

CHANGES IN THE APPLICATION OF METHODS AND TECHNIQUES IN THE IMPLEMENTATION OF MANAGERIAL FUNCTIONS IN THE CONTEXT OF THE IMPACT THE FOURTH INDUSTRIAL REVOLUTION

Assoc. prof. Jankelová N. PhD., MEd Puhovichová D.

Faculty of Business Management – University of Economics in Bratislava, the Slovak Republic

nada.jankelova@gmail.com, diana.puhovichova@gmail.com

Abstract: Tools, which are used while carrying out of the individual managerial functions are constantly evolving and responding to the changes of outer environment. In current conditions the most significant factor, which effects business environment, is Industry 4.0. It is a phenomenon associated mainly with automatization, digitalization and the Internet of Things. The main aim is to identify changes in the application of methods and techniques in carrying out of the individual managerial functions in the context of the impact of the Fourth industrial revolution on the theoretical level, based on a research of available scientific literature. The results of the theoretical research point to the fact that the topic of industry 4.0 is new in the context of management, and the research does not have any influence on the individual managerial functions, which are planning, organizing, controlling, human resources management and leadership. Most of the scientific work focuses on the field planning, organizing and controlling. On the other hand, not mentioned are the functions like human resources management and leadership, within the effects of the Fourth Industrial Revolution on the tools and methods, which are used for the implementation.

Keywords: FOURTH INDUSTRIAL REVOLUTION, TECHNOLOGICAL EVOLUTION, INNOVATION, AUTOMATIZATION, BIG DATA, MANAGEMENT, PLANNING, ORGANIZING, CONTROLLING, HUMAN RESOURCES, LEADERSHIP

1. Introduction

Technological progress at the end of the 18th century caused the introduction of steam or water-powered production machines. It was the period we call the first industrial revolution. The Second Industrial Revolution at the beginning of the 20th century introduced electricity and mass production, which was used to power the machines. The beginnings of the 1970s were groundbreaking in electronics and information technology, which formed the basis for production automation. However, we are now in the midst of the Fourth Industrial Revolution, which is characterized by its exponential pace compared to the linear pace of previous revolutions. The depth and range of the changes indicate the transformation of management and production systems. This is enforced by emerging technological developments, particularly in areas such as autonomous vehicles, the Internet of Things, artificial intelligence, nano-technology, robotics, biotechnology, energy storage, material science, and quantum computing.

Nowadays, technological development and innovation play an important role in every business. This is mainly reflected in increasing of the competitiveness of any kind of a business. It is the fourth industrial revolution, that will lead to possible changes in a number of areas, which will even go beyond the industrial sector. This can be summarized by professor Klaus Schwab, who is the founder of the World Economic Forum. He stated, that there is a need to form a comprehensive and global view of how technology affects human lives, how it transforms economic, social, cultural and human environments. There has never been time for greater hope or greater danger in the past.

2. Industry 4.0

Each one of industrial revolutions has brought advantages and challenges for social-economic status of countries, which got involved in such a transformation. For example, Great Britain led the first industrial revolution, when the first steam engine was invented. The second industrial revolution was mainly caused by the United States with revolution in communication. In the third industrial revolution, the main key factor was the internet. The internet has changed the world economics and we expect, that this transformation will continue with Internet of Things. Industrial revolutions led into economic growth, increased productivity and better life standard. However, the distribution of wealth in the developed countries was not done fairly. Inequality became one of the main challenges as well as climate changes and with other questions of sustainability. The fourth industrial revolution is not a

exception compare with other industrial revolutions, but it is expected, that it will bring huge advantages and many challenges.

Industry 4.0 points to a new phase of industrial revolution, that is mainly focused on connection, automatization, machine learning and Big data in real time. Industry 4.0, sometimes referred to as intelligent production, deals with production and operations with intelligent digital technology, machine learning, so that complex and better interconnected ecosystem for societies could be formed. Even though every company or organization is different, they all face a similar challenge – a need to connect processes, partners, products and people in real time thanks to physical and digital technology.

