvoj, kariérny rast až po riadenie tímov. Zistenia z viacerých výskumov ukazujú, že napriek tomu, že sme všetci ľudia a určité veci máme spoločné, je potrebné sa zaoberať práve tým, v čom sme rozdielni. Každý zamestnávateľ a manažér chce, aby jeho zamestnanci podávali čo najlepší výkon. Toto mu

umožní práve hľadanie rovnováhy medzi štandardizovanými prístupmi k vedeniu ľudí a prispôbovaním svojho prístupu tak, aby oslovil aspirácie, ambície a postoje jednotlivcov. Pochopením životných skúseností, mentálnych modelov a hodnotových rebríčkov jednotlivých generácií zamestnancov je kľúčom k efektívnemu riadeniu a motivovaniu svojich zamestnancov.

Problém spolupôsobenia viacerých generácií nastáva práve v čase, keď sa nielenže jednotlivé generácie začínajú stretávať na trhu práce, ale tiež sa začínajú objavovať viaceré tendencie zmien, ktoré ovplyvňujú predovšetkým manažment ľudských zdrojov. Spomínanými tendenciami sú najmä starnutie obyvateľstva, nízky (aj záporný) nárast obyvateľstva (najmä vo vyspelých európskych krajinách), globálna migrácia obyvateľstva, zvyšovanie dopytu kvalifikovanej pracovnej sily, snaha krajín EU o udržanie talentov v Európe a v neposlednom rade tiež aplikácia princípov konceptu Industry 4.0 v priemyselných podnikoch (Čambál a kol., 2017).

2. CIEĽ A METODOLÓGIA

Ľudia potrebujú prácu, aby mali z čoho žiť, ale aj aby si uplatnili svoje potreby sebarealizácie. Podniky potrebujú ľudí, aby mohli vyrábať a dosahovať tak zisk. Jedny bez druhých sa nezaobídu a vytvárajú spolu akýsi kruh. Zamestnanci majú svoje preferencie a potreby a dobre pracujú vtedy, ak sú správne motivovaní. Podniky by tak mali vedieť, čím oslovia zamestnanca generácie X,Y,Z a následne ako si ho udržia a vyťažia z jeho talentu maximum pozitívneho pre podnik tak, aby boli naplnené aj očakávania zamestnanca.

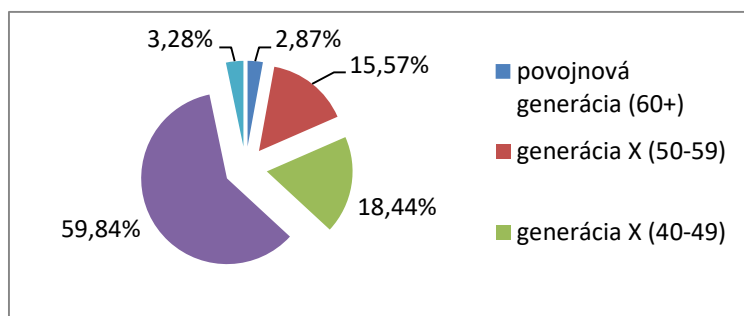
Výskum, ktorý bol realizovaný zamestnancami Materiálovotechnologickej fakulty STU so sídlom v Trnave, prebiehal v mesiacoch apríl – august 2018 a je súčasťou projektu VEGA s názvom „Vplyv koexistencie rôznych generácií zamestnancov na udržateľnú výkonnosť organizácií“. Cieľom výskumu bolo analyzovať súčasnú situáciu generácií zamestnancov so zameraním sa na medzigeneračné interakcie v podmienkach priemyselných podnikov pôsobiach v Slovenskej republike. Do výskumu boli zapojené všetky priemyselné podniky v Slovenskej republike bez ohľadu veľkosti podniku, pričom databáza zapojených podnikov bola vytvorená na základe portálu finstat.sk. Zamerali sme sa na zistenie zloženia jednotlivých generácií zamestnancov na slovenskom trhu práce a preferencie jednotlivých generácií zamestnancov čo sa týka práce, motivácie, odmeňovania atď. Výskum bol realizovaný vo forme online dotazníka. Do augusta 2018 sa do výskumu zapojilo 244 podnikov, pričom naďalej pokračujeme v získavaní údajov až do konca roku 2018, takže prezentované výsledky sú čiastočné a naďalej na projekte pracujeme.

3. VÝSLEDKY

Najväčšie zastúpenie podnikov, ktoré sa do výskumu zapojili mal automobilový priemysel (25,41%), výroba (23,36%) a strojársky priemysel (18,44%). Až v 53,28% prípadov išlo o veľké priemyselné podniky s viac ako 500 zamestnancami. Priemerný vek zapojených zamestnancov bol 38,5 roku pričom priemerným rokom narodenia zamestnancov bol rok 1980 (čo predstavuje generáciu Y). Zastúpenie jednotlivých generácií zamestnancov (Obrázok 1) predstavuje 2,87% zamestnancov povojnovej generácie (60+), 34% generácia X (pričom generáciu X sme si pre naše potreby rozdelili ešte podľa veku na 50 - 59 rokov čo predstavovalo 15,57% zamestnancov a na 40 – 49 rokov, čo predstavovalo 18,44% zamestnancov), 59,84% generácie Y a 3,28% nastupujúcej generácie Z. Obrázok 1 jasne ukazuje, že najpočetnejšie zastúpenie na trhu práce má generácia Y a že povojnová generácia je už na ústupe a odchádza do dôchodkového veku. Naopak, generácia Z pomaly začína prenikať na trh práce. Najvyššie dosiahnuté vzdelanie bolo až v 72% prípadov vysokoškolské,

čo však dávame do súvislosti s tým, že dotazníkový prieskum bol zasielaný zamestnancom na vedúcich pozíciách.

Obrázok 1: Generácie zamestnancov na trhu práce v roku 2018

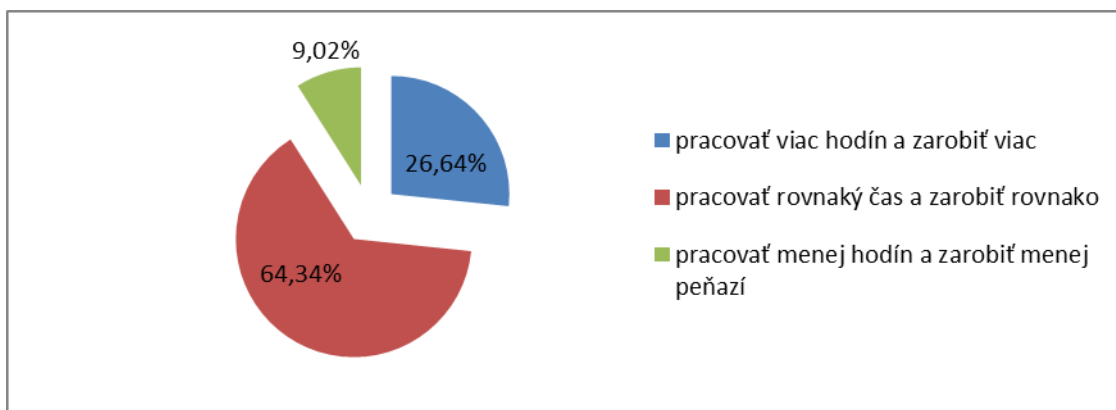


Zdroj: vlastné spracovanie

V rámci výskumu sme tiež zisťovali, čomu by zamestnanci dali prednosť, čo sa týka voľného času a peňazí a z obrázka 2 vidíme, že až 64,34% opýtaných by uprednostnilo pracovať rovnaký čas ako doteraz a zarobiť rovnako peňazí. Takže konštatujeme, že zamestnancom primárne nezáleží len na výške zárobku, ale aj na adekvátnom množstve voľného času, ktorý chcú mať po práci. Zisťovali sme aj, do akej miery je pravdepodobné, že si zamestnanci v najbližších dvanástich mesiacoch pokúsia nájsť nové zamestnanie. Až 41,39% uviedlo, že je to nepravdepodobné a 29,51% že je to veľmi nepravdepodobné. V tomto prípade teda môžeme zhodnotiť, že zapojení zamestnanci sú na svojich pracovných miestach spokojní a neplánujú ich meniť, čo pre podniky znamená aj nízku fluktuáciu.

Výskum Jennifer. J. Deala poukazuje na to, že starší zamestnanci sa cítia byť dotknutí, ak si mladší zamestnanci hneď pri pohovore pýtajú mnohokrát vyššie platy a kompetencie ako majú oni sami, po odpracovaní niekoľko desiatok rokov. Väčšina pracovnej sily (generácia X) bude mať nárok na odchod do dôchodku v nasledujúcom desaťročí, mladí zamestnanci (generácia Z) sa stanú horúcou komoditou na trhu práce. Ak podnik neponúkne mladým zamestnancom vyššie platy a pútavejšiu prácu, niektorý iný podnik to urobí. Pochopenie tohto druhu tlaku je kľúčom k podpore silnej medzigeneračnej komunikácie (Babeľová, Horváthová, 2017).

Obrázok 2: Rovnováha voľného času a zarobených peňazí



Zdroj: vlastné spracovanie

V rámci výskumu sme tiež zisťovali, v akej miere spolupracujú zamestnanci so zástupcami jednotlivých generácií. Odpovede sú uvedené v tabuľke 1. S generáciou Z prichádza každodenne do kontaktu až 34% zamestnancov ale porovnateľné percento uviedlo (36%), že s ňou do kontaktu neprichádza vôbec. Svedčí to o ešte len pozvoľnom nástupe tejto generácie do pracovného prostredia. S generáciou Y spolupracuje dennodenne až takmer 90% zamestnancov. Rovnako aj s generáciou X každodenne príde do kontaktu až 78% (v prípade 40 – 49 rokov) opýtaných a tiež 53% (50-59 rokov). Generácia baby boomers je však na ústupe, títo ľudia sú už pomaly v dôchodkovom veku, čo preukazuje aj naše zistenie, že až 64% opýtaných neprichádza s touto generáciou do kontaktu vôbec.

Tabuľka 1: Intenzita interakcií s jednotlivými generáciami zamestnancov

	Generácia Z	Generácia Y	Generácia X		Baby boomers
Vek zamestnancov	Do 25 rokov	25 - 39	40 - 49	50 - 59	60+
Áno, každý deň	34,43%	89,34%	78,28%	53,28%	19,25%
Áno, 1-2x týždenne	17,62%	6,97%	12,30%	17,21%	8,20%
Áno, 1-2x mesačne	11,89%	1,23%	5,33%	7,79%	7,79%
vôbec	36,07%	2,46%	4,10%	21,27%	64,75%

Zdroj: vlastné spracovanie

Ideálnym vekom pre manažéra, resp. riadiaceho zamestnanca je podľa výskumu vek 40 až 49 rokov, čo uviedlo aj 56,56% opýtaných. My sa prikláňame k rovnakému názoru, pretože človek v tomto veku má už potrebné pracovné skúsenosti, rešpekt v kolektíve pred zamestnancami a v neposlednom rade má už špecifické životné skúsenosti. Nechceme však povedať, že človek starší, resp. mladší sa nemôže stať ideálnym manažérom a zvládať svoju rolu ukážkovo, snažili sme sa tu však vytvoriť akýsi „profil“, v akom veku je ideálne stať sa manažérom.

4. ZÁVER

To, že na trhu práce pôsobia viaceré generácie zamestnancov je nám známe. Je však dôležité, aby si túto skutočnosť uvedomili aj samotné podniky – a ich manažéri aj tak k jednotlivým generáciám pristupovali. Pretože ako ukazujú mnohé výskumy, jednotlivé generácie sú rozdielne a ak manažéri chcú, aby ich zamestnanci pracovali efektívne, treba aby rozdielne aj zamestnancom pristupovali. Nie rozdielne = nespravodlivo, ale rozdielne = s ohľadom na rozdielne potreby a výnimočnosti jednotlivých generácií. Uvádza sa, že existujú tri skupiny manažérov. Prvá skupina manažérov vníma rozdielnosť generácií, ale len okrajovo, počuli o tom, ale neriešia ďalej. Druhá skupina má hlbšie poznatky z odbornej literatúry a uvedomuje si potrebu prepojenia teoretických poznatkov do praxe. Tretia skupina manažérov, najmenšia, už vie pracovať cielene s generáciami zamestnancov, túto skupinu však tvoria prevažne manažéri vo veľkých nadnárodných spoločnostiach. Každá z generácií má svoje silné a slabé stránky a je len na manažéroch, či dokážu vyťažiť maximum silných stránok z jednotlivých generácií a eliminovať tie slabé stránky tak, aby sa navzájom pozitívne dopĺňali. Cieľom nášho článku bolo predstaviť čiastkové výsledky výskumu o súčasnej situácii na trhu práce v Slovenskej republike týkajúcej sa zastúpenia jednotlivých generácií. Zistili sme, ako už mnohé zahraničné štúdie ukázali, že v súčasnosti je pracovný trh zastúpený predovšetkým generáciou X a Y s pomalým nástupom generácie Z a odchodom baby boomers.

