

DIGITALIZATION, ARTIFICIAL INTELLIGENCE AND WORK FORCE

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Abstract: Digitalization has been changing organizations from the time when Internet was discovered. On the other side digitalization is rapidly reshaping our workplaces. Nowadays people cannot imagine business or their personal lives without digital technologies, digital technologies often change individual's work and collective work practices in significant but unpredictable ways. Digitalization has created many challenges at companies and also at work place, but also create excellent opportunities for organizations. New technologies are a key driver of labor market change in recent decades. On the other side there are technological developments in areas such as artificial intelligence and concerns that this technologies will destroy jobs. There are lot of existing studies which examined the role of digitalization on business performance and worker productivity. Digital technologies help but also allow companies to improve their workplace form traditional/outdated to fresh and digital. The benefits from the digitalization are appeal to both employees and management. In general technologies are unpopular among workers in traditional companies, primarily because they are not well known, as well as because of the fear of possible job losses. A large number of surveys and surveys of the opinion of workers reveal a small percentage of workers who support the implementation of robotic production systems because most believe that they will "take" their jobs. For that reason, in recent years, the issue of informing workers with new technologies that work with artificial intelligence has been updated, in order to neutralize the fear of the unknown. Artificial intelligence is being perfected to ensure complementarity of production processes to improve productivity and, ultimately, increase profits. Those jobs that will be closed and replaced by robotization and the introduction of artificial intelligence will actually generate new jobs that should be filled with workers through their retraining and retraining, because machines and artificial intelligence still need to be managed by a human factor. In this paper we will explore the situation about the level of digitalization, implementation of AI (artificial intelligence) in different fields of working and how this process cultivate the digital work force, what are the skills of workers' representatives for information management, digitalization, AI (artificial intelligence) management, as well as the creation of a personnel strategy and its implementation in the company.

Keywords: artificial intelligence, work force, digitalization.

Field: Social sciences

ДИГИТАЛИЗАЦИЈА, ВЕШТАЧКА ИНТЕЛИГЕНЦИЈА И РАБОТНАТА СИЛА

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Резиме:

Дигитализацијата ги менува организациите од времето кога беше откриен Интернетот. Од друга страна, дигитализацијата брзо ги преобликува нашите работни места. Во денешно време луѓето не можат да го замислат бизнисот или својот личен живот без дигитални технологии, дигиталните технологии често ја менуваат работата на поединецот и колективните работни практики на значителни, но понекогаш и на непредвидливи начини. Дигитализацијата создаде многу предизвици кај компаниите и на работното место, но исто така создаде одлични можности за организациите. Новите технологии се клучен двигател на промените на пазарот на труд во последните децении. Од друга страна има технолошки развој во области како што е вештачката интелигенција и загриженоста дека оваа технологија ќе ги уништи работните места. Постојат многу постоечки студии кои ја испитуваат улогата на дигитализацијата врз деловните перформанси и продуктивноста на работниците. Дигиталните технологии помагаат, но исто така им овозможуваат на компаниите да го подобрат своето работно место од традиционално/застарено до свежо и дигитално. Придобивките од дигитализацијата се привлечни и за вработените и за раководството. Во принцип, технологиите се непопуларни меѓу работниците во традиционалните компании, пред сè затоа што не се добро познати, како и поради стравот од можно губење на работни места. Голем број анкети и анкети за мислењето на работниците откриваат мал процент на работници кои поддржуваат имплементација на роботски системи за производство бидејќи повеќето веруваат дека ќе им ја „земат“ работата. Од таа причина, во последните години се ажурираше прашањето за информирање на работниците со новите технологии кои работат со вештачка интелигенција, со цел да се неутрализира стравот од непознатото. Вештачката интелигенција се усовршува за да се обезбеди комплементарност на производствените процеси за да се подобри продуктивноста и, на крајот, да се зголеми профитот. Оние работни места кои ќе бидат затворени и заменети со роботизација и воведување на вештачка интелигенција всушност ќе генерираат нови работни места кои треба да се пополнат со работници преку нивна преквалификација и преквалификација, бидејќи машините и вештачката интелигенција сè уште треба да се управуваат од човечки фактор.

