

Human Capital in the Changing Work Environment of Industry 4.0

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Abstract. The analysis of surveys conducted in Bulgarian companies proves that the quantity and quality of human capital to the greatest extent determine the long-term potential for sustainable organizational development. Aware of the need for investment in human capital, more and more company leaders and managers are focused on creating value for their business through training and development of their employees; building knowledge, skills, competences and motivational attitudes towards the changing working environment in Industry 4.0. The article examines flexible forms of work and creative approaches to increasing the satisfaction and engagement of employees in the implementation of strategic company goals.

Keywords: changing working environment, Industry 4.0, human capital, flexible forms of work.

INTRODUCTION

Industry 4.0 completely transforms the production processes and has an impact on the world economy and politics, as well as on society and the individual - a carrier of capital and the most important resource for each company. Knowledge, intelligence and the quality of human resources have long become decisive forces for the prosperity of any nation.

In digital transformation, human capital is the core of any organization and business for the creation of value. Human capital is a system of competencies - knowledge, skills, qualities and attitudes to work (inherent in the workforce) that are driving forces for the creation of economic, social and personal well-being, through higher productivity and quality of performance and through the achievement of the strategic goals of the organization. Due to the specifics of human capital, resulting from the personal characteristics of each individual person in the organization, it is difficult to measure and therefore - the most difficult to manage. It is created and managed in a dynamic, highly competitive business environment and is

influenced by a variety of critical factors. The growing interest in human capital can be explained by the change in the understanding of economic development factors.

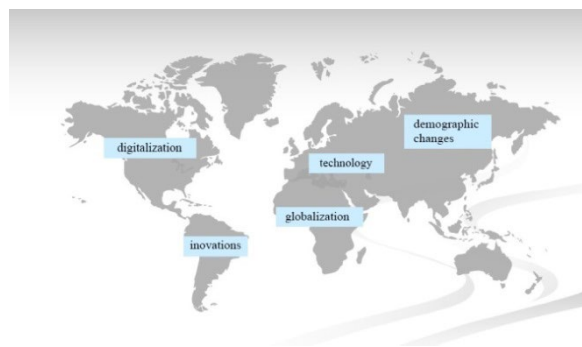


Fig.1. Major factors changing the work environment.

Globalization, changing economic and social conditions, the introduction of innovative digital technologies are some of the factors requiring the need for changes and restructuring of labor markets. Flexicurity is a holistic approach to labour market policy that provides workers with secure jobs the opportunity to quickly find new ones. Flexibility implies a smooth transition of workers to rapidly changing working conditions. Flexibility and security go hand in hand. They are aimed not only at employed persons, but also at the restructuring of the labor process in the organizations themselves. Flexible forms of employment enable the employer to reduce the costs associated with the cost of labor. It is also aimed at employees, who have the opportunity to improve knowledge and competences by combining their duties in other areas. The second factor is social security, guaranteeing a dignified existence, justice and solidarity for all participants in the labour markets.

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EXPOSITION

The aim of the entire European Community is to promote partnership and unity among all EU member states. Synergies, the implementation of an integrated labour policy, joint cooperation, solidarity and the development of flexible forms of employment are certainly the way to smart and sustainable growth for all European countries.

We live in a digital world where we do everything virtual, unlimited and everywhere (the new normal). Workers, firms and governments accumulate new comparative advantages in changing conditions. High-tech equipment and process robotization are changing business models and management approaches.

American futurist Alvin Toffler writes: "Today's market, technology and consumers need rapid change and in so many different ways they exert pressure on the company that the bureaucratic uniform is becoming obsolete. Since markets are constantly changing, location is less important than mobility and flexibility."

The quantity and quality of human capital determine to the greatest extent the long-term development potential of the individual, company or country. This was true as early as the 18th century, when the Scottish economist Adam Smith concluded that: "The acquisition of... Talents during... education, training or apprenticeship is a real cost that represents an invested capital in an individual. These talents are part of his well-being, and the same is true of the welfare of society." This continues to be true today.

The development of socio-behavioral, so-called. "soft" skills, such as the ability to work in a team, empathy, resolve conflicts and improve relationships, increases the human capital of the individual. Globalized and automated economies place a higher value on human capabilities that cannot be fully mimicked by machines. Abilities such as persistence in difficult situations have economic benefits that are often as great as those associated with cognitive skills.