Growth of new digital industrial technology represents transformation, that enables to collect and analyze information among machines, which causes faster, more flexible and more effective processes for the production of more quality products with low costs. This production revolution increases productivity, strengthens economics, supports industrial growth and changes the profile of manpower. The end result is that it changes competitiveness of companies and regions. It leads to higher competition and it changes the traditional production relationships among suppliers, producers and customers, as well as relationships among people and machines.

The following table 1 shows nine technological trends, which are “building blocks” of Industry 4.0 according to the Boston Consulting Group.

Table 1: Nine technological trends

Technological trend	Description
Big Data and analytics	The collection and comprehensive evaluation of data from many different sources - production facilities and systems, as well as enterprise and customer management systems - will become the standard for real-time decision support.
Autonomous robots	Autonomous robots integrate among people and learn from them. These robots are a cheaper version and have more options than those, who are used in production today.
Simulation	Computer simulations are used to determine the best possible

	design of production and distribution systems.
Horizontal and vertical system integration	Thanks to Industry 4.0 will be companies, departments, functions more cohesive, because universal data integration networks are being developed.
The industrial Internet of Things	The way of connecting machines and people at work. It is a network of a large number of communication technology interconnected devices that leads to systems that enable monitoring, collection, exchange, analysis and valuable new knowledge.
Cybersecurity	With increased connectivity and the use of industry-standard communication protocols, which are connected with Industry 4.0, the need to protect systems and production lines from threats increases dramatically. The result is to ensure safe and reliable communication.
The cloud	Method of storing and accessing data and programs via the internet.
Additive manufacturing	Also known as 3D printing, which is used to produce prototypes and individual components.
Augmented reality	These systems are currently being developed, but their importance is expected to increase in the future. Augmented reality aims to provide real-time information to improve decision-making and workflows.

3. The managerial functions

Under the term management according to Drucker we understand the process of coordinating the activities of workers to achieve results, that cannot be achieved by individual work. Management is therefore a process through which we strive to achieve our goals in an effective and efficient way with the help of basic management functions, which are planning, organizing, controlling, human resources and leadership.

Planning is an essential management function. It deals with the development of the future procedure and decides in advance on the most appropriate steps to achieve the set objectives. It decides in advance what to do, when and how. It overcomes the gap where we are and where we want to be. Organizing is a process based on combining physical, financial and human resources and developing a relationship among resources to achieve organizational goals. The right organizing requires a needed amount of raw materials, tools, capital and people. The main function of controlling is measuring of results according to standards and correction of deviations, in order to ensure achievement of the goals of the organization. The purpose of controlling is to ensure, that all of the activities have been conducted in accordance with standards. Controlling represents preliminary verification, if the steps are being carried out correctly in a such a way to reach a final goal. The human resources are one of the managerial functions, within which the organizational structure is filled. In the last years employment is gaining higher meaning, due to technological progress, increased the size of

companies and complexity of human behavior. The main purpose is to assign a workplace to each of the employees. Leadership is understood as the art. Managers must possess leadership skills, provide people with an attractive vision, be enthusiastic about it, and then acquire them as followers. The purpose is to influence individual attitudes with the aim of achieving the desired behavior to meet the set objectives.

For theoretical purposes, it is advantageous to separate the individual managerial functions, with a purpose of better defining each of them. However, from a practical point of view the managerial functions overlap and interact with each other.

4. Results and discussion

Success of Industry 4.0 is encouraged by innovative ability of the company. In order to be able to call a company "smart", it is needed to obtain sufficient quantity of intelligent human capital, to ensure environment for education and innovation, which requires appropriate managerial approaches. Not enough attention is being dedicated to management. It is needed to realize, that is inevitable to develop abilities for successful managing business models and product portfolio for easier acquirement of potential trades and acquiring of new customers, as well as improving of processes and systems of value string, managing risk and culture. It is clear that the companies will be facing numerous economic, social, technological challenges in the next period, which requires dynamic abilities and innovation of manpower. This is the reason that it is so important to discuss about the ability of the companies to improve their own knowledge, which leads towards innovations, in order to still agree with demands of Industry 4.0. Because of that in the next part of theoretical research we will offer an answer to scientific question, where we will deal the impact of the fourth industrial revolution within each of the managerial functions:

How does the fourth industrial revolution affect each of the managerial functions?

