

DIGITAL SKILLS, ORGANIZATIONAL BEHAVIOR AND TRANSFORMATION OF HUMAN RESOURCES: A REVIEW

Ahmet Oguz DEMIR

National Research University Higher School of Economics, 100100, Russian Federation
odemir@hse.ru

Abstract

In the last twenty years digital technologies started to be used more commonly by companies all around the world and these technologies started to transform all processes of manufacturing and other industries. Considering this transformation process, the objective of this study was to identify the major technological trends and their impact on the organizational behavior referring to the change in the employment trends all over the world in industrial level. In the paper the digitalization and the digital trends are identified, the digital professional skills are analyzed and the trends for organizational behavior are focused. The descriptive study shows us that digitalization is not only transforming the national economies and industries but also has and will have a huge impact on organizational

Key words: digitalization, digital economy, organizational behavior, business models

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I. INTRODUCTION

Over the last two decades, digital technologies (DTs) have been used more intensely by enterprises all over the world and have been changing all processes from procurement to sales in all industries, particularly in the manufacturing industry. This process of change not only changes the structure of production and productivity but also changes the quality and quantity of labor used by enterprises in the workflow processes.

In this process, labor must be able to use digital tools instead of traditional techniques; have capabilities that require specific knowledge such as coding; be able to follow the processes related to developing technologies such as big data and artificial intelligence and have other similar skills. This transformation in economy and production not only changes business models but also redefines professions. Formal education models and their contents are renewed by taking this change into consideration. In addition, changing professional skills and change in business processes bring to the agenda concepts such as continuing education and lifelong learning for employees. This transformation along with employment-based changes and motivation problems in companies leads to more emphasis on new concepts such as corporate entrepreneurship and leadership in business life.

In the framework of all these developments, this paper aims to conduct a thorough search of the relevant literature about the effect of digitalization on organizational structure and work life and to analyze the developments from this perspective. The following part of the study includes definitions of digitalization and prominent digital technologies in the economy, addresses findings related to the professional skills required in this process, and then evaluates the transformation that this change brought about in business models with a reference to previous studies.

II. DIGITAL TECHNOLOGIES AND TRANSFORMATION IN BUSINESS MODELS

1. Digital technologies and digital transformation

Information technologies are defined as all tools for collecting, processing, storing and distributing information (Hanelt et al. 2015). These tools affect all processes related to production and work. According to the definition made by Bharadwaj et al. (2013), digital technologies are combinations of all technologies shaped on information, computing, communication and connection. In particular, the rapid development of internet infrastructures and the increasing accessibility and speed of access in parallel with this development enable digital technologies to be more involved in the production process. In this context, digital technologies and digital transformation tools have recently become the main source of product and service innovations for the business world. (Fitzgerald et al. 2013) In this process, DTs shorten the product cycle, eliminate the cross-industry boundaries and therefore necessitate the formation of new business models and organizational structures

appropriate to those models. (Setia et al. 2013)

For example, the development of the internet and mobile technologies used in the financial sector has completely changed the transaction habits of the customers. In parallel with this change, the business models of banks, which are the main institutions of the finance sector, and the quality and quantity of human resources they need in accordance with this model, have also changed rapidly. Customer experience shifted from bank branches to internet tools; and the various DTs, especially artificial intelligence, have become the main tools for banking services. Similarly, as described in Berman et al. (2011), the use of various DTs in the manufacturing industry sectors where the production of physical products (cars, chemicals, etc.) is common has restructured business models. Therefore, the competitiveness of enterprises varies depending on their use of this technology, the suitability of their business models to this technology, and the change of their human resources structure.

Given this background, digital trends that will affect the sub-sectors, enterprises, business models and organizational structures and employee behavior in parallel with all these changes are defined as follows. (IMDA, Digital Framework for Action)