The main objective of the article is reduced to justifying the need to invest in people, their acquisition of new knowledge and skills, lifelong learning, as factors that lead to economic and social progress. Flexible forms of work and creative approaches to increasing the satisfaction and engagement of employees in the implementation of strategic company goals are discussed.

Methodology: The method of content analysis of sources from the scientific field in which the study is positioned is used. A secondary analysis of the results of sociological surveys in the problem area is made. Specific case studies from social practice are analyzed. An empirical study has been conducted with the means provided by the Internet. The results of studies in Bulgarian companies prove that the quantity and quality of human capital to the greatest extent determine the long-term potential for sustainable organizational development.

Bulgarian companies and institutions are part of the global world. That is why the survey pays attention to the self-assessment of each respondent for their creative

potential and tolerance. They are convinced that organizations can achieve competitiveness in this world now, in the era of the fourth industrial revolution, provided that management teams activate their creative capital.

Particular attention is paid to the role of the environment. The summary of the examples given leads to the finding that creative places are open, tolerant of different ones and this makes them a crossroads of ideas. By breaking down barriers between different cultures, this environment becomes the epicenter of creativity and combining existing concepts into a huge number of unfamiliar ideas.

The transformation is provoked by the advent of the digital age, online platforms and fast-growing companies. The change on a global scale does not bypass the business in Bulgaria. The HR specialist is no longer just an employee of the Personnel and Labor Relations Department, but a person who helps both to achieve the company's goals and to provide a better working atmosphere for employees.

Automation through technology and robots will increase productivity and wealth and create many new opportunities for people with the right skills. People will be able instead of focusing on "tasks" identified as work, to focus on the work that makes the world a better place to live. The surveyed organizations recognize that they need to develop the digital literacy of their staff, to engage in time to respond adequately to the needs of their customers. Digital literacy enables the human resource in the organization to add value to the customer and become human capital, which is the bearer of the competitiveness of the organization in the conditions of the fourth industrial revolution. It complements material capital in the production process and makes an important contribution to technological innovation and long-term growth.

Human capital can be referred to as the value that is added to a company by an employee, which can be measured by his skills and competences. Human capital can be developed in many ways to obtain the highest economic value for the organization. The activities related to human capital formation are very diverse and include educational initiatives and self-initiatives at different levels: health, investment in geographical mobility, as well as the formation of relevant attitudes and motivation in personal and social terms.

Leaders can learn a lot about ways of communicating in business if they learn how to communicate with horses. More and more organisations in the UK are sending their managers to horse communication courses to learn to overcome business challenges, improve their performance and, of course, hone their leadership skills. The art of communicating with horses is the ability to communicate with horses in their own language, using nonverbal communication and body language. Since each horse has its own personal individuality, it is easy to make a connection between communicating with them and communicating with people, especially given the fact that the most human communication is nonverbal. According

to scientific research, only 7% of any message is conveyed through actual words, and 93% is nonverbal communication – facial expression, posture and tone. Understanding between a person and a horse is mutual respect, and achieving it can also improve the way leaders communicate with people. Working with horses can help leaders step out of their comfort zone and teach them valuable management skills in a creative and memorable way. Many managers have never approached a horse or attempted to communicate with these animals, and by learning how to do so, they also gain the ability to connect with people and have more influence as leaders.



Fig. 2. Leadership lessons with horses. [6]

The changing nature of work requires a set of skills that improve the adaptability of workers by allowing them to easily transfer from one job to another. Authors of publications in various scientific disciplines [1,2,4] as well as employers consistently indicate that they value higher-order cognitive (technical) skills and social-behavioral skills the most. In this new work environment, continuous learning is required; creativity; skills to solve unexpected problems and situations; responsibility for one's own quality and quantity of performance of work duties; changing knowledge in the field of human capital management. In a survey of industrial Bulgarian companies with business leaders and employees, the necessary skills to work in today's conditions of increasing digitalization were arranged, illustrated in Fig. 3:

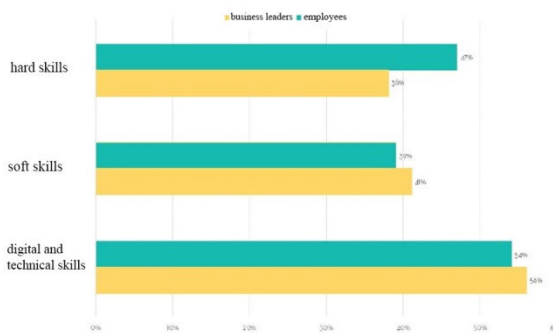


Fig. 3. The importance of skills according to employees and business leaders.