Dodatok

Príspevok vznikol v rámci riešenia projektu VEGA 1/0348/17 "Vplyv koexistencie rôznych generácií zamestnancov na udržateľnú výkonnosť organizácií".

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WORK 4.0 PROJECT AND ITS INTERCONNECTION TO THE CAPABILITY OF MEMORY INSTITUTION TO BE ACTIVE PLAYERS IN CULTURAL INDUSTRY IN SLOVAKIA

*Alena VALJAŠKOVÁ*⁸⁶

Abstract: The main subject of this article is to introduce the necessary changes into the educating of employees and the organizational culture of Memory Institutions and its interconnection with the Industry 4.0 and Cultural Industry. As the Erasmus + project WORK 4.0 has pointed out, huge changes have been appearing, or have already reached some professions including the professions of a Librarian and an Archivist, too. The paper deals with the question how to support their place in Cultural Industry, what are the challenges that Libraries and other Memory Institutions in Slovakia have to face in connection with new approaches and new technologies and if they have ability to cope with them and to learn which will save them from being overlooked in evolving Cultural Industry. Directions for future research are suggested.

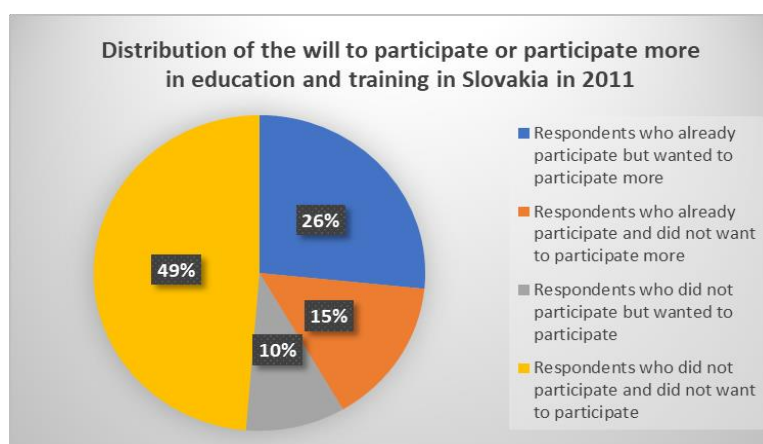
Key words: Cultural Industries, Economy, Future, Librarian, Memory Institution

JEL Classification: J10, Z1, Z10

1. MEMORY INSTITUTIONS IN SLOVAKIA

The starting question for this paper was, if new technologies could overtake jobs in Memory Institutions or if the ability to learn will save people from losing their job. As we search for the answers, we find a Eurostat research with the question, if employees are willing to participate or to participate more on education and training. The question was asked in several European countries in the years 2011 and 2016. In Slovakia the results were almost the same in both years. The percentage of respondents which did not participate and did not want to participate in training was almost the same - in 2016 it was 45,9 % of respondents and in 2011 it was 48,7 % of respondents.

Chart 1: Distribution of the will to participate, or participate more, in education and training in Slovakia in 2011



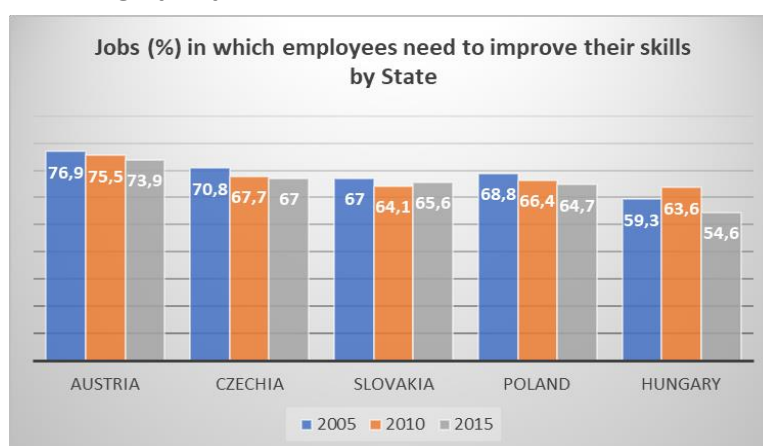
Source: Eurostat (2016), own adjustment (2018)

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Chart 2: Distribution of the will to participate, or participate more, in education and training in Slovakia in 2016

Source: Eurostat (2016), own adjustment (2018)

This allows us to assume that almost half of the employees were not willing to make further improvement to their knowledge. That is a challenge for organizations in general and for the Memory Institutions in Slovakia even more. Libraries, museums, galleries, archives must face these difficulties and the changes that are coming with Industry 4.0. The improvement of employees' skills and using new technologies are the main points for the development of organizations, which are a part of the Cultural Industry. It is clear from the Eurostat research from 2015 that in Slovakia more than 65% of employees are under pressure to learn new skills.

Chart 3: Employed persons with job which involve improving their skills in Austria, Czechia, Slovakia, Poland and Hungary in years 2005, 2010, 2015 in %.

Source: Eurostat (2018), own adjustment (2018)

Due to the use of new technologies and new approaches, which are coming into almost every type of profession, the impact of digital transformation on professions is huge. As the Erasmus + project WORK 4.0 Guidelines stated, the changes in the working requirements connected to the emergence of computers/digitization call for bigger flexibility also within jobs. There is a call for a new skillset needed to perform jobs in cooperation with technologies and this skillset requires continuous adaptation (2017, p. 33). Andrea Záhradníková from Adient Slovakia organization stated, that graduates are missing important skills when applying for a job. Mostly they don't have sufficient soft skills, hard skills or foreign language skills (2018, discussion). These skills, critical thinking or willingness to adapt and learn are important for staff of all ages in Memory Institutions, too.

This can be achieved by active involvement of the state in modernization and restructurization school curricula, especially in the fields of informatics, humanities, logic, creative thinking, problem solving, project and team work (Work 4.0, 2017). As Karl Popper said: *We are not students of some subject matter, but students of problems. And problems may cut right across the borders of any subject matter or discipline* (Facilitating, 2005, p. 16). The ability to learn across different subject areas is crucial knowledge for coping with technologies, too.

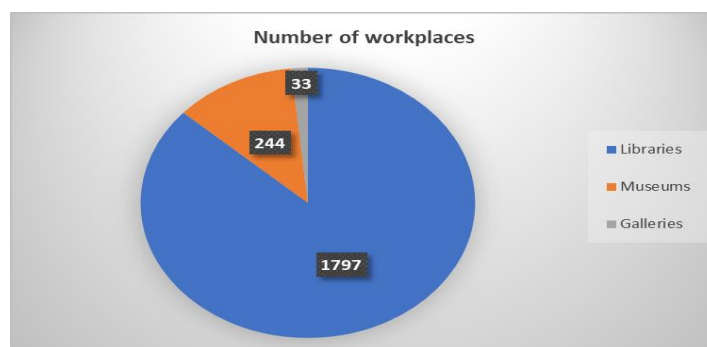
2. CULTURE IN ORGANIZATION

Organizational culture can be understood as a set of basic beliefs, values, attitudes and norms of behavior that are shared within the organization and that are reflected in the thinking, feeling and behavior of members of the organization (Franková, 2011, p. 184-185). This statement covers all important aspects which, if fulfilled, promote creativity and innovation in the Memory Institutions.

We have started a research in some Memory Institutions and asked them what they see as a problem in their institutional culture. The answers, as they understood the question, were merely about the age of employees and its consequences. Two main groups of workers were marked in Memory Institutions in Slovakia: young workers and older workers (50+).

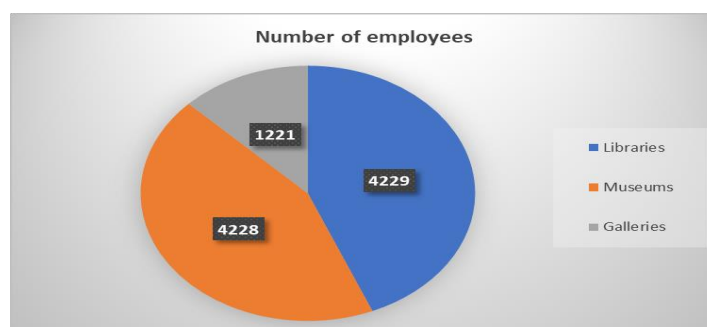
To get an idea of how big the groups of employees within the Memory Institutions are in question, we have created following charts from the data available on the web page of the Ministry of Culture of Slovakia. We use data for 3 types of Memory Institutions – libraries (scientific, public and special including branch offices), museums (including branch offices and extended exposures) and galleries. We had data from these 3 types of institutions at disposal to the date of submission of this paper.

Chart 4: Number of workplaces for libraries, museums and galleries in 2017

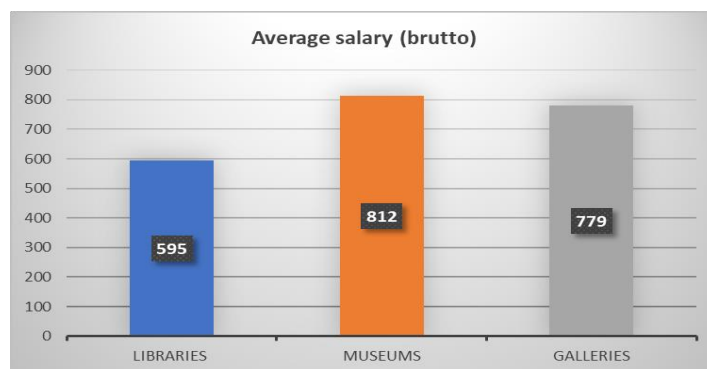


Source: Ministry of Culture (2018) , own adjustment (2018)

Chart 5: Number of employees in libraries, museums and galleries in 2017



Source: Ministry of Culture (2018) , own adjustment (2018)

Chart 6: Average salary for employees in libraries, museums and galleries in 2017

Source: Ministry of Culture (2018), own adjustment (2018)

2.1 Chronical lack of finances in public sector

The informations we worked with can give us data about the number of workplaces at which libraries, museums and galleries operate and about the number of employees they worked within these 3 types of Memory Institutions and their average salary.

We focused on the issue of librarians' income. In comparison with the research in other European states there was a huge disproportion revealed. In Germany the librarian salary starts from approx. 2.300 €. The average salary for a librarian in UK was 2.200 € per month. In Czechia, which is closest state to Slovakia historically and geographically, there is a common problem with low wages. Still the income for librarians is better than in Slovakia. The average salary in Czechia differs from 747 € until 886 € per month for employees with average education. According to this data there are major differences between other European states and Slovakia, where the average salary for a librarian is 595 €.

Present results from Slovakia are that the young generation is not willing to work in public institutions like libraries due to the low wages. Sometimes it is a starting point for their career and they stay there for a year or two, but then they leave the organization. So one of the biggest problems are tariff wages (Act no. 553/2003). Consequently, it affects the average age of employees. This is the responsibility of the state, because Memory Institutions are mainly financed as public institutions from the state budget or from the budget of the higher territorial unit. For example, the wage for a graduate (with a Master degree) one year employed librarian is 578,50 Eur brutto (Act no. 553/2003, appendix n. 3). That is clearly not much, if the young employee wants to live on their own. Without satisfactory salary there cannot be good organizational culture, if the employees are worried about their ability to pay for the food or housing.

2.2 Unwelcoming environment

Another problem for young employees lies in the environment of institution, which is frequently not welcoming to the changes. Older co-workers have hard time to adjust to the changes, proposed by younger colleague or by a manager, or have a hard time to cope with some new technologies that are being implemented. That is intertwined with a problem of their willingness to learn. This implies the necessity of approaching to the further education of employees systematically and conceptually.