Planning

Industry 4.0 uses "Cyber Physical Systems" (CPS) and "Internet of Things" (IoT) for introducing of technological and human improvements, which in the end result leads to higher productivity, product quality with shorter production time and product price. That is the reason why the demand for the improving of planning becomes primary. Industry 4.0 requires a new way of planning the processes and production, where automatization gets more attention in workplace and data are usually stored on cloud servers. It is expected that, communication among machines will rise more then ever before. The changes raise questions and concerns especially regarding the planning processes: Can planning be fully automated? Is it possible to transform human knowledge into future products?

The role of the software in planning in Industry 4.0 is to effectively deal with concerns and to ensure, that through automatization processes the demands of production with demands of individual suppliers would be overlapped. Software, that automatize different roles within product life cycle, is very much needed in order to increase of effectivity of Industry 4.0. We can say, that the correct demands for the software will represent one of the building pillars of Industry 4.0.

Organizing

In environment of many changes, the organizational structures represent a major role in development of education and innovation. In broad spectrum, companies could have either mechanical or organic design. Mechanical design of company characterized by centralized structure, specific tasks, formality, vertical communication and strict hierarchy. This design is mainly suitable in a stable environment, which is not the case of Industry 4.0. Industry 4.0 is characterized by unstable environment known for decentralization, horizontal communication and team work. Therefore, we consider it an organic design. This design is more suitable for innovative strategies and changing environment. It is suggested, that managers prefer organic design when creating

organizational structure. But there is never clear rule for choosing the design, as each company is different.

In industry 4.0 it is suggested that matrix structure, project teams, flat structure and decentralization are usually used.

Controlling

Within the controlling we could talk about CPS systems. CPS systems represent integration of computing, networking and physical processes, whose main purpose is to control the physical process and via feedback accommodate to changing conditions in real time. In the future CPS systems will become present in all industrial fields and integral part of Industry 4.0. CPS systems will open new production methods, which will become standard of tomorrow's industry. Environment of products will be configured by its own, adjusting and optimizing, which will lead to higher movement, flexibility and cost – effectiveness.

Leadership

Leadership means the ability to impact others and to inspire, motivate and to steer the activities to achieve organizational goals. Leaders could achieve desired goals by choosing the correct way of leadership style. Specialized leadership style should be applied in Industry 4.0, in order to speed up the process of innovation and learning. Most disgusted leadership style in field of innovation and education is transformational leadership style. We could also mention other leadership styles, like authentic style and transactional style. However, the most used is the transformational leadership style. Industry 4.0 needs something more than transformational leadership style, which should be more specific for education and learning. The problem is that, transformational leadership style is based on idealization of impact, inspirational motivation, intellectual stimulation, and vision. Industry 4.0 should mainly focus on knowledge, education and innovation. Therefore, a knowledge-oriented leadership style is required, which we obtain thanks to combination of transformational and transactional leadership style. Because this leadership style is based on knowledge it could make it easier for companies to accelerate the pace of innovation and learning, as well as achieving the compatibility with Industry 4.0.

Human resources

Thanks to human resources could organization formed skills, abilities, behavior and attitude of employees to achieve the goals of companies. The human resources are considered a significant factor to win a competitive advantage in the knowledge economy. In Industry 4.0 managers should mainly focused on supporting innovation and learning in companies, within human resources. In the next part of theoretical research, we will deal with selected field of functions of human resources, in which the impact of Industry 4.0 would be seen the most. We will mention: job design, staffing, training, performance appraisal. In job design.

The job design should be characterized by a variety of work activities, flexible tasks in several areas, extensive delegation of tasks and responsibilities for staff.