Effectively managing the collaboration between humans and artificial intelligence is a new challenge for management teams. The fourth industrial revolution, which is characterized by a fusion of technologies from the physical, digital and biological spheres, is changing the structure of the traditional labor market, increasing the demand for engineers, computer scientists and new unknown or little-known professions.

One of the main bridges between the physical and digital worlds today is the "Internet of Things" using connected technologies and different platforms. In in-depth interviews with functional and strategic managers of industrial Bulgarian companies, they find that technological platforms lower the barriers that people and companies must overcome to create material goods, changing the personal and professional work environment. Operations managers point out that digital platforms significantly reduce the cost of closing barriers. On the other hand, respondents share the concern that technology will eliminate some jobs, leading to an increase in unemployment. Examples often given as arguments are that robots are already entering the service sector, that airplanes and cars can be created by 3-D printers, and that nanotechnology and artificial intelligence are affecting more and more industries.

While it is true that technology will have a disruptive impact on the workforce as we know it today, it will not eliminate it, but rather change the spectrum of skills needed. Demand for more basic skills that can be replaced by technology is declining. At the same time, there is a growing demand for high cognitive skills, socio-behavioral skills and combinations of skills associated with greater adaptability. Rapidly developing industrial technologies and the integration of artificial intelligence require adaptability of management capacity and flexible digital literacy of personnel.

In Industry 5.0 people and machines will need to interact as harmoniously as possible to remain competitive and adapt to the new way of working. At the same time, human resources are increasingly confused and fearful about their future and often change jobs in search of security. The expression "no people" will take on a new and even more terrifying meaning in the next few years, and organizations will undergo major changes, while the question arises of what company managements can do to retain and motivate people on the team for the realization of these inevitable changes. To be designers of new processes, we must learn to see the human side of change and how to manage change as a structured process in which the human is the key factor in making effective and flexible solutions. CEOs in Bulgaria face 3 main challenges in recruiting: finding the right people for the right technology so that the business wins; to find and develop employees with the right set of skills and to respond to the differences in motivation and way of working characteristic of the representatives of the Millennials generation.

It turns out that business managers value the skills that cannot be reproduced by machines, such as problem

solving, collaboration, adaptability, emotional intelligence. The ten most necessary skills for success in the workplace in response to global change in the coming years will be [7]:

- creativity related to a new way of thinking in the changing work environment;
- emotional intelligence, distinguishing productive human relations with empathy and commitment to results and good working relations;
- analytical/critical thinking as a requirement for proactive behavior in conditions of dynamic change;
- active learning and attitude for continuous development with learning from mistakes, active experimentation for better results;
- skills for evaluating situations and more complex tasks, requiring the ability to evaluate and make independent decisions;
- effective interpersonal communication;
- leadership skills to provide opportunities, support and engage people to develop their potential for good results at work;
- understanding and skills for working in an environment of cultural and personal differences;
- technological skills;
- willingness to work and commitment in conditions of continuous change, leadership, creativity and innovation.

The development of the already popular "soft skills" and leadership, including emotional intelligence, problem solving, teamwork and communication, creativity are increasingly important as a weight in the selection or promotion of an employee, as they are rarely cultivated in the family or the university, and at the same time require a long time and effort to be well developed. It is precisely these skills that technology cannot reproduce on its own, which makes them even more highly valued.

In recent years, the problem of staff recruitment and staff qualification has seriously worsened. According to employers, the majority of candidates do not have qualifications that meet the requirements of the development of the modern economy and technology. The age aspect is striking - older workers and employees are diligent and responsible, but with outdated knowledge and skills. Young people can be said to have knowledge and skills at a modern level, but they are not so motivated and demand high salaries without having the necessary experience.

Industry 4.0 gives us the opportunity to rethink the concepts of working-age population, retirement and individual life planning. New technologies are fundamentally changing the nature of work in all industries and professions [5]. The results of a survey conducted among Bulgarian companies from 10 industries show that 54% of workers performing routine and repetitive operations are exposed to risk as a result of the digital automation of production processes. The survey participants believe that in the next 3-4 years, the skills to solve complex cases and knowledge of systems will be much more in demand than physical abilities.