Во овој труд ќе ја истражиме ситуацијата за нивото на дигитализација, имплементацијата на ВИ (вештачка интелигенција) во различни полиња на работа и како овој процес ја негува дигиталната работна сила, кои се вештините на претставниците на работниците за управување со информации, дигитализација, Управување со ВИ (вештачка интелигенција), како и креирање на кадровска стратегија и нејзина имплементација во компанијата.

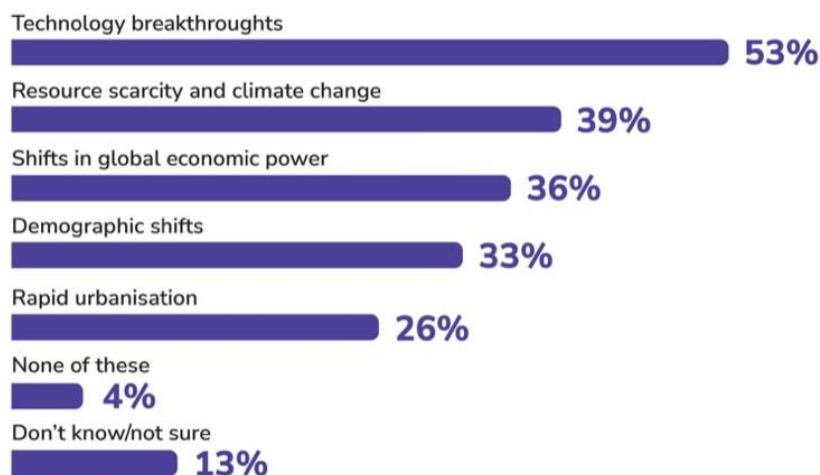
Клучни зборови: вештачка интелигенција, работна сила, дигитализација

Област: Општествени науки

1. INTRODUCTION

The process of digitalization is overtaking the workplace, as more companies are seeing the benefits of virtualization of processes and tasks. Other companies are going even further, by introducing automation technologies and artificial intelligence, either to optimize or completely replace the human element in the workplace. These trends are expected to continue to rise in the near future, especially considering the driving forces at hand, better illustrated in figure

Figure 1. Driving forces behind digital transformation in the workplace



Source: PwC, 2022

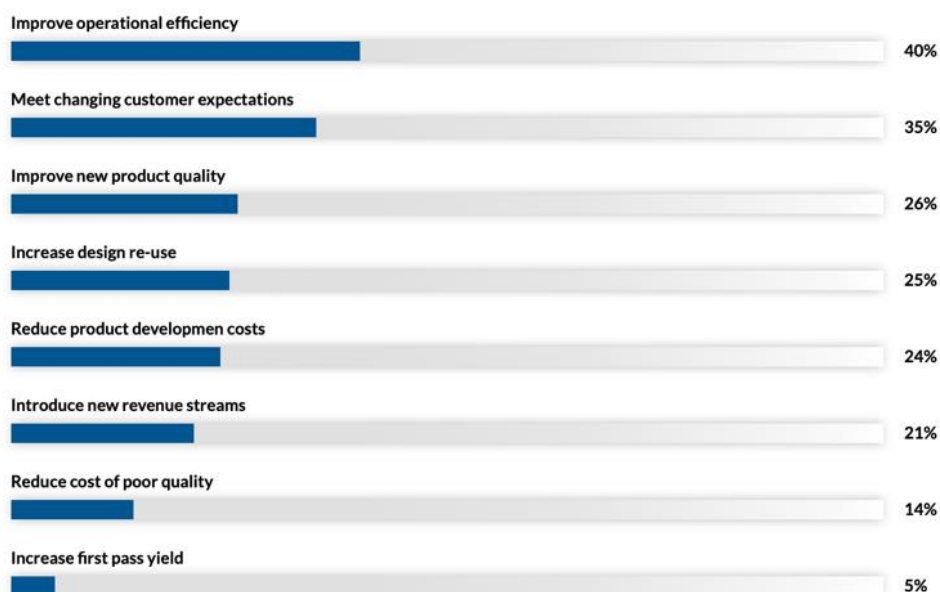
The biggest driving force of digital transformation in the workplace are technology breakthroughs (53% of respondents), followed by resource scarcity and climate change (39%) and shifts in global economic power (39%). One of the more prominent technological breakthroughs is artificial intelligence, a major contributor in workforce automatization, especially in production-oriented companies and factories. Additionally, the demographic shifts contribute to younger workforce (Generation Z and Generation Alpha), keener to using digital tools and platforms, making the digitalization of processes and tasks an easier implementation with little to no organizational resistance. The incoming changes of digital transformation are attractive for employers, however they can be frightening to workers who might feel threatened that parts of their jobs are being replaced, as well as have to learn new skills and tools in their ordinary work environment. The workers' representatives must be enabled to participate in the processes in order to protect the workers they represent and must do so by activating all the channels they have available. It should however be noted that it is not always possible to perform one's role to the fullest, in the absence of stringent regulations and/or sanctions that can be imposed in the event of failure to comply with the provisions of the regulations. It should understand, in fact, where the power of innovation will bring us, which cannot be aimed at the reduction of jobs place, but to offer a better service to the customer and to put employees in the best possible conditions to perform own business with customers.