Still there are some trend setters among Memory Institutions. Managers in these institutions are aware that it is their responsibility to change the status quo in libraries, museums, galleries. Memory Institutions are here to preserve and present the cultural heritage, to be a service for community and to answer if there is need within society. The questions

arise: Are these institutions willing to develop new approaches to the users, learners or to their own staff? What can be a facilitator for bursting the creativity in employees or in institution itself? What would start their development?

3. AUTOMATIZATION AND DIGITIZATION

Emerging new technologies or their improvement is on a daily basis. New technologies are being implementing within Memory Institutions in Slovakia and they are digitizing their collections. Mostly they are applying for a grants/projects from EU or Slovak Ministry of Culture to be able to buy technologies and hardware and, with this financial support, to be able to be a part of Industry 4.0 (for example: Digital Library and Digital Archive (2012-2015); OPIS – Operational Program for Informatization of Society, Priority Axis 2., Development of Memory and Fund Institutions and Restoration of their National Infrastructure 2007-2013, etc). Digitization of precious archives gives researchers opportunity to interact less with archives or libraries.

Augmented and virtual reality, or 360° and 3D pictures and videos are at the frontiers of new technologies. These technologies, which are not completely exploited and are evolving, may become very important for museums and galleries. They will benefit from adopting these technologies to immerse visitors in the historical and art environments associated with the exhibits (Work 4.0, 2017, p. 21).

Firstly, older invention of RFID technology offered to the reader option to scan the book without interference with the librarian. Secondly, emerging today softwares like X Degrees of Separation by Google, or Transkribus show us importance to develop new strategies how people in this field of work should stay important and become mediators between information and the public.

A good example is the Museum and Cultural center in Trebišov, which is located in the southern part of Zemplín region (East Slovakia). In September 2018 this museum opened a new, interactive exhibition under the title The Treasure of the Štefan Dobó family. The management of this museum is trying to attract visitors and to educate them about history through the use of new media with maintaining of concept of Genius Loci.

Picture 1: Exhibition The Treasure of the Štefan Dobó family with an interactive panel in Museum in Trebišov



Source: AV Media (2018)

The exhibition is available in three languages: Slovak language, Hungarian- due to the near borders with Hungary- and, to be international, English. However, there is still a great amount of other work that needs to be done, for example a new English version of the webpage should be created to attract tourists and let them know that such exhibition is available. Good promotion of the institution is the next step which should not be overlooked by managers or employees, if they have a creative environment in their organization.

4. THE MAIN PROBLEMS FOR MEMORY INSTITUTIONS AND POSSIBLE SOLUTIONS

We have described a good example of implementation of technology in a museum, as well as some informations about low wages in public sector and some examples of unwelcoming environment in institutions. This brings up a question: What to do or do better in Memory Institutions?

The direction in which Memory Institutions could improve is stated in Integrated Regional Operational Program, which discussed Mobilizing Creative Potential in the Regions. This Programme aimed: *to stimulate the promotion of sustainable employment and job creation in the cultural and creative industries by creating a favorable environment for the development of creative talent and non-technological innovations* (Ministry of Culture, 2016). This program shows that *non-profit sector has never been under such pressure to increase its organizational performance* (Kesner, 2005, p. 54). Creation favourable environment within organization is our proposal how to start the change in Memory Institutions in Slovakia.

4.1. Several approaches

The use of new technologies is intertwined with organizational culture. The managers in libraries, museums, galleries, archives in Slovakia should be aware of this important dimension of organizational culture and work on some main interconnected problems.

As Nick Milton (2018) wrote in his blog, the knowledge in institution should come in 3 levels: *what institution must follow, what should follow and what could follow*. Should and must follow is wrote in Law definitions and in some other regulations. For creating the “could” is required to have good institutional culture for motivation of the employees to create new knowledges. Motivation of employee depends on several factors: *internal, external and personal factors of employee* (Seková, 2013, p. 126). Motivation for competence raising and learning lies in managers’ hands, and without that, there wouldn’t be any successful implementation of technology.

4.1.1 Motivation of employees

As we already mentioned salary in public sector is low. Financial and legislative neglecting of Memory Institutions is still not reducing (Kesner, 2005). If there will be no correction of tariff wages it could cause problems when looking for new skilled employees willing to work in this type of institutions. There will be one personal and important motivator missing for the employee. One option could be a pay-for-performance system as an additional possibility of how to give a reward to the employee for his activity and in employees eyes it could be seen as fair and motivating (Lawler, 2000). The founder of the institution could give the organization a budget for this additional salary (paid for example twice a year) which, because of transparency, shouldn’t be used for managers, but only for employees. Reducing dependence on the state budget is another way. Any support from the founder for the commercial activity of the institution is welcome. To be positive, the first step in motivation

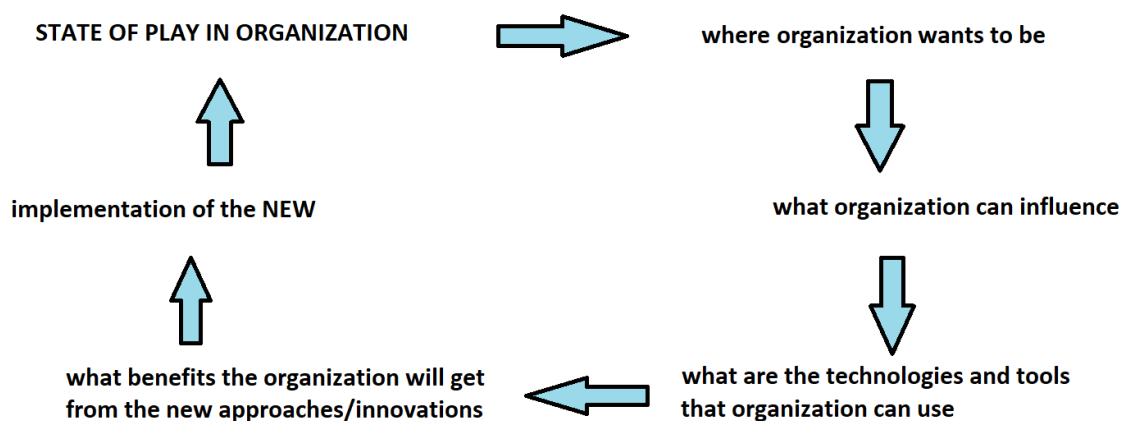
issue of employees in Memory Institutions in Slovakia was already made. It is a promise from the State representatives that the tariff wages for the public sector will be raised by 10% since 2019. This is the first step to create a favourable environment, even though the motivation does not depend solely on monetary remuneration.

4.1.1 Motivation from managers

In last decades we can perceive slow but persistent impact of Knowledge Management on the environment in some organizations. One paradigm of Knowledge Management is focused on organizational, social and managerial elements related to the internal processes and environment of the organization. It contains organizational culture, learning organization, intellectual capital (Encyclopedia of Knowledge Management, 2006). We would like to define this type of management as management of “common sense”.

- Our hypothesis is that the main principles of Knowledge Management will help to develop good institutional culture and should be done as the first step to the revitalization of Memory Institutions.
- The second step in creating positive culture in the organization is to help people find value in their work. Management should give a positive feedback to those who are active and creative members of the staff by acknowledging their efforts. Culture which empowers professionals to be innovative after they fulfill primary mission is more than welcome.
- Investment in the intellectual capital, learning organization or lifelong learning is absolutely necessary. Employees in Memory Institutions will need to develop interdisciplinary skills which they could gain through learning or discussing with their colleagues. This skills include: *critical thinking, synthetic thinking, creativity to new ways how to work on problems, innovative thinking, communication skills, practical intelligence, willingness to push boundaries* (Work 4.0, p. 34). The value of an employee with such capabilities and qualities can be priceless for the organization.
- The main step for managers is to dispose of conservative strategies and reorient the organization to the best learning strategies, which brings organization capability to become a leader (Knowledge Management, 2006).

Figure 1: Organization as an active member in Cultural Industry (learning cycle)



Source: own elaboration (2018)

- Communication towards users and promotion of the institution is the next step that could help to find financial partners for financing new projects.
- We believe that the last but not least step should be the implementation of new technologies. Managers should be prepared to overcome problems connected with the implementation of new technologies from the side of staff and from the side of users. Creating a good institutional culture should be done before the time of implementation of technologies or should go at least at the same time.

4. CONCLUSION

There are several problems stated in this paper. But they have probable solutions with which the founder or the higher territorial unit and the institution itself must deal with. There are several directions for future research. From changing the curriculum at schools, through lifelong learning for employees, up to satisfaction with wages within the professions and welcoming organizational culture. The state and organizations should create the environment open to creativity of individuals or groups, which will increase the institution's potential for smooth implementation of new technologies with maintaining or raising the number of creative employees. That will provide infrastructure to attract more users and direct Memory Institutions towards growth and development within the Cultural Industry.

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JOB RELATED LONG-TERM STRESSORS AND MATERNAL PARENTING STRESS

*Evelina VIDUOLIENE*⁸⁷

Abstract: *There are few major reasons, as well economical and organizational, why parenting stress is so important to investigate and offer evidence-based recommendations for parents as well other professionals who interact with the family. Results of 563 mothers are presented and parenting stress, family life and long-term occupational stressors were explored in the longitudinal study. Long-term occupational stressors may have more negative impact on perceptions how mothers perceive child care related challenges and her incompetence, poor self-efficacy as a primary caregiver compared to stressors that occur inside family life, e.g. family life related negative or challenging circumstances. Higher parenting stress that depends on maternal malfunctioning is associated to family financial insecurity (credits and indebtedness, income decrease, uncertainty about future and employment) and monotony at work. Mother's extra hours spent at work may have negative impact on maternal stress that arouses because of child's perceived problems and child care challenges.*

Key words: *longitudinal study, long-term work-related stressors, maternal parenting stress, occupational stress.*

JEL Classification: *I12, J13, J29*

1. INTRODUCTION

Relationship between occupational stress and parenting stress seems to be bidirectional process. Negative family life circumstances and work stressors have a negative impact on maternal emotional state and increase parenting stress as these situations are the additional burden on the maternal role (Campbell, Ewing, 1990; Ostberg, Hagekull, 2000), may cause work-family conflict. Employee who perceives higher parenting stress and enormous parenting role demands may face decrease in occupational tasks performing, in results and work effectiveness, job satisfaction and motivation, organizational commitment, be resistant to innovations, may cause increase in absenteeism, mistakes, escalate conflicts with co-workers and clients. These circumstances is a tremendous loss for individual, organization and labor market.

1.1 Parenting stress and its impact on individual and family quality of life

Parenting stress is defined as the negative strain related to the self, the child, and the parent-child interaction in the context of parenthood (Abidin, 1990; Deater-Deckard, 2004). Parenting stress arises when the parent's expectations about the resources needed to meet the demands of parenting are not matched by available resources (Deater-Deckard, 2004, p. 5).

There are many studies analyzing the associations of child emotional and behavioral difficulties and parenting stress, most of them investigate the impact of the child's temperament, unacceptable behavior or emotional reactions on maternal well-being and parental stress (Deater-Deckard, 2004; Ostberg et al., 2007; Pimentel et al., 2011). These

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studies mostly analyze the associations of parenting stress, child behavior and emotional problems of school aged children (Bayer et al., 2010; Blader, 2006; Mesman, Koot, 2000).

There are few major reasons why parenting stress is so important to investigate and offer evidence-based recommendations for parents as well other professionals who interact with the family and the child. Parenting stress is the best predictor of child behavior and emotional problems in the future compared to child's difficult temperament, health issues and child development under adverse circumstances in the family (Mesman, Koot, 2000; Crnic, Gaze, Hoffman, 2005; Mäntymaa et al., 2012). Stressors related to the child care affect parent-child relationship quality and child well-being (Crnic, Low, 2002). It seems that one of the most effective ways of preventing child behavioral and emotional problems is to control and reduce parenting stress. Parenting stress has negative sequences on family life - it affects parents' health (it increases probability of depression, anxiety and psychosomatic as well somatic disorders, affects sleep quality), quality of life and marital adjustment negatively (Lavee et al., 1996; Secco et al., 2006). Parenting stress is closely linked to the child's physical abuse (Begle, Dumas, Hanson, 2010; Shutay, 2009). Parenting stress also negatively affects individual's behavior efficacy outside family microsystem – in social interactions and labor market.