Only 38% of the surveyed managers indicate that the strategies they use are able to implement the upcoming changes in the organizations, ensuring their sustainable development. The majority of HR managers in the surveyed companies believe that the quality of working life and flexible working hours should be improved. More and more employers are using a "human cloud" populated by people performing specific work tasks from different locations around the world. For cloud workers, the benefits are greater job satisfaction, less stress, mobility and freedom. The challenge remains for business owners to discover new forms of social and labor contracts that respond to the changing work environment and nature of work.

Digital transformation places new demands on the quantitative and qualitative characteristics of human resources, their effective management and development. Based on the systematization of the scientific discussion on a global scale, two groups of researchers are forming, which discuss the impacts of the Fourth Industrial Revolution in the field of work. According to the first group, the consequences are reduced employment, increased inequality and economic instability. Automation, artificial intelligence, and other technological inventions are no longer only affecting uneducated, low-wage workers. Robots will be able to perform jobs that require significant qualifications and education.

Another group of authors is optimistic - the studies of the OECD, McKinsey Global Institute, Boston Consulting Group, etc., show that new digital technologies will lead to the enrichment of jobs and the creation of new ones, to a higher decentralization of decision-making and planning, transparency of business processes and improvement of social services. Digital innovations have important impacts on the way human resources participate and add value in many industrial value chains. The need for human labor is reduced, workplaces are reorganized, the dynamics of business processes and communications are changing. The accelerated pace of change requires a new management of organizations, with a reassessment of corporate culture, strategy and structure.

Many Bulgarian developments are aimed at the importance and necessity of developing non-standard forms of employment, combined with certainty for the achievement of modern, competitive labor markets, leading to economic growth and a successful market economy. According to the EC, flexicurity can be defined as an integrated strategy for simultaneously increasing flexibility and security in the labor market. Flexible employment in most European countries is mainly defined in the following categories:

- Part-time: this type of employment is when the worker is employed full-time and any reduction in his working hours is considered part-time;
- Term-time working: the employee remains at a permanent job, but can use paid/unpaid leave during the school holidays;
- Jobsharing: a type of flexible form of employment when two (or sometimes more) people share common responsibility for a given type of work;

- Floating working hours: it enables employees to choose, within limits set by the employer, how long their working day should be;
- Compressed working week (fortnights): The essence of this type of employment is the redistribution of working time into smaller but longer blocks during the week. – Working from home on a regular basis: full-time employees performing their work duties from home;
- Mobile work / remote work: In this type of employment, employees can work remotely from the organization's workplace, throughout the week or during most of it;
- Career break: this is the so-called creative leave, aimed at extended periods of leave – usually unpaid within one to five years.

A large number of processes related to HRM are being digitized. A significant part of the day-to-day administrative tasks of personnel management are supported by digital tools. This makes it possible literally in fractions of a second to perform complex operations based on the analysis of multiple factors. A variety of statements and reports are prepared; vacations are planned; salaries are managed; career development is tracked, etc. In some organizations, many training materials have been prepared in digital format - for example, for initial training when introducing a new employee into the work process. Virtual trainings help unify the information provided for every employee in the company, regardless of location. Industry 4.0 changes both the outside of companies and the way they look from the inside. Many institutions are renovating old buildings in accordance with technological and cultural changes. New ideas and alternative perspectives are accepted within the organization. The changes are not only on the surface. To rapidly innovate, companies are introducing new organizational designs based on cross-functional teams, a structure borrowed from digital companies [3].

As technology advances, the human part of the job will become increasingly important. Full-timers will gradually be replaced by temporary workers or cross-functional teams as the main source of talent. Smart offices will become their main priority. The trends are aimed at shaping open and shared workspaces, allowing free movement of people and information.

The understanding of a workplace is changing. Often teams are virtual. A new way of looking at workforce mobility. These and other changes related to globalization require a new way of thinking and new solutions from HR professionals.

Creative people have always been one of the most mobile groups in the workforce and this mobility trend is now being transferred to the business world as a whole. Regardless of the work industry, professional life is becoming more nomadic, digital and flexible in a green office, helping to organize remote work, teambuilding or outsourced work week for the whole team in nature.

Today, Coworking Bansko extends to four different locations in the city, and the number of members exceeds 100 per month. There they get everything to work well and have an even better time. The mountain town is imperceptibly turning into one of the main hubs for digital nomads.