If we want to hire innovative personal, recruiters should focus on identifying the characteristics needed for innovative behavior, for example: openness to new experiences, which is evaluated through psychometric examination in recruiting process. During staffing should be also target orientation of the candidate evaluated. The target orientation divides into two types: either knowledge oriented or performance oriented. In the case of Industry 4.0 should recruiters should prefer the candidates who are knowledge oriented. Knowledge oriented employees tend to join more difficult tasks, they like to get better, they want to develop the filed of their skills and have the tendency to achieve great results.

Companies should offer all types of trainings to their employees. It is suggested that, the trainings also reach beyond the field of skills of employees in order for them to broaden their spectrum.

The performance appraisal system, which suits Industry 4.0, should focus on developing of the employees. It is mainly about the approach, which is based on a result and the approach, which is based on a behavior, as these approaches support education and

innovation. It is recommended, that the employees get feedback about their performance. Ever more popular now is the approach – managing by objectives (MBO). MBO is characterized by specific goals, which represent brief statements of expected results. Managers and employees set their goals and ways on how to reach them, through mutual discussion and consensus. Undeniable part of MBO is also feedback, which enables managers and employees to monitor the tasks and based on it agree on corrective measures. MBO is suitable approach to evaluate performance in such a way, so that compatibility of the company with Industry 4.0 could be reached.

5. Conclusion

Through the literature and scientific articles, we have clarified the position of individual managerial functions within the company. We have also mentioned, how Industry 4.0 manifests itself in the field of management, which we have fulfilled the main goal of theoretical research. We also provided an answer to research question, in which we introduced changes in application of methods and techniques in the implementation of managerial functions in the context of the impact of the Fourth Industrial Revolution.

The theory has pointed out, that if companies want to remain competitive in the future, they will have to invest in industry 4.0. Today, companies are able to operate without elements of industry 4.0, but only for a limited time. They have to look for a way of further development, which is digitalization in all areas of business.

6. References

- [1] BCG, Embracing Industry 4.0 and Rediscovering Growth, <https://www.bcg.com/capabilities/operations/embracing-industry-4.0-rediscovering-growth.aspx>.
- [2] Centrum vedecko-technických informácií na SR., Stojíme na prahu ďalšej priemyselnej revolúcie, <http://vedanadosah.cvtisr.sk/stojime-na-prahu-priemyselnej-revolucie>.
- [3] Drucker P.F., Management, budoucnost začíná dnes, Praha, Management Press, 1992 (Drucker P.F.).
- [4] EPICOR, What is Industry 4.0 – the Industrial Internet of Things (IIoT)?, <https://www.epicor.com/en-us/resource-center/articles/what-is-industry-4-0/>.
- [5] Industry 4.0, Čo je Industry 4.0?, <http://industry4.sk/o-industry-4-0/co-je-industry-4-0/#e>.
- [6] Howard, E., Success in Simulation and Scheduling, <https://www.simio.com/blog/2018/09/11/production-planning-software-industry-4-0/>.
- [7] HUTT, R., 9 quotes that sum up the Fourth Industrial Revolution, <https://www.weforum.org/agenda/2016/01/9-quotes-that-sum-up-the-fourth-industrial-revolution/>.
- [8] Kvašňák, L., Priemysel 4.0 zastihol firmy a štát Nepripravených, <https://www.etrend.sk/trend-archiv/rok-2017/cislo-6/priemysel-4-0-zastihol-firmy-a-stat-nepripravenych.html>.
- [9] Papula, J., Podnikanie a manažment, Praha, Wolters Kluwer, 2017 (Papula, J., E. Papulova, J. Papula, Z. Papulova).
- [10] Science Direct, A review of the meanings and the implications of the Industry 4.0 concept, www.sciencedirect.com.
- [11] Shamim, S., Management approaches for Industry 4.0: A human resource management perspective.
- [12] Shinde, S. V., Functions of management. Solapur, Laxmi Book Publication, 2018 (Shinde, S.V.).
- [13] World Economic Forum 9 quotes that sum up the Fourth Industrial Revolution, <https://www.weforum.org/agenda/2016/01/9-quotes-that-sum-up-the-fourth-industrial-revolution/>.