1.2 Work-family conflict, occupational stress and parent-child interaction outcomes

Stressful life events are defined as changes in family life that require changes in adaptation and additional psychological resources (Dohrenwend, 2006). Major stressful events in family life have negative impact on child's and parents' well-being, child's sense of safety, are related to child's internalizing and externalizing problems in future (Mesman, Koot, 2000; Jewett, Peterson, 2002). Young children's reaction to major stressful event of family life may be blaming themselves, no matter that stressful event is beyond their or parents control (eg. death of family member, loss of job, mother's pregnancy, etc.). Often children in stressful situation seek comfort in their parents (especially mother as the primary caregiver). Children under six years old do not realize the stressful event completely, their reaction may be moderated by the reaction of parents (Mogil et al., 2010).

However the family is a microsystem. Child care challenges and problems, personal and family life risk factors, environmental and work related stressors or other adverse changes in one microsystems (e.g. child health issues, low socioeconomic status, lack of child care support, negative circumstances in family life, long-term or acute severe work related stressors, etc.) may have negative impact on parenting stress, quality of life and work-family balance, contrary, positive changes would make positive changes in every microsystem (Bronfenbrenner, Morris, 2006). For this reason family life and work-related factors that may be associated with maternal well-being, maternal stress are assessed in this study too.

Other studies assessing what predictors may cause parenting stress examine potential risk factors such as child emotional and/or behavior problems, low partner's support, socioeconomic status, child and parent health. In the current study, important additional risk factors such as stressful events and the mother's occupational stress were analyzed. It is possible that all these factors influence child development, parenting stress, subjective assessment of the child behavior and emotional problems.

2. PROBLEM FORMULATION AND METHODOLOGY

2.1 Purpose of the study

1) Determine whether long-term work related stressors and stressful family life events may affect maternal parenting stress, 2) examine whether maternal occupation stress affects both

maternal parenting stress associated with child behavior, emotional and/or behavioral problems (child related parenting stress), or whether these type of stressors affect parenting stress related to maternal psychosocial problems, incompetence, unsureness about herself as an effective mother (mother related parenting stress), 3) distinguish work-related long term stressors that may have major impact on maternal parenting stress and well-being.

2.2 The study

Research was performed two times: 1st time the author evaluated maternal parenting stress, stressful family life events and maternal work related stressors within past 6 months, sociodemographic variables and child's health status. After 12 months year the same variables were examined. Results of the 1st and 2nd studies presented as T1 and T2, respectively.

The questionnaires were anonymous and participants gave them back in envelopes. Participants were asked to compose a unique code (related to the demographics of each participant) in order to link the T1 evaluation with the T2 evaluation which was performed 12 months later.

2.3 Participants

Participants in study T1. 1810 mothers of children aged from 2 to 5 were invited to participate in the study. In total, 1268 mothers participated in the study, with a response rate of 70.1 percent. The age range of the mothers is 20 to 49 years with a mean $M=32.2$ ($SD=5.6$) years. Most mothers have university college (24.5 percent) and university education (44.9 percent) and are married (75.8 percent). 50.5 percent of the respondents filled in information regarding parenting stress about boys (child age $M=50.5$, $SD = 10.1$ months) and the remaining part (49.5 percent) about girls (child age $M=51.1$, $SD=10.1$ months).

Participants in study T2. 12 months past 1180 mothers who participated at baseline were invited to be reinterviewed. 764 mothers participated in the T2 study (75.0 percent of invited to participate). The paper analyzes data of 563 mothers who participated in T1 and T2 study. Mothers who participated in both studies age $M=33.6$ ($SD=5.4$) years on average, most mothers have university college education (23.8 percent) and university education (46.5 percent), are married (75.0 percent). More than half of the participants work full time, are satisfied with their family income. 50.1 percent filled in information regarding parenting stress about boys (child's age $M=61.2$, $SD=8.5$ months) and 49.9 percent about girls (child's age $M=61.9$, $SD=8.1$ months).

2.4 Assessment methods

Parenting stress. Parenting Stress Index (PSI, Abidin, 1995) is the most widely used measure of parenting stress (Deater-Deckard, 2004, Abidin, 1990, 1995). The 120-item Parenting Stress Index is a Likert type parent self-report questionnaire. Three major scales of the PSI were used in longitudinal study: Child domain (Cronbach α : T 0.92, T2 0.92) and Parent domain (Cronbach α : T1 0.92, T2 0.92) scales as well as Life Stress scale. The reliability results are similar to those of a normative sample (Abidin, 1995) or higher compared to other countries (e.g., France, Germany, China).

Child domain scale evaluates those aspects of parenting stress that arise from the child's behavior (hyperactivity, distraction, child's mood, child's demandingness, etc.). *Parent domain scale* evaluates those aspects of parenting stress that is associated with the parent (e.g., sense of parental competence, role restriction, parent's depression, relationship with the spouse, social isolation and parent's health). *Life stress scale* evaluates family life stressors that are often beyond parent control (e.g., death of a close family friend, maternal pregnancy, moving to new home, problems at school, etc.).

Mother's occupational stress scale was constructed by the author of this study according to previous researches (Holt et al., 1993; Landsbergis et al., 2003). Work related long-term stressors were evaluated the ones that occurred within past 6 months and lasted at least 3 months. The scale consists of 12 situations with different point load according to impact level and are presented in Table 2. Cronbach α of this scale was T1 0.64 and T2 0.65.

Higher scores on every scale represent higher child or parent domain parenting stress, more stressful family life and work-related events during past 6 months.

Sociodemographic variables that may be related to maternal parenting stress, including such variables as child gender, age, mother's work type, family status were evaluated.

Financial strain variables: family financial situation, situations like income increased/decreased significantly, credits and indebtedness, uncertainty related to future and employment, loss of the job during past 6 months. These variables may be related both to occupational stressors and family life changes.

3. RESULTS AND DISCUSSION

The SPSS 18.0 package and multinomial regression method were used for a statistical analysis.

For evaluation whether long-term work related stressors and stressful family life events may affect maternal parenting stress, multinomial linear regressions for Child Domain parenting stress at T2 and Parent domain parenting stress at T2 were performed. Variables as mother's age, education, child's age and gender were included in 1st block of regression analysis (as control variables). T1 mother's employment status, family status, financial situation, family life stressors scale and mother's occupational stress scale were included in 2nd block of regression analysis, and the same variables at T2 were included in 3rd block regression analysis.

Results revealed that these variables has no correlation with Child Domain parenting stress: final model adj. $R^2=0,031$, R^2 change for every step of regression analysis was insignificant. Results for final regression model are presented in Table 1 ($F(14;548)=1,242$, $p=0,240$).

Mentioned variables has weak correlation to Parent Domain parenting stress, however it's larger compared to Child Domain parenting stress model: final adj. $R^2=0,072$, R^2 change 1st step $\Delta R^2=0,028$, $p=0,003$; 2nd step $\Delta R^2=0,018$, $p=0,063$; 3rd step $\Delta R^2=0,026$, $p=0,010$. Results for final regression model are presented in Table 1 ($F(14;548)=3,049$, $p<0,001$). According to results, lower maternal education and child's male gender are associated with higher parenting stress related to maternal characteristics. As well T2 maternal unemployment, child's mother and father living separately at T2 and higher maternal long-term occupation stress at T2 are related to higher Parent Domain parenting stress.

Table 1: Summary of regression analysis for sociodemographic and stressors variables which predict maternal parenting stress at T2: final model

Predictors	Dependent variable: Child domain parenting stress		Dependent variable: Parent domain parenting stress	
	β	p	β	p
Mother's age (1 st step)	0,018	n.s.	0,050	n.s.
Mother's education (0=lower) (1 st step)	-0,026	n.s.	-0,112	0,009
Child's age (1 st step)	-0,071	n.s.	-0,022	n.s.
Child's gender (0=male) (1 st step)	-0,076	n.s.	-0,114	0,007

Mother's employment status T1 (0=full/part time employment, 1=unemployment) (2nd step)	0,043	n.s.	0,043	n.s.
Family status T1 (0=both parents live together, 1=parents live separately) (2nd step)	-0,035	n.s.	0,009	n.s.
Family financial situation T1 (0=having sufficient income) (2nd step)	0,054	n.s.	0,017	n.s.
Family life stressors scale T1 (2nd step)	0,049	n.s.	0,073	n.s.
Mother's occupational stress scale T1 (2nd step)	0,020	n.s.	0,083	n.s.
Mother's employment status T2 (0=full/part time employment, 1=unemployment) (3rd step)	0,095	n.s.	0,141	0,044
Family status T2 (0=both parents live together, 1=parents live separately) (3rd step)	0,154	n.s.	0,148	0,047
Family financial situation T2 (0=having sufficient income) (3rd step)	0,006	n.s.	-0,040	n.s.
Family life stressors scale T2 (3rd step)	0,024	n.s.	0,049	n.s.
Mother's occupational stress scale T2 (3rd step)	-0,006	n.s.	0,109	0,049

Note: T1 – 1st evaluation, T2 – 2nd evaluation after 12 months. n.s. – not significant.

Financial strain and occupational stressors have minor association to Child domain parenting stress – adjusted $R^2=0,052$, $p=0,032$ for ΔR^2 ($F(17;545)=1,746$, $p=0,032$). Parenting stress that is related to child's problems, misbehavior and adaptation problems may be associated to mother's extra hours spent at work (Table 2). Contrary to expected, new contract and job position are associated to lower Child domain maternal parenting stress.

Financial and occupational stressors are associated to Parent domain parenting stress – $R^2=0,141$, $p<0,001$ for ΔR^2 ($F(17;545)=5,263$, $p<0,001$). Higher stress is associated with financial strain (credits and indebtedness during past 6 months, significantly decreased family incomes), uncertainty related to future and job, as well monotony at work (Table 2).

Table 2: Results of regression analysis for mother's occupational stress and financial strain variables which predict maternal parenting stress at T2

Predictors T2 (0=present)	Dependent variable: Child domain parenting stress T2		Dependent variable: Parent domain parenting stress T2	
	β	p	β	p
Incomes increased significantly	0,010	n.s.	-0,036	n.s.
Credits and indebtedness	-0,055	n.s.	-0,121	0,008
Promotion at work*	-0,027	n.s.	-0,025	n.s.
Incomes decreased significantly	-0,019	n.s.	-0,145	0,002
New job*	0,112	0,013	0,066	0,121
Problems with the manager*	-0,008	n.s.	-0,058	0,200
Family member lost the job	-0,052	n.s.	-0,067	n.s.
Problems with co-workers*	-0,032	n.s.	-0,021	n.s.
Inadequate workload*	-0,009	n.s.	-0,037	n.s.
Extra hours spent at work*	-0,127	0,012	-0,073	n.s.
Lack of time to meet deadlines*	0,021	n.s.	-0,043	n.s.
Monotony at work*	-0,065	n.s.	-0,085	0,046
Harmful work conditions*	0,065	n.s.	0,062	n.s.
Uncertainty about future and employment	-0,051	n.s.	-0,097	0,027
Inadequate salary*	-0,026	n.s.	-0,053	n.s.
Discrimination at work*	0,034	n.s.	-0,025	n.s.
Unsolvable problems at work*	-0,017	n.s.	-0,004	n.s.

Note: *situations added to Occupational stress scale. T1 – 1st evaluation, T2 – 2nd evaluation after 12 months, n.s. – not significant.

These results have several implications. Family life stressors may have smaller impact on perceptions how mothers perceive child misbehavior, child care related challenges and her incompetence, poor self-efficacy as a primary caregiver compared to stressors that occur outside family life, e.g. job related negative circumstances. Stressors evaluated in the study have impact on Parent domain parenting stress rather than on Child domain parenting stress so it affects mother's positive self-perception, self-esteem, self-confidence and feeling of control.

The other important implication's that the feeling of insecurity neither it's related to financial issues or lack of employment guarantee affects individual's well-being, adjustment, health and interactions in other microsystems. Erickson Warfield (2005) also stated that household income and an interaction between child behaviour problems and work interest were significant predictors of maternal parenting role stress.

4. CONCLUSION

1. Sociodemographic characteristics, financial strain variables and work related long-term stressors are related to maternal parenting stress that is associated to maternal malfunctioning but not to parenting stress that depend on perceived child's misbehavior and problems.
2. Lower maternal education and child's male gender, maternal unemployment, child's parents living separately and higher maternal long-term occupational stress are related to higher Parent Domain parenting stress.
3. Higher parenting stress that is related to maternal malfunctioning is associated to family financial insecurity (credits and indebtedness, income decrease, uncertainty about future and employment) and monotony at work. Parenting stress that is related to child's problems, misbehavior and adaptation problems may be associated to mother's extra hours spent at work.