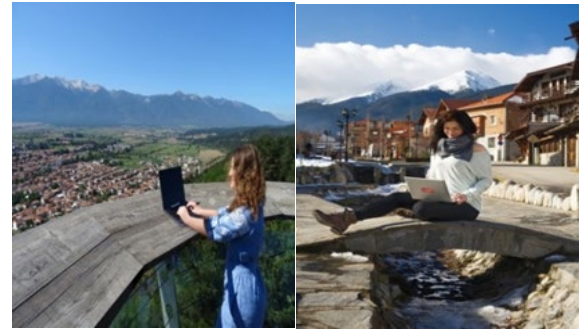


Fig. 4. Shared workspace for digital nomads in Bansko.

The growing need for greater flexibility in the workplace is driving more and more large companies to use shared workspaces. Together with startups, they aim to keep up with new developments, to discover emerging trends and new opportunities for selling services. According to the forecasts of the World Economic Forum, by 2030 self-employed workers or so-called will make up 80% of the workforce.

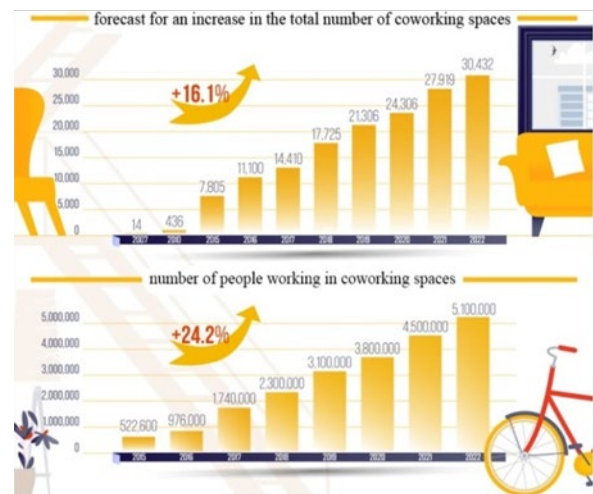


Fig. 5. Coworking spaces.

The lobby is the most suitable area in the hotel to be transformed into a shared workspace. Such an initiative could bring additional revenue to hoteliers in traditionally lean periods and attract people looking for comfortable furniture, fast free Wi-Fi, electrical outlets and ready-to-eat food and drinks. At NEST, Dubai's Tryp by Wyndham co-working space, those who pay a monthly "rent" can use the hotel's gym, swimming pool and have unlimited coffee - all while working alongside colleagues from around the world in a designer and comfortable environment.



Fig. 6. New concept for hotel lobby.

Globalization (including the diminishing importance of geographic location) is leading to the creation of multinational (and multicultural) teams and companies. For these entities to function effectively, corporate culture plays a key role. The HR specialist has a key role in building, maintaining and developing the desired corporate culture – he is its carrier, ambassador of its values and mission. What has been said can be summarized as follows:

- New software technologies (payroll, wages, vacations, career)
- AI; chat bots for recruitment, etc.; virtual trainings; digital portals – for example for introducing new employees; to introduce procedures and policies, etc.
- Tasks at a strategic level (eg strategic partner on the Board of Directors).
- Management of succession and development processes.
- Engagement – formation, maintenance, development.
- Programs for organizational well-being and satisfaction; resistance to stress.
- Managing multicultural communities.
- Balance – professional – personal life.
- Change management; agents of change.
- Perceiving the organization and managing the experience.
- Talent management.

"Factory 4.0" provides an overview of the firm as an interconnected global system at the microeconomic level. Figure 3 depicts some of the key factors: outside the factory we see "Logistics Network 4.0", the resources of the future, new customer requirements and the means to achieve them. Inside the factory, we imagine new production technologies, new materials and new ways of storing, processing and exchanging data.

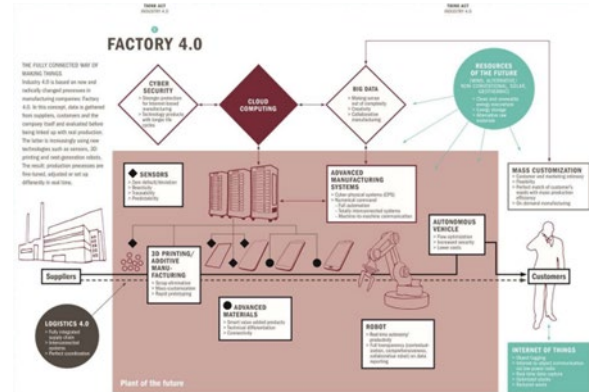


Fig. 7. General view of a smart factory.