- a. **Big Data:** ²⁰ Gartner defines big data as high-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation. Big data and the use of this data in decision-making processes ensure a better understanding of market conditions and customer behavior, providing significant advantages for enterprises and also laying the ground for enterprises to develop products and services to meet customer needs. According to the working paper prepared by Upadhyaya and Kynclova (2017) for UNIDO, the biggest management and financial challenge that enterprises face related to big data relate to human resources. Therefore, they argue, there is a clear need for open-minded human resources with knowledge of data processing techniques, analytical skills, programming skills, or ability to use programs.
- b. **Artificial intelligence:** Shubhendu and Vijay (2013) define artificial intelligence as the study of ideas to bring into being machines that respond to stimulation consistent with traditional responses from humans, given the human capacity for contemplation, judgment and intention. The authors underline four basic criteria for artificial intelligence: functional (the system must be capable of performing the function for which it has been designed), able to manufacture (the system must be capable of being manufactured by existing manufacturing processes), designable (the design of the system must be imaginable), and marketable (the system must be perceived to serve some purpose well enough).
- c. **Blockchain Technologies:** Saqaf and Seidler (2017) define blockchain technology as a distributed digital ledger or accounting book where each transaction between members, or nodes, of the blockchain is securely reflected through strong cryptography as an extra block in a database. In this system no single node can defraud or tamper with its content. Distributed digital ledger or blockchain technology, which is a technology that has developed together with data mining, creates new areas in many sectors such as banking, finance, tourism and logistics, which are based on transaction security.
- d. In addition, the use of these technologies and their effective adaptation to the sectors also create new areas of enterprise and new professions. **Quantum Technologies:** European Quantum-Technologies Roadmap (2016) collects quantum technologies under four main headings. Riedel et al (2017) describe quantum technologies as quantum computation, quantum communication/cryptography, quantum detection/metrology and quantum simulation. Quantum computers will improve electronic security and prepare the ground for faster and more efficient encryption and processing. Developments in quantum technologies will contribute to the acceleration of mechanization, robots and all other DTs.
- e. **Internet of Things:** In the report published by the Internet Society (2015), the Internet of things is defined as providing the ability to process, use and modify data with minimal human involvement to objects, sensors and devices in everyday use with evolving network connections and calculation skills. The same report predicts that 100 billion devices will connect to each other through Internet technologies and this will create an economic impact of \$ 11 trillion in 2025. As can be seen here, it is foreseen that human involvement will be minimized in the processes. Therefore, studies are carried out in order to reduce human role in daily work and life.
- f. **Robotics and Sensors:** Robotics and sensor technologies envisage robots to replace humans in production processes and an effective role in the whole process for robotics along with evolving sensors and artificial intelligence technologies. This DT, which has been at the top of the agenda of the world together with the concept of Industry 4.0., has led to the discussions on the complete liquidation of blue-collar labor from production in the manufacturing industry. Kagerman (2015) argued that Industry 4.0 applications would be different from previous technological transformations in terms of business models and economic development, stating that this process would extend a longer period of time.

²⁰ <http://www.gartner.com/it-glossary/big-data/>

- g. Virtual Reality/Augmented Reality: Van Krevelen and Poelman (2010) define augmented reality or virtual reality technologies as one part of the general area of mixed reality in which real objects are added to virtual ones, replace the surrounding environment by a virtual one. The use of these technologies in many industries, especially communication, media and tourism, has increased rapidly in recent years and is increasing more and more every day.
- h. 3D Manufacturing Technologies: Berman (2012) defines 3D manufacturing technology as a technology that can produce an object with a layered printing technique, and is separated from prototyping with its low cost and easy handling features. With these features and low cost, this technology enables user-specific production and enables industries to operate more efficiently with low inventory costs.

The transformation resulting from the above-mentioned main technology trends has led to changes in the business models and organizational structures of the enterprises. Indeed, this transformation not only changes the supply side of the economy, but also the general habits of society and the approach to consumption. In addition, sustainability and resource utilization efficiency are increasing with new approaches such as sharing economy. With this in mind, enterprises have had to adapt to a stronger competitive environment not only in terms of production processes but also in terms of consumption in the market.

2. The effect of digitalization on business models

A business model is defined as the ways how an organization is linked to external stakeholders (customers, partners, etc.), and how it engages in economic exchanges with them to create value for all exchange partners. (Zott et al., 2003) Osterwalder et al. (2004) argue that business models are composed of four dimensions and nine building blocks under these four dimensions. These dimensions are how a product/service creates value, which target audience is targeted and how this target audience is accessed and linked with the business, which internal and externalities, resources and partners are needed, and how products and services generate costs and revenue. (Kane et al. 2016)

The change in business models, which have emerged parallel to the impact of innovation activities such as DTs on the enterprises, is also an important area of study. Cavalcante et al. (2011) argue that business model creation is related to the initial business model design based on a business idea, stating that business model expansion is to add new activities to the existing business model without altering the underlying logic. The revision of the business model implies a redesign of the existing business model and thus a radical and destructive change. Finally, the destruction of the business model is defined as the cessation of business activities. Burkhart et al (2011) argue that the impact of external forces, such as new technologies, is not sufficiently understood, and that the change that has emerged in business models along with digital transformation should be evaluated within this framework.