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PROJECTED 4.0 SECTOR IMPACT ON PUBLIC SECURITY IN LITHUANIA

Vytautas ŠLAPKAUSKAS⁸⁸

Abstract: *This study consists of three parts: the analysis of the traditional concept of public security, the analysis of the role of technical directives and their relationship with social norms, analysis of the compliance with social rules and technical directives in Lithuania. The study revealed that the technical directives, based on smart technologies, will become more and more important as a result of the industrial revolution. Development of internet possibilities created an alternative (virtual) reality, where usual rules of social behaviour are not being followed. Development of users of smart technologies marks a new stage of public security not only of Lithuania, but also of other countries, which can be interpreted twofold - in terms of close perspective and in terms of further perspective. In further perspective, the control of behaviour of users of smart technologies will be more and more changed by their self-control, which will be formed by the rules generated by communication and telecommunication technologies - technical directives.*

Key words: *public security, social norms, social behaviour institutions, technical directives.*

JEL Classification: O15, O31, O32

INTRODUCTION

The fourth industrial revolution is taking place on the foundation of the third digital revolution. The latter flooded the world with computers and automated data cumulation. However, a new tide of changes differs from the previous ones in few important aspects. Firstly, innovations are being created and may spread faster than ever before. Secondly, decreasing marginal costs of production and rise of platforms that concentrate operational activity in most sectors increases a link between profit and volume. Thirdly, this revolution will include all the countries and they will contribute its creation, and mankind will perceive an impact of changes in many fields. It will change almost all fields of work and learning.

„Industrie 4.0“ refers to digitisation of production and industry sector, and its driving mover is an increase of transparency, efficiency and effectiveness. Most enterprises reckon on participation in change of business models by adapting information and telecommunication technologies (ITT). Extended chain of value and services based on ITT, such as predictable handling, after-sale services based on virtual reality, are new expected business models in industry sector. „Industrie 4.0“ starts from pilot implementations of manufacturing, planning/control and logistics.

Impact of industrial revolution on public security manifests, first of all, by the fact that manufacturing of products of smart technologies expands and a number of their users increases. In terms of ideology of public security, creators and users of smart technologies become active elements of security systems, on responsible/irresponsible behaviour of which depends a proper functioning of security systems or their autonomous parts. Therefore, there is a need not only for creation of smart programmes of possible cyber-crime investigation and

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prevention and institutions of their management, but also for examination of peculiarities of behaviour of users of smart technologies.

Absolutely reasonably an anxiety is spreading, that the fourth industrial revolution might redound upon traditional sources of mankind purport – work, community, family or identity. Or it can lift society to a new level of collective consciousness and moral, when we'll understand that only by working together we'll reach a success. In order to be able to use possibilities of the fourth revolution and to avoid crises, we need to think carefully about the questions it raises. To find out whether our reality understanding corresponds economic and societal development, value creation, conceptions of privacy and property, even personal identity. We need to raise moral and ethical questions, that were presented by modern discoveries in the fields of artificial intelligence and biotechnologies. We need to rethink how we'll communicate in the future and how we'll nourish relationships.

A goal of this paper is to reveal an impact of the industrial revolution on Lithuanian public security, which arises due to different nature of social rules and technical directives.

TRADITIONAL CONCEPTION OF PUBLIC SECURITY: GENERAL RULES OF CONDUCT ARISE FROM THE NEED FOR SOCIAL TRUST

Public security is a multidimensional conception that is impossible to be described unambiguously. This indetermination is determined by multiple dimensions and relativity⁸⁹. In minimalistic point of view, public security is a cultural - social, legal, organizational, economic and technological factors, by which there is a striving to form and nourish a social trust, ensure personal and property security as well as to protect citizens and the state. A safe environment is the only appropriate medium, where implementation and development of human rights and freedom is possible. A feeling of safety determines both behaviour of individuals and life quality as well as the state's social and political stability, citizens' trust in legal and institutional mechanisms functioning in it.

Security is a state of protection and insurance against danger as well as a trust in own knowing. This conception covers objective security, feeling of safety (subjective security), trust in security (absence of doubts). During examination of security we are facing different problems of values protection. However, protection of some values, such as life, health, status, welfare, is very complicated because in case of their loss it is difficult, and in some cases even impossible, to restore them. Therefore, it is always easier to apply the conception of security on things than on humans. Security of humans and society is the most important social (communal) problem. This impels to distinguish and constantly examine the threats to humans' security.

Most threats to individual, as writes B. Buzan, arise because humans are living in a social environment, which generates an inevitable social, economic and political pressure.⁹⁰ Four types of social threats are being distinguished most often: physical threats (pain, injury, death), economic threats (property expropriation or destruction, incapacitation from possibilities of placement or use of resources), threats to rights (imprisonment, denial of human rights) and threats to status (public humiliation). These types of threats usually manifest not by one, but in bigger or lesser set of them.

In most common terms, protection against dangers is based on a voluntary compliance with the idea of general rules or those of social behaviour. This one of the oldest existential ideas

⁸⁹ Tumulavičius V. (2017). *Viešojo saugumo užtikrinimo teisiniai aspektai Lietuvoje: dabarties tendencijos ir procesai*. Mokslo studija [Legal Aspects of Ensuring Public Security in Lithuania: Current Trends and Processes. Science Studio]. Vilnius: Generolo Jono Žemaičio Lietuvos karo akademija, p.18.

⁹⁰ Buzan, B. (1997). *Žmonės, valstybės ir baimė. Tarptautinio saugumo studijos po šaltojo karo* [People, states and fear. International Security Studies after the Cold War]. Vilnius: Eugrimas, p. 71.

of human groups was revealed on the second half of the XX-th century by the researches of Friedrich A. Von Hayek. According to Hayek, rules of social behaviour originated and entrenched when practical mind of human groups realized benefits of abidance of general behavioural rules: regularity of behaviour of individuals forms such „existing order, under which individuals can successfully plan own actions, because they can follow expectations reliable enough on how other individuals will behave. <...> Only because individuals follow particular general rules, human group can live in conditions of the order that we are calling a society. <...> Namely a real compliance with the rules is a condition of development of order of actions; and if they have to be maintained by force as well how that force could be used is a secondary question. There is no doubt that practical observance of rules is preceding their conscious maintenance by force. <...> However, in order a society to survive, it must find a way for efficient learning of the rules, and often a ways to establish them (though it isn't the same) as well“⁹¹.

Thus, learning of general behaviour rules and their voluntary compliance create a stable social order that is a source of social trust and feeling of public security. This is confirmed by the researches of P. Berger and Th. Luckmann: sociability develops and intensifies only in the process of institutionalization of common habits, by nourishing inter-trust and safety of own members⁹². Unceasing creation of public security and trust means that in this process it is possible to achieve some particularly defined forms of stability of balance of „individual - society – state“ interrelationship.

Execution of moral duties is a foundation of nourishment of inter-trust and security. A. Bergson revealed, that "duties imposed by society, allowing him [individual] to be [in a society], internalizes such order in him [through a process of socialization], that usually coincides with the order of life"⁹³. Therefore, there is no a coincidence that personal relationship in the societies that nourish social values and norms are subject o social relationship.

In terms of human existence and forms of activity, mostly five organizational institutions of social life are being distinguished - family, school, church, enterprise (workplace), the state. These main social institutions are interrelated by social behaviour institutions that regulate behaviour and activity of individuals, their groups and organizations - moral, religion and law. Therefore, it is very important to emphasize that all types of social institutions are related: organizational institutions of human social life are functioning on the basis of social behaviour institutions. The more we regard the requirements of social behaviour institutions, the better functions organizational institutions of social life. And vice versa.

Thus, a strength of relation of social behaviour and social life organizational institutions expresses the strength of society's social structure. Social structure is a formation of society, elements of which - social institutions, social groups, social organizations and forms of social actions - are interrelated. Character of functioning of social institutions and internal concentration of social groups, level of development of social organization and forms of social activity suppose a singularity of particular society, its attitude towards human.

All individuals act in one or another social context, which is supposed by interaction of social institutions. The main function of social structure is a constant „control“ of reality creation, in order to ensure predictability and regularity of social behaviour of individuals and their groups, reassurance of succession of public social security and social existence. Its implementation is based on basis of social institutions - moral, religion and law social

⁹¹ Hayek, Friedrich A. (1998). *Teisė, įstatymų leidyba ir laisvė. I : Taisyklės ir tvarka* [Law, Legislation and Freedom. I: Rules and order]. Vilnius: Eugrimas, p. 146-147.

⁹² Berger, P., Luckmann, Th. (1999). *Socialinės tikrovės konstravimas* [Social reality construction]. Vilnius: Pradai, p. 80.

⁹³ Bergson, A. (1994). *Dva ištėčnika morali i religij* [Two sources of morality and religion]. Moskva: Kanon, p. 7.

nourishment. For example, "first striving of religion was maintenance and strengthening of public requirements. Religion fills gaps of relation between daily habits, public requirements and laws of nature"⁹⁴. This important role is impossible to be replaced or refused because of metaphysical aura of religion, which additionally and deeply motivates individual behaviour. Thus, moral, religion and law are tools of social control and individual self-control.

Individuals do not feel social control, because it is a natural cultural condition of social interaction, which makes a socializational impact on individuals. However, they feel a weakening of social control in large scale processes of social-political changes, especially rapid ones, because assessment of social behaviour standards and requirements of responsibility are weakened. In such cases, impunity is settling in social processes and because of that the state of public security is vanishing.

Weakening of social control opens the door to social disorganization - weakening and rupture of relation between cultural values and norms of social behaviour. Social disorganization is an inevitable negative shadow phenomenon of social structure reorganization, which vanishes while social control function is strengthening. In other words, generally social disorganization is understood as a temporary phenomenon, which naturally disappears after reorganization and when social structure starts acting normally again.⁹⁵ Thus, traditional conception of public security is based on a voluntary compliance with social behaviour rules and social control.

TECHNICAL DIRECTIVES AND THEIR RELATION WITH SOCIAL NORMS

Development of users of smart technologies is conditioned by rapid public social changes that directly arise not because of political or economic impact, but because of absolutely new possibilities of information and communication technologies and rules of social behaviour, generated by these possibilities. Information and communication technologies generate new rules of social behaviour - technical directives, that are not of social nature directly.

Technical directives are rules of behaviour that indicate how humans must behave with things, work tools and technologies, nature phenomena, in order to ensure own security and that of living environment and in order to reach practical goals as efficiently as possible. The name was selected because they regulate not only the relationship corresponding the standards that depend on human will and are set on subjectively created rules. Namely performance of smart technologies depend not only on technologies created by human, but also obey different nature laws. That means, that technical directives indicate how human must behave with smart technologies in order their activity to be purposefull, safe and efficient.

All technical directives are related and described by a common feature - this is a regulation of relations between human and nature objects that depend not only on human will. In a most common sense, the rules of smart technologies, construction works, use of electric power, appliances, fuel, use of raw materials, storage of manufacturing waste, conditions of their disposal into environment, as well as other ecological, sanitary, hygienic, medical, biological and other rules are prescribed to technical directives.

While describing technical directives, it is important to determine their relation with social norms. Both regulators are distinguished⁹⁶:

⁹⁴Bergson, A., *supra* note 5, p. 10.

⁹⁵ Šlapkauskas, V. (2009). Teisės vaidmens silpnėjimas komercializuotoje visuomenėje [Weakening of law role in a commercialized society]. *Jurisprudencija. Mokslo darbai*. Nr. 4(118), p. 269.

⁹⁶Baublys, L., Beinoravičius, D., Kaluina, A., Kathrani, P., Lastauskienė, G., Miliauskaitė, K., Spruogis, E., Stankevičius, V., Venckienė, E. (2012). *Teisės teorijos įvadas* [Introduction to the theory of law]. Vilnius: Leidykla Mes, 2012. P. 265.