The connected worker has a mobile hub that collects the sensor data received from the wearable devices the worker wears. These wearable sensors include various solutions, providing sensory concentration combined with pattern detection technologies in processing the data stream.



Fig. 8. Connected Worker Concept.

In many countries such as the UK, the government is pushing changes and pushing policies to encourage companies to use smart devices. In addition to smart factories, there are already cities that have taken the first steps to become "smart cities" - with smart traffic and public transport, lighting, roads and regulation, buildings and parks that are connected in a harmonious system and interact with each other, creating an environment that is both responsive to people's needs and energy efficient.



Fig. 9. Smart cities.

RESULTS AND DISCUSSION

The analysis of the results and the implementation of the good practices in the business can lead to changes in the used business model. In this way, the value of the labor input is increased and a higher return is realized. This helps to implement optimization processes, such as the use of artificial intelligence for uniform procedures and activities.

The research carried out in the industrial sector of Bulgaria gives grounds to summarize the conditions for achieving economic and social progress in the changing working environment:

- investments in human resources;
- their acquisition of new knowledge and skills;
- lifelong learning.

The activities related to the formation of human capital are:

- educational initiatives and self-initiatives at different levels;
- investments in geographic mobility;
- formation of relevant attitudes and motivation in personal and social terms.

Developing a strategy in line with company goals and objectives is imperative. This poses the main question not only about the new role of the manager related to the management of human resources, but also about the implementation of new processes - artificial intelligence, monetary value measurement of the results of the work and its impact on the profitability of the company. All this could be achieved through the development of a single strategy meeting the company's goals.

Complex knowledge, which requires knowledge of programming in different languages, will be increasingly required. The emergence of new positions such as big database analyst and people with scientific knowledge using big databases.

CONCLUSION

Today, with the advent of robotization and automation, taking away jobs, new digital technologies creating a virtual space, every aspect of life is changing. Variants of collaborative partner production are emerging, finding expression in significant projects without traditional hierarchical organization.

The future belongs to those organizations that realize their role in building, maintaining and developing effective interpersonal relationships in work teams. Company leaders should invest in human capital, minimize the reasons for leaving creative employees and increase the factors that increase their satisfaction and motivation to stay and develop. For successful and competitive business organizations, the use of human capital is a major factor of long-term importance, not a means of short-term exploitation and maximum profit.

More and more decisions in the changing work environment are made with the help of algorithms underlying many automated production processes and systems. They generate new forms of social and economic relationships in our increasingly digital world.

REFERENCES

- [1] Naydenov, P., Integrated system for logistics management, Conf. Proceedings of 6th International conference "Economics and management – based on new technologies", EMoNT 2016, Vrnjacka Banja, Serbia, 16-19 June 2016, ISBN: 978-86-6075-059-6.
- [2] Petrova D., Analysis of SMEs in Bulgaria – Assessment of Their Innovation Activities, Rezekne 2013, Latvia, Rezekne Higher Education Institution, Faculty of Engineering, Scientific Institute for Regional Studies, Environment. Technology. Resources, Proceedings of the 9th International Scientific and Practical Conference June 20-22, 2013, Volume 3, ISSN 1691-5402: 46-49.
- [3] Petrova, D., Intelligent, Innovative and Sustainable Industry in Bulgaria – prospects and challenges, Vide I. Tehnologija. Resursi - Environment, Technology, Resources, Proceeding of the 12th International Scientific and Practical Conference „Environment. Technology. Resources“, June 20-22, 2019, Rezekne, Latvia, Volume I, ISSN 1691-5402 – print, ISSN 2256-070X – online.
- [4] Totev, H., The deplorable state of the Bulgarian economy requires urgent measures for its modernization, but creates enormous difficulties for the investment process, Conf. Proceedings of 4th International conference "Economics and management – based on new technologies", EMoNT 2014, Vrnjacka Banja, Serbia, 12-15 June 2014, ISBN: 978-86-6075-045-9.
- [5] Schwab, Klaus, The fourth industrial revolution, by World Economic Forum, 2016.
- [6] Leadership lessons with horses. [Online]. Available: <https://www.trainingjournal.com/> [Accessed: February 9, 2023].
- [7] The 10 Vital Skills You Will Need For The Future Of Work [Online]. Available: <https://bernardmarr.com/> [Accessed: February 17, 2023].