Advanced developments of digitalization include Artificial Intelligence (AI) in the workplace and especially process automation. AI implementations can be as simple as a chat-bot on a specific webpage (replacing or assisting employees in customer support) to very complex, such as entire production facilities managed completely automatically. There are 2 types of AI programming techniques for business, including NLP (natural language processing) and machine learning. NLP is focused on making computers be able to understand text and spoken words/commands the same way as humans, while machine learning is focused on use of data and algorithms to imitate the way humans learn and operate. Usual AI implementation in the workplace encompasses:

- Machine translation – companies utilizing tools and platforms to quickly translate documents, e-mails and other information to enhance internal and external communication
- Spam detection – one of the oldest implementations of AI and NLP, where text classification enables scanning e-mails and text patterns that could indicate variations of spam and phishing attacks
- Big data processing – AI techniques to analyse large amounts of data and text to determine trends and transform data to valuable information
- Robotics – the most advanced implementation is concerned with manufacturing, where AI is not only software based, but also combined with hardware to assist in physical operations and activities. This can include drones, delivery robots, self driving vehicles and other types of implementations.

It is expected that the global artificial intelligence market to reach \$641.3 billion by 2028 (Fortune Business Insights, 2020), following recent numbers of \$51.08 billion in 2021 (Verified Market Research, 2021), which indicates a CAGR (Compound Annual Growth Rate) of 36.1%. This type of trajectory is predicted based on the increased adoption of cloud computing services, as well as the demand for AI-based virtual assistants – initiated by the fast digitalization processes during the COVID-19 pandemic. Figure 2 shows the employers incentive in introducing digitalization, where operational efficiency and customer satisfaction are cited as the most influential benefits. However, the general objective of this research is to analyze the impact of digitalization on the job quality of public service workers, and the challenges faced by trade unions regarding the increased digitalization of work.

Figure 2. Benefits of digital transformation



Source: Melrose et al., 2020

The research focuses on different public and private sectors, while evaluating the impact of digitalization in several different aspects under job quality and satisfaction. The main aim of the research is to focus and explore how the implementation of digitalization platforms and technologies can improve (and change) the way employees function in their day to day activities, as well as outline the main areas for potential risks, barriers and improvements, including such aspects as working conditions, work organization, working time, health and safety, learning and training, quality of contracts and others.