1) according to differences of regulation object: social norms regulate human interrelationship, and technical directives regulate human relationship with nature, work tools, technologies;

2) according to origin of regulators: origin of social norms - human creations (e.g., subjects of legislation, single individuals, their groups, society); technical directives are created by specialists of a particular field (e.g., programmers, engineers, designers);

3) according to character of formulated rule: social norms usually express a rule of subjectively compulsory behaviour, even by ignoring which, there is a possibility to achieve desirable results (e.g., to take over a possession in illegal, unallowable by norms ways); and technical directives express an objectively compulsory behaviour rule, that is based on necessary dependence of technological and natural phenomena;

4) according to character of impact because of nonobservance of the rule: social norms not always ensure application of impact means (e.g., unsolved crimes, ignorance of communal pressure, etc.); and impact of technical directives is inevitable. That can be not only damage of any item, but also that may lead to dangerous consequences to human or even society.

By describing relation of technical directives and social norms, it needs to be highlighted that these regulators can interact closely. This takes place because particular technologies or human behaviour with them and different items become socially significant, technical directives often become social ones, or in more particular terms - legal norms. For example, rules of the road. Human behaviour while driving a car is significant not only as his relationship with this object, but also as his relationship with other people, to whom he might be potentially dangerous. By their nature, rules of the road in some cases are technical directives turned into legal norms in striving to protect themselves from dangers. Nonobservance of corresponding rules brings administrative, criminal responsibility. That means that observance of technical directives is ensured by the means of legal effect.

The fourth industrial revolution generates not only creation of technical directives and their implementation, but also changes our thinking. The wider products managed by smart technologies will entrench in social life, the more a character of legal regulation will change, i.e. there will be a moving from allowable (dispositive) legal regulation method to imperative method - prohibition and order. Settled method of requirements inevitably influences a thinking transformation of free individual towards obedience. In the process of adaptation to constantly increasing number of technical directives, free individuals voluntarily become more and more obedient to control of new latent power. In other words, internet has already taken over control of our life control. This tendency will intensify and will go even further.

PECULIARITIES OF OBSERVANCE OF SOCIAL RULES AND TECHNICAL DIRECTIVES IN LITHUANIA

Members of modern Lithuanian society, especially young generation, are not clearly committed to follow voluntarily the requirements of social behaviour norms. Often the individual behaviour is being selected that does not cause personal threats and can be beneficial, or selection of behaviour model is based on balance of relation between threats and benefit. This means that individuals more and more are grounding their behaviour on instrumental thinking - balance of input and benefit. Although elements of thinking could be found in the late soviet period, because everyone was corrupted, and justice was being sold⁹⁷.

⁹⁷ Simis, K. (1982). U.S.S.R.: The Corrupt Society: The Secret World of Soviet Capitalism. New York: Simon & Schuster, p. 9.

However, neo-liberalism ideology is the most favourable for their entrenchment in real relationship.

Researches of society's legal behaviour performed by the author of this report revealed:

1. During the period of Lithuanian statehood restoration in 1990 - 1993, there took place a creation of permissible legislation regime, which became a favourable context to entrench negative features of society's legal identity - legal nihilism, corruption and legalization of activity of non-legal nature. Activity of non-legal nature is an activity directed against protection of human rights and freedom, justice and other legal values.

2. Analysis of content of social - legal processes that took place at the stage of Lithuanian statehood establishment in 1993-2000 revealed characteristic features of that period⁹⁸:

2.1. In the context of economic and social instability there spread a contraband and new forms of organized crime, e.g., racket.

2.2. There formed a new public property stratification, that acquired features of polarization. There were highlighted two dangerous tendencies of social development: a) tendency of intergrowth of business and political activity, which manifests by spread of corruption; b) tendency of impoverishment and marginalization of part of the society⁹⁹. By avoiding to adjust business and policy relation systematically, there was not enacted a law on general declaration of private incomes and assets.

2.3. Political and legislative attempts to increase a role of criminal law policy revived noticeably, but at the same time crisis of law enforcement and realization of this role deepened. There is a striving to form a modern legal system, prevailing feature of which is its technical nature¹⁰⁰. Therefore, in legislation and law application, there is highlighted an instrumental attitude towards the law¹⁰¹.

2.4. The media were unable to coordinate its mission and business. Its propagated cult of power and aggression stimulated a development of individuality and suppressed a development of positive social community.

2.5. A striving for benefit and profit became a subordinating principle of society's values system. Position of society's moral neutrality is forming, i.e., there is a public avoiding to assess illegal behaviour of individuals in moral attitude.

3. Process of Lithuania's preparation and becoming the member of the EU oriented political-legal establishment development of Lithuania as legal state, which was a favourable context of formation of society's legal identity. However, based on generalized results of the researches performed by different authors, it can be stated that: a) lack of respect to the Constitution and human rights is characteristic not only to society, but its political elite as well; b) legal identity that is characteristic to a society of western orientation haven't formed yet.

4. Lack of voluntary obedience to follow the requirements of social behaviour norms was highlighted between users of smart technologies as well. Review of cyber security researches¹⁰² revealed that:

⁹⁸ Šlapkauskas, V. (2001). Socialinės deviacijos intensyvėjimas [Intensification of social deviation]. *Jurisprudencija*, t. 19(11), p.44.

⁹⁹ Šlapkauskas V. (1999). Der Charakter der Evolution einer modernen Soziokultur// In the book: *Litauische Gesprache zur Pädagogik: Humanismus. Demokratie*. Erziehung. Frankfurt am Main: Peter Lang GmbH, Europäischer Verlag der Wissenschaften, p. 27-33.

¹⁰⁰ Cotterrell R. (1997). *Teisės sociologija. Įvadas* [Law Sociology. Introduction]. Kaunas: Dangerta, p. 64-66.

¹⁰¹ Šlapkauskas V. (2006). Instrumentinio požiūrio į teisę absoliutinimas ir jo kritika [Absolute instrumental approach to law and its critique]. *Jurisprudencija*, 4(82), p. 83-90.

¹⁰² Grinius, L. (2016). Kibernetinio saugumo situacijos Lietuvoje apžvalga ir tendencijos [Overview and Trends in the Cyber Security Situation in Lithuania]. *Apžvalga*. Gruodžio mėnesio specialusis priedas, p 17.

a) Lithuania is leading in Europe according to possibilities of broadband internet access. In 2013, penetration of internet access services in broadband connection reached 38,5 percent of citizens;

b) number of cyber-incidents increases every year, for example, subdivision of Lithuanian Republic national electronic communications network and information security incidents investigation in 2012 investigated 21416 incidents, in 2014 - 36136 incidents, and in 2015 - 41586 incidents.

5. National cyber security centre in the report of 2017 highlighted that level of cyber security in Lithuania is assessed as insufficient.¹⁰³ Thus, possibilities of use of first products of the fourth industrial revolution already caused a lot of new challenges to further development of security of Lithuanian society.

CONCLUSIONS

1. In traditional attitude of public security, various technologies played only an auxiliary role in strengthening of social control and thus nourishing a stable state of public security. However, development of internet possibilities created an alternative (virtual) reality, where usual rules of social behaviour are not being followed. This situation formed because of a banal reason - avoidability of legal responsibility and striving of administrators of single portals to increase portal's attendance. In other words, even before dispersion of use of smart technologies, there formed a nihilistic attitude towards normativeness of social life.

2. Development of users of smart technologies marks a new stage of public security not only of Lithuania, but also of other countries, which can be interpreted twofold:

2.1. In terms of close perspective: a number of users of smart technologies in the process of rapid growth, number of users, who will try to use information and communication technologies against single objects and subjects of public security due to various reasons will increase relatively. Such impact may arise from both single groups of society and outside of the country. Development of users of smart technologies in Lithuania takes place rapidly, and country's cyber security is assessed as insufficient. Therefore, inevitably a system of prevention of cyber incidents will be further developed. The need for management of this situations stimulates a development of preventive technologies and their implementation in activity of social control institutions as well as corresponding changes of legislation and law application not only in Lithuania, but also in other European countries.

2.2. In terms of further perspective, strategies of prevention of inappropriate behaviour of users of smart technologies and their realization will be determined by political regime of the country. The countries with non-democratic regime will strive for absolute control of users of smart technologies within boundaries of their jurisdiction. In the countries of liberal democracy, human right protection is limiting possibilities of prevention of behaviour of users of smart technologies. However, in further perspective, the control of behaviour of users of smart technologies will be more and more changed by their self-control, which will be formed by the rules generated by communication and telecommunication technologies - technical directives.

¹⁰³ 2017 metų nacionalinio kibernetinio saugumo būklės ataskaita [2017 National Cyber Security Status Report]. (2017). Vilnius: Nacionalinis kibernetinio saugumo centras. P. 43. Available at: file:///C:/Users/User/Desktop/Ketvirtosios%20pramonės%20revoliucijos%20poveikis%20viešajam%20saugumu/NKSC_ataskaita_2017_lt.pdf.

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IMPACT OF INDUSTRY 4.0 TECHNOLOGIES ON THE EMPLOYMENT OF THE PEOPLE WITH EYE PROBLEMS: A CASE STUDY ON THE SPATIAL COGNITION WITHIN INDUSTRIAL FACILITIES

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Abstract: Nowadays, Industry 4.0 technologies simplify the blind and visually impaired (B&VI) employment and make the work conditions B&VI friendly. The interviewing of B&VI and the analysis of literature and Internet resources show that two features must be implemented at least – detection of unexpected obstacles in front of the B&VI on the distances of up to 1 m and the B&VI remote localization. The developed soft-/hardware complex uses wearable Raspberry Pi 3 B microcomputer with an ultrasonic range sensor HC-SR04 to solve the first problem and the Bytereal iBeacon fingerprinting to work out the second one. The presented approach was successfully tested at the three-workroom industrial facilities – the B&VI detected obstacles and the blind companion remotely localized the B&VI via the iBeacon fingerprinting, HTML dynamic website, and MQTT protocol. This satisfies the requirements to the accessibility, safety, and problem solving; the ability to apply other assistive technologies meets the flexibility feature of the four-hospitality criterion.

Key words: Industry 4.0, smart city, employment, blind and visually impaired, spatial cognition, wearable assistive device

JEL Classification: O35, J21, J81, I15

1. INTRODUCTION

Nowadays, Industry 4.0 and smart sustainable development and inclusive growth are commonly called as the trends and fourth industrial revolution [1-3]. Cyber-physical systems, Internet of Things (IoT), cloud and cognitive computing are the main constituents of this concept [2, 4]. These technologies have a huge impact on almost every aspect of the smart enterprise including the employment of people with disabilities and eye problems (blind and visually impaired, B&VI) in particular [5-7]. The competitive strength of smart cities is based on five driving forces [8] related to the smart enterprises: productive business environment; profitable regional economy; high employment level and qualified human resources; smart infrastructure; accessible natural and environmental resources; efficient banking and financial institutions. The B&VI employment rate is about 30 % worldwide nowadays [7]. The solution of this problem brings many benefits to both sides – enterprises have qualified employees and show social responsibility, B&VI have money, companionship, and a positive and valued self-identity [7]. The B&VI employees design mental maps of the premises based on the infrastructure elements such as tables and walls. This activity takes a few hours or days – the duration depends on the dimensions and B&VI experience. The main difficulties of B&VI are about detection of unexpected obstacles such as trolleys and boxes. The main drawbacks of blind companions are about remote localization of the B&VI. In this work, a case study on the B&VI spatial cognition within three-workroom industrial facilities is discussed using the assistive device with the following features:

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- detection of unexpected obstacles in front of the B&VI on the distances of up to 1 m with ultrasonic range sensor HC-SR04 [9] installed on the Raspberry Pi 3 B board [10];
- Raspberry Pi 3 B based indoor localization [11] of the B&VI using the received signal strength indicator (RSSI) from the Bytereal iBeacon Bluetooth low energy (BLE) 4.0 near field orientation modules with a cover range of 50 m [10-14], MQTT IoT protocol [15], and HTML dynamic website.

Then, this information is said to the B&VI and / or transmitted to the blind companion. This specific configuration satisfies the basic requirements to the assistive devices for the B&VI spatial cognition at the industrial facilities. This functionality was designed via the interviewing of B&VI at the Instituto para Ciegos y Débiles Visuales “Ezequiel Hernández Romo” (San Luis Potosi, Mexico) and the analysis of literature (e.g. [11, 16-20]) and Internet (e.g. [21-23]) resources.

The goal of this paper is to show how Industry 4.0 technologies simplify the B&VI employment and make their work conditions more B&VI friendly. Even a small improvement of the B&VI assistive devices implies a large social benefit.