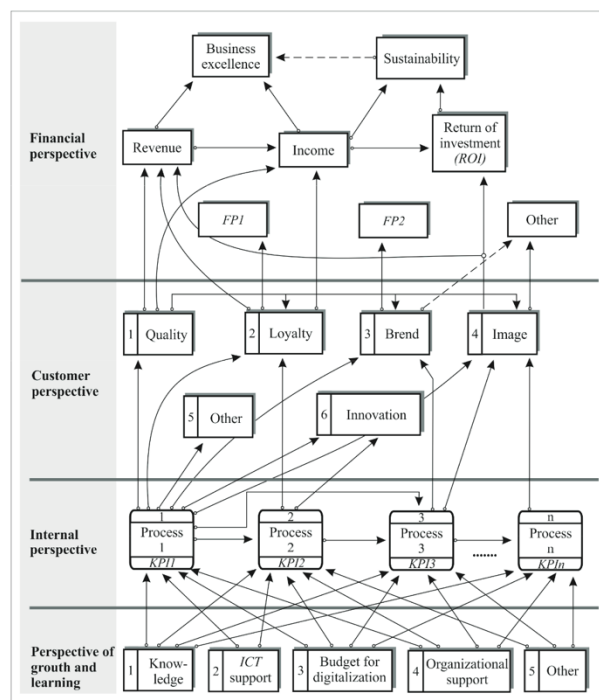
2. MATERIALS AND METHODS

From the material and methods approach in this paper we will emphasize on theoretical research through the analysis of secondary sources of information. Relevant books, academic journals, scientific publications, empirical studies, publicly available statistics, articles from the Internet and other materials relevant to the subject matter will be considered. It will be used the method of induction and deduction to draw conclusions from existing data in the field, such as laws and regulations for trade unions, as well as available statistics on digitalization of the workforce.

3. DIGITALIZATION OF BUSINESS PROCESSES

As part of the called 'Fourth Industrial Revolution', Schwab (2016) emphasizes that digitalization can encompass a range of diverse and complementary technological which can be seen. Digitalization and digital transformation involve different types of technologies, which are at various stages of development. Differences can be seen between digitization (conversion of continuous analog, noisy and smoothly varying information into bits), digitalization (social implications of increases computer assistance, new communication platforms for economy society and culture) and automation (implementation of technology, software and programs to accomplish a procedural outcome with little or no human interference) (Schumacher et al., 2016). Digitalization results in the increased presence and use of connected databases and scheduling tools, in the form of software applications for devices such as computers, tablets or smartphone apps. Figure 3 shows 4 different perspectives on digitalization, including the perspective of growth and learning, internal perspective, customer perspective and financial perspective. This map includes a broad reach of digitalization, however for the purposes of the paper, we will focus on the first two perspective – growth/learning and internal perspective. When implementing digital transformation, companies assess the quality of work (job quality) as one of the main performance and optimization indicators in benchmarking. Job quality can be viewed as a multidimensional concept, which is included in the agendas of different government bodies and international institutions.

Figure 3. BSC map to determine impact of digitalization



Source: Arsovski, 2017

The United Nations and the International Labour Organizations have initiated the agenda on “Decent Work”, which is concerned with improving the job quality and job satisfaction levels of employees (Ghai, 2003). This has resulted in developing a conceptual framework, including different types of indicators based on employment statistics (UNECE, 2015). Some examples include the set of job quality indicators from EC (European Commission) and EMCO (Employment Committee, implemented in the European Employment Strategy framework (European Commission 2014a; Peña-Casas 2009; Davoine et al. 2008). One of the most important aspects is the quality of employment, which is also among the EU objectives as part of the Europe 2020 strategy, although it mostly focuses on the supply side of labour markets instead of job quality aspects (Piasna 2017; Bothfeld and Leschke 2012). Some newer developments, such as e-economy, has led to concerns regarding the sustainability and quality of new jobs created by digitalization (Degryse 2017; Valenduc and Vendramin 2016). Various dimensions of job quality, can be seen as a positive step towards better job quality in the EU according to the European Pillar of Social Rights (EPSR). Organization for Economic Co-operation and Development (OECD) also work on the development of job quality measurement (OECD, 2014). Development of conceptual frameworks are important in approaching the fundamental dimensions of the quality of work. Distinction can be made between two aspects – quality of jobs and quality of employment, but for research purposes we encompass both under “job satisfaction”. Job satisfaction can be measured by intrinsic and extrinsic motivators. Intrinsic motivators are internal, much more difficult to achieve, but also much more powerful and longer lasting, while extrinsic motivators come from the work environment, easier to achieve, but also short-term and less impactful (Reena & Bonjour, 2010). Digitalization can potentially achieve intrinsic motivation, as the digital tools and platforms can lead to easier achievements of goals by individuals, thus improving their immediate job satisfaction and job quality parameters. In the business world, tasks are synchronized and not in isolation, which means they are often combined into particular set of activities which consist a job. Therefore, digitalization has to take into account the process as a whole, instead of digitalizing individual activities which can lead to suboptimal performance and reduced employee satisfaction.

4. IMPACT OF DIGITALIZATION AND AI IN THE WORKPLACE

The implementation of digital technologies in the workplace creates the opportunity for improvements both in the processes performed, as well as the performance of employees at the tasks at hand. There are studies which focus on job substitution with digitalization (Frey & Osborne, 2013), however this approach can create a negative stigma in the workforce and potentially lower the acceptance levels of digitalization. Certain research shows that job risks of digitalization and automation can go as high as 54% (Bowles, 2014) which creates unequal opportunities to replace human workers with machines. The debate is focused on whether automatization can be performed by all tasks at hand, since a human can work a multitude of processes, not all of which can be automated or replaced with machine learning. Initiatives such as AI learning or machine learning can achieve new levels of intelligence which can be honed to replace the workforce and mimic human activities (Wehle, 2017), as well as by further introducing so-called deep learning. Deep learning is seen as a subset or form of machine learning, which utilizes either supervised or unsupervised algorithms, and it has a surge in popularity due to digitalization of processes. By extracting the complex high-level abstractions in deep learning, machine learning can move from a hierarchical learning process to a matrix-style learning approach, tackling several activities, tasks and processes at once. Based on the data obtained, we can differentiate AI digitalization in three subsets:

- **Complete process automatization** – includes the automation of processes from their beginning to end, being completely performed by a machine. Human interaction is limited to interference on improving the process, insert new algorithms or step in when problems/malfunctions occur
- **Partial process automation** – limited approach when only parts of the process are automated with either AI or machine learning, while other tasks are performed by individuals. The majority of digitalization process in companies (except production facilities) are implemented as a partial process automation.
- **AI decision making** – except operational activities, AI (and especially deep learning) can be implemented as either a support system or autonomous decision making system in companies. Examples of such implementations can be inclusion in DSS systems or warehouse systems for various tasks (reordering, optimal quantity and other)

In current literature, there are varying opinions on the scale of these types of digitalizations, as they are analyzing jobs as a simple (operational) task, instead of a system which includes different types of tasks, activities and decisions, as well as a combination of skills and knowledge. One examples are jobs including activities such as

face-to-face interactions, which are less likely to be replaced by automated systems (Arntz et al., 2016). Since jobs are increasingly required to have a combination of various skills (intellectual, physical, social etc), they cannot be easily replaced or complemented by digital technology.