This paper is organized as follows: In Section 2, the related work is presented. In Section 3, the experimental testbed and iBeacon fingerprinting are discussed, and then a rule for the B&VI localization is proposed. In Section 4, the B&VI spatial cognition is presented using the assistive device with Raspberry Pi 3 B and ultrasonic range sensor HC-SR04 for the detection of obstacles on the distances of up to 1 m; the blind companion finds the B&VI location via iBeacon RSSIs and HTML dynamic website; different equipment communicate with each other based on the MQTT IoT protocol. Conclusions are summarized in Section 5.

2. RELATED WORK

In the last decade, technologies of smart factories / cities drastically improved the quality of life and work conditions, and hence the regional economies got new impulse for the growing. In particular, people with disabilities received new opportunities for employment and self-realization. Analysis of the successful projects shows three important development stages:

- formation of the smart governance;
- training of the end-users;
- development of the smart assistive infrastructure such as the yellow tactile pavings, wheelchair ramps, virtual or real blind companions, etc.

The smart city four-hospitality criterion [8] is applicable to the smart enterprises as well, i.e. industrial facilities must be accessible, safe, flexible, and able to solve the problems of B&VI.

Most of the literature deals with IT-based technologies for the B&VI spatial cognition within smart factories. The results were mainly published in the journals and conference proceedings related to the IoT and assistive devices for B&VI since these technologies are based on the intelligent algorithms and IoT soft-/hardware.

Nowadays, location systems use two principal techniques for positioning – radio frequency (RF) / acoustic / optical triangulation / trilateration [24, 25] and fingerprinting [26, 27]. Triangulation [25] and trilateration [24] determine absolute or relative locations by the measurement of distances using the geometry of triangles and circles / spheres, respectively. The ranges are identified via RF (WiFi, Bluetooth, RFID [10]) technologies, acoustic (e.g. HC-SR04) and / or optical (e.g. GP2Y0A21) sensors. Fingerprinting uses machine learning to

match the B&VI location based on a predefined set of characteristics of sensor signals at each of the locations.

In [11], different indoor localization techniques (Angle of Arrival (AoA), Time of Flight (ToF), Return Time of Flight (RTOF), RSSI, Channel State Information (CSI), etc.) and technologies (WiFi, Ultra Wideband (UWB), Visible Light, etc.) are described in detail. Three approaches of the object localization are presented: the user device utilizes the reference or anchor nodes to obtain its relative location; a set of the reference or anchor nodes passively obtains the position of the user connected to the reference node; proximity detection of the distance between a user and a point of interest. Existing localization systems are evaluated from the perspective of energy efficiency, availability, cost, reception range, latency, scalability, and tracking accuracy. It is pointed out that the final solution depends on the various factors such as smart factory infrastructure, existing soft-/hardware, localization technique.

In [16], the behavior of B&VI is discussed when they explore unknown places. It helps to build a more appropriate interface and dialogue system. A study on how the B&VI verbalize a route with a set of elements and rules is presented. A concept of the blind companion is shown but the soft- and hardware are not discussed.

In [17], an ambient intelligence system RUDO for B&VI is presented. It consists of several modules: recognition of approaching people, alerting to other household members' movement in the apartment, work on a computer including writing in Braille on a regular keyboard, supervision of sighted children, cooperation of a sighted and B&VI, control of heating and zonal regulation by the B&VI. Here, the home solution is discussed only.

In [18], the information and assisted navigation system for the B&VI performs voice-controlled navigation inside the building. The location system was developed based on Bluetooth technology. The system locates the user and sends the instructions to reach the desired destination after the environment is equipped with sufficient sensors. Here, the obstacle detection relies on the user abilities only.

In [13], a measurement study of the Estimote, GELO, and Wizturn Pebble iBeacons and iOS / Android mobile device platforms shows that iBeacon RSSI values vary significantly across iBeacon vendors, mobile device platforms, deployment height of the device, indoor / outdoor environmental factors, and obstacles. In addition, it was pointed out that iBeacons can be used indoor and outdoor both, but GPS is unusable inside buildings. Hence, the design of the location estimation model is a complicated problem.

In [19] and [20], QR code based indoor navigation systems are presented. This approach is feasible if the QR code is in front of the camera. In [28], a camera reads AprilTags and then calculates the location and orientation of the device. However, it is a common situation when QR codes and AprilTags cannot be captured by the camera, and hence the B&VI location is unidentifiable.

In [26] and [27], a promising approach of the location fingerprinting with iBeacons is presented. In [26], the training data is collected from a Bluetooth-enabled iOS client device, and then is pushed to and stored in the computational cloud for future retrieval and use. In [27], a detailed study of the user fingerprinting localization with 19 BLE beacons distributed around 600 m² testbed is presented. The results show advantages of BLE beacons for positioning compared with WiFi fingerprinting. Machine learning algorithms are not applied in [26] and [27].

Nowadays, Industry 4.0 applies several IoT protocols such as MQTT, CoAP, XMPP, DDS, and AMQP [29, 30]. MQTT IoT software can be executed on thin clients like Arduino Uno since it takes approximately 10 KB of random access memory. It was shown that MQTT

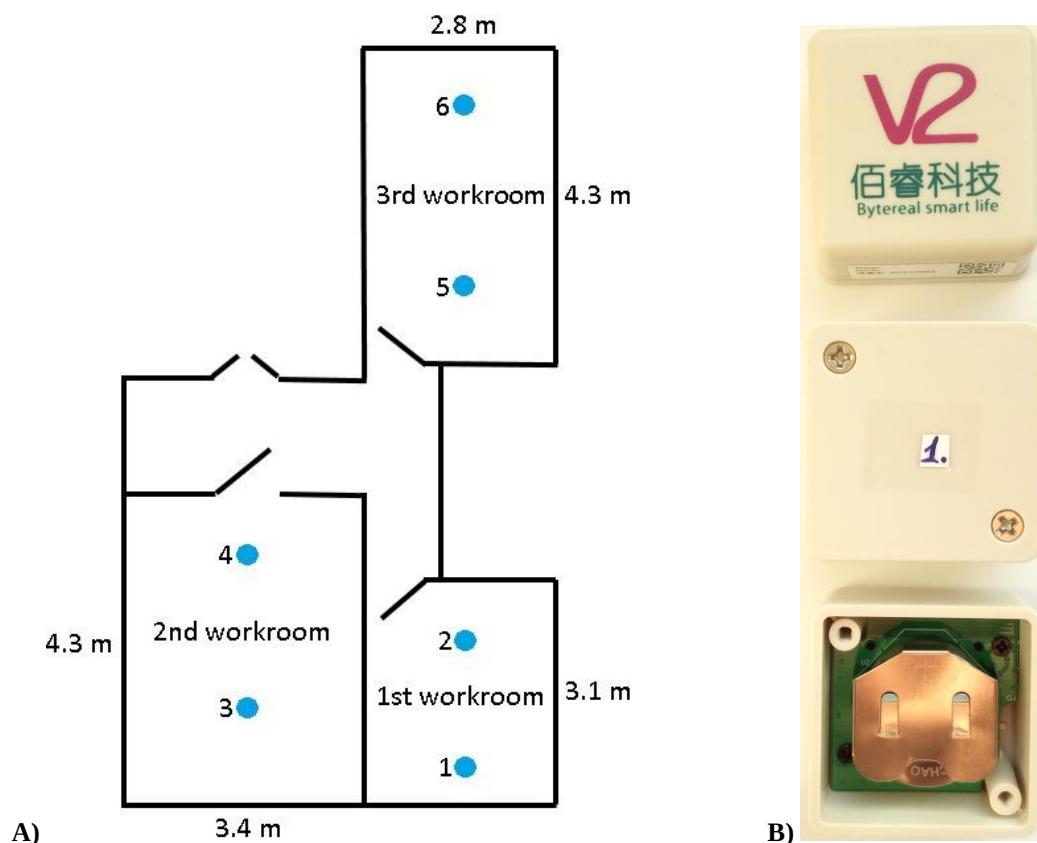
brokers work reliably with 100,000 publishers and 100 subscribers [29] that satisfies the requirements to the smart enterprise networks.

Analysis of the above-stated work shows that Industry 4.0 and smart city technologies simplify the B&VI employment and make their work conditions more B&VI friendly via IoT. For the time being, there is no universal soft-/hardware solution for smart factories. Hence, the development of case-oriented projects with four-hospitality criterion is the most effective approach to support the B&VI working activities.

3. EXPERIMENTAL TESTBED AND iBEACON FINGERPRINTING

The testbed is a small industrial facility of approximately 40 m² (see Figure 1, A; six blue dots represent the iBeacon fingerprinting points) in Vinnitsa city that is common to Ukraine. The area has an existing WiFi network with one access point within the testbed. Three Bytereal iBeacons (see Figure 1, B) were horizontally installed on the ceilings, workroom center adjusted. The distance between the floor and ceiling is 2.5 m.

Figure 1: A) Map of the experimental testbed; B) Three Bytereal iBeacons



Source: the map was designed and the photo was taken by authors (2018)

The Raspberry Pi 3 B board measures the RSSIs of Bytereal iBeacons at six points (blue dots in Figure 1, A) using the Python library Bluepy [12]. The 1st workroom iBeacon has a name BR522827 and Bluetooth address 20:18:ff:00:33:5d, 2nd – BR523803 and 20:18:ff:00:33:16, 3rd – BR523809 and 20:18:ff:00:33:19. The results are presented in Table 1. Sometimes, iBeacons are not detected – RSSI equals -120dBm in this case.

Table 1: RSSIs of Bytereal iBeacons

No. of the point	1st workroom iBeacon RSSI, dBm			2nd workroom iBeacon RSSI, dBm			3rd workroom iBeacon RSSI, dBm		
1	-66	-63	-64	-72	-75	-78	-81	-85	-85
	-61	-62	-69	-74	-75	-77	-91	-84	-87
	-61	-62	-75	-75	-76	-73	-84	-83	-85
	-72	-63	-75	-76	-74	-74	-87	-93	-84
	-67	-77	-62	-75	-75	-74	-86	-84	-86
2	-57	-64	-64	-65	-71	-67	-97	-88	-93
	-63	-58	-65	-67	-68	-72	-103	-92	-93
	-57	-57	-57	-67	-70	-71	-103	-93	-94
	-58	-57	-57	-72	-72	-71	-81	-92	-94
	-58	-57	-58	-68	-70	-71	-90	-92	-93
3	-89	-87	-89	-69	-76	-72	-97	-93	-92
	-89	-84	-77	-76	-80	-71	-89	-89	-91
	-79	-85	-89	-75	-85	-81	-88	-89	-81
	-95	-91	-89	-67	-70	-79	-95	-87	-92
	-92	-90	-84	-78	-71	-67	-96	-89	-92
4	-71	-71	-75	-69	-61	-58	-85	-84	-80
	-71	-71	-74	-67	-62	-58	-85	-83	-82
	-81	-85	-88	-69	-60	-57	-87	-82	-82
	-77	-89	-79	-65	-60	-60	-82	-82	-92
	-75	-74	-82	-56	-59	-60	-81	-82	-92
5	-98	-99	-95	-86	-96	-84	-66	-70	-66
	-95	-97	-97	-85	-89	-95	-70	-70	-66
	-96	-96	-100	-82	-90	-97	-68	-70	-71
	-97	-93	-93	-91	-96	-85	-71	-71	-68
	-95	-94	-98	-84	-96	-83	-71	-70	-75
6	-90	-96	-89	-93	-86	-87	-68	-72	-68
	-97	-88	-93	-93	-87	-86	-71	-69	-68
	-85	-84	-93	-90	-93	-85	-69	-72	-65
	-96	-93	-89	-88	-88	-99	-69	-70	-64
	-84	-87	-87	-91	-86	-85	-72	-70	-73

Source: the RSSIs were measured by authors (2018)

Analysis of the presented in Table 1 iBeacon fingerprinting RSSIs shows that the B&VI location can be uniquely identified with the following rule: if RSSI of some iBeacon is greater than -65 dBm or greater than any other RSSI more than 11 dBm then the B&VI is in the workroom where this iBeacon is installed.