Another subject that needs to be tackled is the correlation of digitalization and improvements in performance. This is a complex topic which can also lead to various opinions, such as digitalization leading to higher marginal productivity since the workforce is replaced by machines, leading vacant workers to allocate their skills in non-routine jobs (Keister and Lewandowski, 2016). Other studies show that digitalization leads to higher productivity, in turn leading to higher wages and lower working hours (Munoz de Bustillo et al., 2017), as well as reducing wage inequality. On the other side of the claims, we can note that digitalization can be effective along with organizational change (Valenduc and Vendramin, 2016), and also having to take into account the organizational restrictions and barriers when implementing digitalization activities. Technology benefits can also be overestimated, as the specific impact of a certain technology in a company depends on various factors for each implementation scenario. In more general terms, it is easier to automate lower-skilled jobs involving operational activities, compared to higher-skilled jobs which include decision-making processes that are more difficult to replicate. This creates a wage gap based on skills, which is typical for labour markets in developed and less developed countries (de Groen et al., 2017). Digitalization is expected to deepen the differences in wages, as the low-skilled tasks can be easily replaced through digitalization, creating less incentive for companies to invest in these types of employees on their payroll. In turn, this leads to lesser demand for entry-level jobs (Berger and Frey, 2016), reducing the opportunities for low-skilled workers to find jobs and eventually upgrade their skills (Arntz et al., 2016). As the levels of digitalization increases, there is a higher need for qualifications and skills for human-based open positions, since lower skill-levels can be replaced by either machines or AI (de Groen et al., 2017). Studies from the European Commission state that information technology can increase the speed and efficiency of jobs and task completion, as well as replace manual labor (ECORYS and Danish Technological Institute, 2016).

CONCLUSIONS

As was mentioned before this research examines the topic of digitalization of both the workforce and the workplace, with various degrees of impact of positive and negative consequences as the implementation continues. Based on the literature research it can be concluded that the job market has become competitive and new technologies have helped this situation. Each organization has to make room for people to grow and feel like they are part of the team. Managers, executives, team leaders must curate and create a digital experience for their employees, or they will be frustrated and perceive the company to be disorganized. A possible solution to this problem can be supportive digital culture which allows team members to feel connected and included even if they are spread out across the country of globe. Usage of digital tools and AI can help this process. At the market there are wide range of enterprise-wide digital collaboration tools.

It is important in each organization presence of innovation clusters/hubs that support innovation is an important enabling factor for the implementation of digitisation in the workplace. Those people/clusters/hubs are responsible to raise awareness about the opportunities that digitisation technologies which can provide future benefit for the organization.

For future better understanding and implementation of new technologies and AI at work public support in the form of advice, funding is important. By this easily can be identified skills gaps and assist with key measures that need to be met. This is important because different areas of work force that are impacted by the most of new technologies. The different areas across the board impacted by new technologies are those where AI also Internet of Things (IoT) are implemented, also we cannot forget virtual and augmented reality (VR/AR) Public support in the form of funding, incentives and advice can help companies and smaller businesses with fewer resources to identify skills gaps and assist with measures to meet the skills required for digitisation technologies

At the end we cannot forget the social dialogue and governmental institution which are playing a critical role in digitisation at the workplace at many different levels, but at the company level, the management is responsible to encourage greater acceptance by employees of new technologies and digitalization of work place.

REFERENCES

- Arntz, M., T. Gregory and U. Zierahn (2016), "The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis", OECD Social, Employment and Migration Working Papers, No. 189, OECD Publishing, Paris
- Autor D., (2015), Why Are There Still So Many Jobs? The History and Future of Workplace Automation, JOURNAL OF ECONOMIC PERSPECTIVES, VOL. 29, NO. 3, SUMMER 2015