4. THE B&VI SPATIAL COGNITION WITHIN INDUSTRIAL FACILITIES: AN ASSISTIVE DEVICE SOFT-/HARDWARE IMPLEMENTATION

The Raspberry Pi 3 B microcomputer and ultrasonic range sensor HC-SR04 are the main hardware components (see Figure 2). In addition, a small 5 MP Raspberry Pi camera was installed in the enclosure for the future image processing projects. The Arduino Mega board with Ethernet shield (see Figure 3) implement the simple web-server to start a location HTML dynamic website (see Figure 4) based on the data acquired from the MQTT broker. The interaction between MQTT clients and broker is shown in Figure 3: the B&VI with Raspberry Pi microcomputers are the MQTT publishers (Python library paho-mqtt [15] is applied), Arduino Mega board with Ethernet shield (Arduino library PubSubClient [31] is included) is the MQTT subscriber, the blind companion computer (Mosquitto software [31] is installed) with Windows 10 operating system is the MQTT broker. In this project, the Arduino hardware is used since additional sensors can be utilized additionally. This possibility is

crucial for the future scaling of the system. For the time being, the price of one kit for ten B&VI is about USD 700.

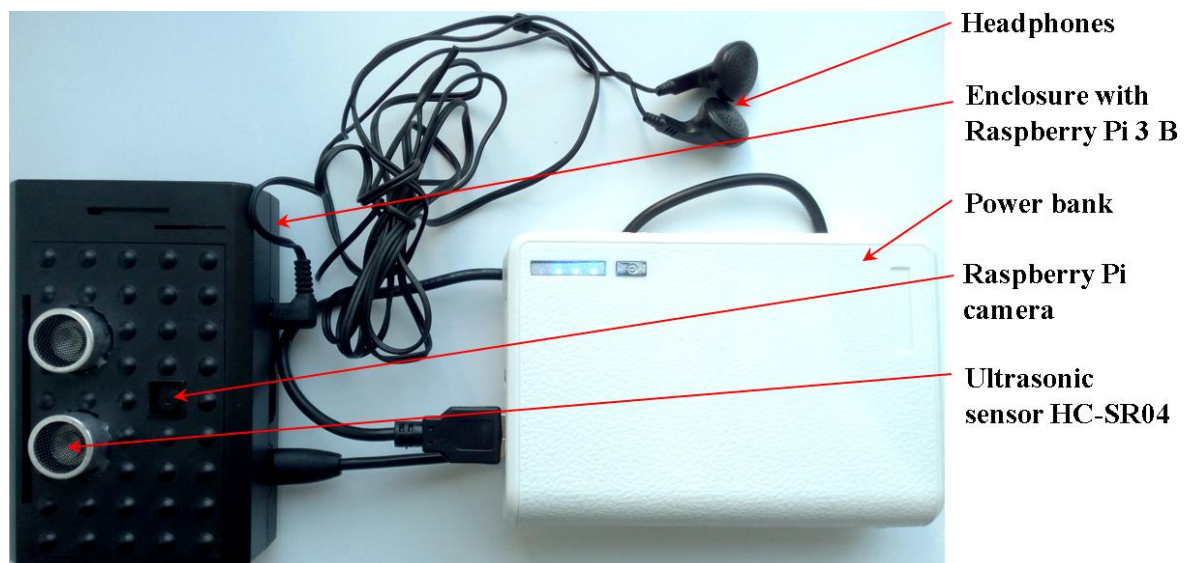
Detection of unexpected obstacles in front of the B&VI on the distances of up to 1 m is based on the ultrasonic detector HC-SR04, which works well on the range of up to 5 m [9]. The Raspberry Pi 3 B general purpose input / output pins are of maximum voltage 3.3 V and a power supply is 5 V. Hence, the voltage divider with resistors 1 kOhm and 2 kOhm is applied to the HC-SR04 Echo output. The Python code for acquiring the information from the HC-SR04 is similar to the program presented in [9]. Since HC-SR04 is not 100 % precise, the following rule is applied to avoid the mistakes: if three last values from the HC-SR04 sensor show that the distance to the obstacle is less than 1 m, it is considered that unexpected obstacle is in front of the B&VI. Since one program loop takes approximately 0.01 sec, detection of the obstacle in front of the B&V is about 0.1 sec, which is quite acceptable for the slowly walking B&VI. The information is pronounced in English to the B&VI via headphone(s) and the text-to-speech engine flite [32].

To acquire the iBeacon RSSIs and calculate the location, the Python code was developed similar to the program presented in [12]. For this purpose, the Bluepy library was installed. The B&VI location is encoded by six-digit number, where the first three digits is the person index number and the last three digits is the workroom code. For instance, “002003” means that a second person is in the third workroom. Then, this information is transmitted to the MQTT broker under the topic “/location/people”.

The Python programs are downloaded from the Internet file server when the Raspbian is started, and hence it is possible to update the software remotely. If the Internet is not connected, previously downloaded files are loaded from the SD card.

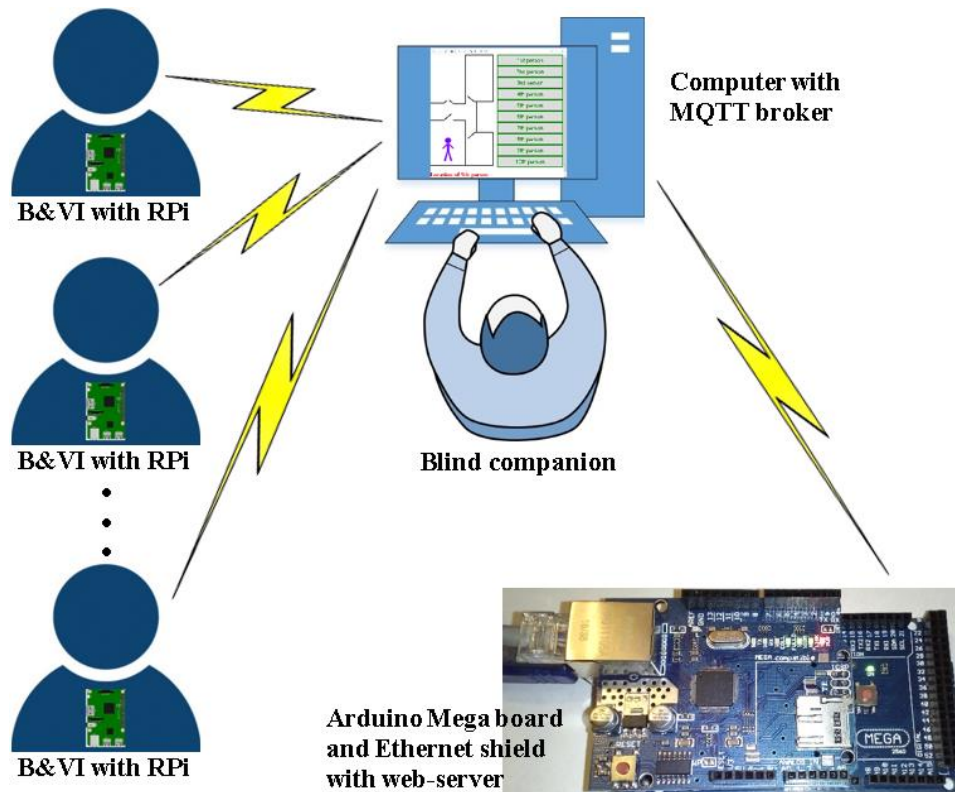
The presented soft-/hardware complex was successfully tested at the above-stated industrial facilities – the B&VI detected the unexpected obstacles on the distances of up to 1 m via the ultrasonic range sensor HC-SR04 on Raspberry Pi 3 B and the blind companion remotely localized the B&VI through the iBeacon fingerprinting, HTML dynamic website, and MQTT IoT protocol.

Figure 2: Raspberry Pi 3 B microcomputer with HC-SR04 sensor, 5 MP camera, headphones, and mobile power bank



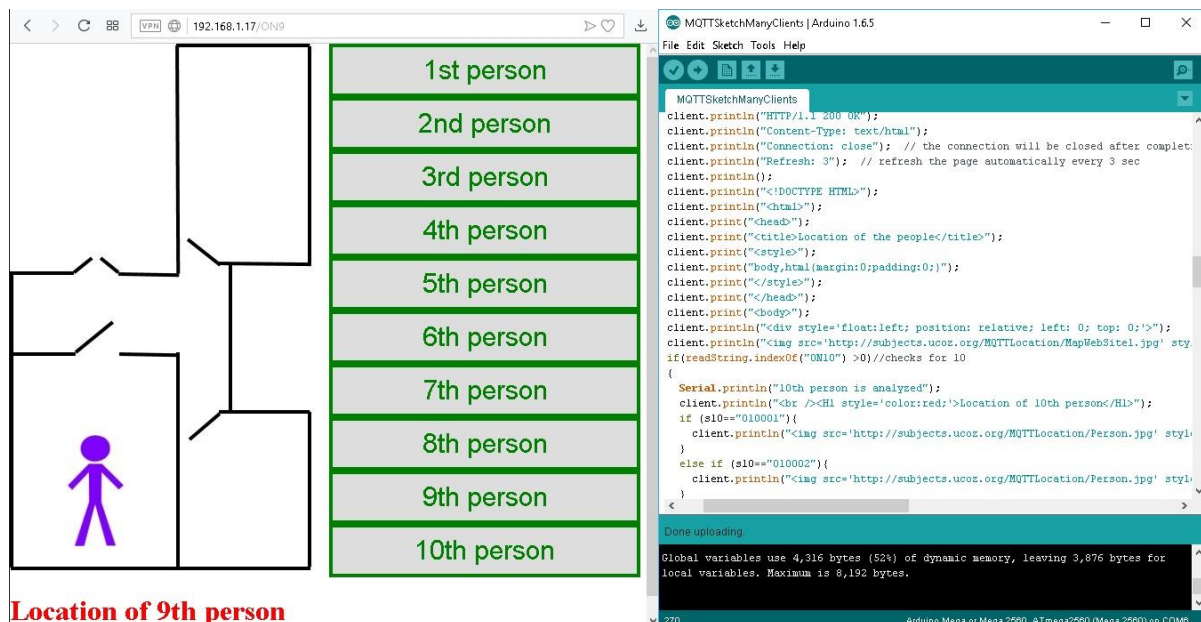
Source: the photo was taken by authors (2018)

Figure 3: Interaction between MQTT clients and broker (RPi stands for Raspberry Pi)



Source: the figure was designed and the photo was taken by authors (2018)

Figure 4: Screenshot of the HTML dynamic website with the B&VI location (on the left) and the Arduino sketch (on the right)



Source: the software was developed by authors (2018)

Our soft-/hardware complex satisfies the four-hospitality criterion – the remote localization and obstacle detection meet requirements to the accessibility, safety, and problem solving, the ability to apply other assistive technologies, e.g. face recognition, is the flexibility feature.

5. CONCLUSION

In this paper, a case study on the B&VI employment in the smart factories is discussed using Industry 4.0 technologies. An assistive device was developed to support the B&VI spatial cognition via the detection of unexpected obstacles in front of the B&VI on the distances of up to 1 m with ultrasonic range sensor HC-SR04 and Raspberry Pi 3 B based indoor localization of B&VI using the iBeacon RSSI fingerprinting, MQTT IoT protocol, and HTML dynamic website. The B&VI is advised on the presence of obstacles by headphones. The B&VI location information is transmitted to the blind companion. For the time being, the price of one kit for ten B&VI is about USD 700.

The experimental testbed is a small industrial facility of approximately 40 m² with three workrooms with one Bytereal iBeacon in each. Analysis of the iBeacon RSSI fingerprinting showed that the B&VI location is uniquely identified with the following rule: if RSSI of some iBeacon is greater than -65 dBm or greater than any other RSSI more than 11 dBm then the B&VI is in the workroom where this iBeacon is installed. The obstacle detection in front of the B&V is about 0.1 sec, which is quite acceptable for the slowly walking B&VI.

The presented soft-/hardware complex was successfully tested at the experimental testbed – the B&VI detect the unexpected obstacles on the distances of up to 1 m via the ultrasonic range sensor HC-SR04 on Raspberry Pi 3 B and the blind companion remotely localizes the B&VI through the iBeacon fingerprinting, HTML dynamic website, and MQTT IoT protocol.

Our soft-/hardware complex satisfies the four-hospitality criterion – the remote localization and obstacle detection meet requirements to the accessibility, safety, and problem solving, the ability to apply other assistive technologies, e.g. face recognition, is the flexibility feature.

The most likely prospect of the presented spatial cognition technology for the B&VI assistance in the Industry 4.0 enterprises is the integration of the developed soft-/hardware complex into other smart structures such as smart industrial transport / environment / governance.

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