- Black S., Spitz Oener A., (2007), Explaining Women's Success: Technological Change and the Skill Content of Women's Work, Working paper
- Bothfeld S., Leschke J., (2012). 'More and Better Jobs': Is Quality of Work Still an Issue - and Was It Ever?, Transfer: European review of Labour and Research, vol 18, issue 3
- Bowles S., Loury G., Sethi R., (2014), Group Inequality, Journal of the European Economic Association, vol. 12, iss. 1
- Davoine L., Erhel C., Guergoat-Lariviere M., (2008). Monitoring Quality in Work: European Employment Strategy indicators and Beyond, International Labour Review 147 (2-3)
- De Groen W., Kilhofer Z., Lenaerts K., Mandl I., (2018). Employment and Working Conditions of Selected Types of Platform Work, Working paper
- De Bustillo R., Macias E., Anton J., Esteve F., (2011). E Pluribus Unum? A Critical Survey of Job Quality Indicators, Socio-Economic Review 9(3):447-475
- Degryse C., (2017). Shaping the World of Work in the Digital Economy, SSRN Electronic Journal, vol 7
- Forde C., Stuart M., Joyce S., Carson C., The Social Protection of Workers in the Platform Economy, DIRECTORATE GENERAL FOR INTERNAL POLICIES POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY, European Parliament, Brussels, project Social protection of workers in the on-demand economy
- Frey C., Osborne M., (2013), The future of employment: How susceptible are jobs to computerization?, Oxford Martin Programme on Technology and Management
- Ghai D., (2003). Decent Work: Concept and Indicators, International Labour Review, vol. 142, no.2
- Guillen A., Dahl S., (2009). Tensions between Quality and Quantity of Jobs in the European Union, in book: Quality of Work In the European Union. Concept, Data and Debates from a Transnational Perspective Chapter: 1 Publisher: P.I.E. Lang
- Keister R., Lewandowski P., (2017), A routine transition in the digital era? The rise of routine work in Central and Eastern Europe, Transfer: European Review of Labour and Research, vol. 23, iss. 3
- Leschke J., Watt A., Finn M., (2008), Putting a Number on Job Quality? Constructing a European Job Quality Index, working paper
- Munoz de Bustillo R., Grande R., Macias E., (2016), Innovation and job quality. An initial exploration, QUINNE Working Paper WP5-1-2016 Version: 2
- Melrose C., Leeder N., Immerman D., (2021). State of Industrial Digital Transformation, PTC whitepaper available at <https://www.ptc.com/en/resources/iiot/white-paper/state-of-industrial-digital-transformation>
- Pena-Casas R., (2009). More and better jobs: conceptual framework and monitoring indicators of quality of work and employment in the EU policy arena, PUDIScope, University of Edinburgh
- Peterson S., (2017). Four steps to leading diverse teams effectively, London Business School Review, vol. 27, iss. 3
- Piasna A., (2017). "Bad Jobs" recovery? European Job Quality index 2005-2015, Working paper
- Valenduc G., Vendramin P., (2017), Digitalisation, between disruption and evolution, Transfer: European Review of Labour and Research, vol. 23, iss. 2
- Rasnaca Z., (2017). First or one among equals? : the CJEU and the construction of EU social policy, PhD Thesis, European University Institute
- Schwab K., (2016). 4th Industrial Revolution, World Economic Forum
- PwC (2022). The future of work: A Journey to 2022, <https://www.pwc.com/ee/et/publications/pub/future-of-work-report.pdf>
- Schumacher A., Sihn W., Erol S., (2016). Automation, digitization and digitalization and their implications for manufacturing processes, Innovation and Sustainability International Scientific Conference, Sustainable Innovative Solutions 2nd Edition
- Arsovski Z., (2017). Digitalization of Business Processes from Aspects of Sustainability and Excellence in Value Chains, Conference: 22th International Scientific Conference Strategic Management and Decision Support Systems in Strategic Management At: Faculty of Economics Subotica, University of Novi Sad
- Reena B., Bonjour R., (2010), Motivation: Extrinsic and Intrinsic, Language in India: Strength for Today, vol. 10, issue 2
- Wehle H., (2017), Machine Learning, Deep Learning, and AI: What's the Difference?, Conference Data Scientist Innovation Day

Internet sources:

https://unece.org/fileadmin/DAM/stats/documents/sustainable_development/2013/Country_comments_and_reactions.pdf (accessed on 16.05.2022)

https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_099406/lang--en/index.htm (accessed on 15.06.2022)

<https://op.europa.eu/en/publication-detail/-/publication/c0468264-71b5-4223-aea3-1ad83005e9f1> (accessed on 11.08.2022)

<https://www.voced.edu.au/content/ngv%3A76714> (accessed on 28.08.2022)

<https://www.fortunebusinessinsights.com/factory-automation-industry> (accessed on 28.08.2022)