Veit et al. (2014) argue that a business model is digital if changes in digital technologies trigger fundamental changes in the way business is carried out and revenues are generated. El Sawy and F. Pereira (2013) state that digital technologies create ecosystems containing new actors, structures and rules linked to each other, new digital business models, and time, change and new business architectures in this context. This conceptual transformation affects enterprises more and more and is not yet sufficiently used by most existing business model concepts. Previous studies have mostly investigated the impact of digital technologies on business models through sectors such as software, internet and media, which are closely related to digital economics. At this point, it is not easy to adapt the transformation processes in the related sectors to the enterprises operating in the traditional industries. (Yoo et al. 2010)

A number of studies have reported that, with the increasing use of DT, enterprises experience a change in work scale and speed and that this change should not be dealt with independently from the partnerships, business associations, and competitors. Other studies have reported that digital platforms allow traditional industrial boundaries to be exceeded, niche areas to be detected, and enterprises to operate in new areas. In these studies, Apple's entertainment ecosystem and Amazon's book sales ecosystem are stated to be the two most important examples in this context. (Bharadwaj et al. 2013, D'Adderio 2001; Klein and Rai 2009; Rai et al. 2012; Saraf et al. 2007).

III. DIGITALIZATION AND ITS EFFECTS ON WORK LIFE

1. The effects of digitalization on working life

The fact that digital technologies have become the main tools of goods and services production processes have brought about a number of changes in all the workflow processes of enterprises. This process of change, in turn, has brought with it many important changes in human resources planning and management. In many industries, there have been significant changes in the skills and competencies that enterprises demand from employees. Furthermore, the demand for quantity of labor is also changing with the spread of technologies such as automation and artificial intelligence that eliminate the need for human beings. One of the most discussed issues in this process is the effect of the spread of DTs in the economy on employment or unemployment.

According to a report by McKinsey Global Institute (2012), the Internet creates employment in both developing and developed countries. In the same report, it is reported that in the 30 most promising developing countries, 3.2 new jobs have been created for each job lost due to internet technologies. In developed countries, this ratio is reported to be 1.6.

Klonner and Nolen (2008) report that employment has increased by 15 percentage points when network coverage was expanded in rural areas of South Africa and that this has had a positive effect on especially women's employment. In another study, Beard et al. (2010) found that Internet-users in the United States hardly give up looking for a job compared to non-Internet-users. In contrast to these studies that have reported positive findings, a number of other studies have argued that the reduction in human employment will accelerate especially in areas where automation is used more. (Autor 2014; Brynjolfsson and McAfee 2014).

In their analysis of the effects of technology on labor market, Acemoğlu and Autor (2011) argued that significant declines have occurred in real wages of low skill workers; job 'polarization' has emerged; rapid diffusion of new technologies has substituted capital for labor in tasks previously performed by moderately-skilled workers; and offshoring opportunities, enabled by technology, have expanded which allow foreign labor to substitute for domestic workers in specific tasks.

The widespread use of DT has also eliminated the distinction between blue-collar and white-collar. The fact that DTs have replaced humans especially in manufacturing industry branches that use less qualified labor has caused employment to concentrate on qualified labor. On the other hand, increasing effects of technologies that have recently developed such as artificial intelligence signal the change to arise in the future nature of the structure of white-collar employment. In line with these requirements, enterprises continue to work to ensure that their current employees are qualified to meet new competitive conditions as well as take into account these new professional skills and competencies in new recruitment processes.

2. DTs and new professional skills and competencies

With the spread of DTs in product and service production, the roles and tasks of the employees in all departments of enterprises have started to change. This change necessitates the reevaluation, development, and adaptation of the professional knowledge, skills, and competencies of the employees. In a working paper titled 21st Century Skills and Competences for New Millennium Learners in OECD Countries prepared by Ananiadou and Claro (2009), it is stated that basic knowledge and skills related to decision making, digital citizenship and productivity should be identified and appropriate education models should be included in curricula.

Colbert et al. (2016) argue that technological developments have only recently begun to transform work and workplace experiences and workplace definitions and that the rapid development and change of the digital capabilities of the workforce and the use of technology in the workplace will continue. They also stated that this change brings with it important opportunities for increasing the institutional effectiveness for enterprises and managers. Benson et al (2002) noted that internet and other technologies affect employee and organizational performance and employees' communication, learning, decision making and business practices. They concluded that human resource managers should change accordingly.

Chryssolouris et al. (2013) stated that engineers and blue-collar workers in the manufacturing industry sectors should be supported by lifelong learning activities and that employees' knowledge and skills should be constantly updated on the rapid developments in manufacturing industry technologies and information and communication technologies. Prahalad and Hamel (2006) argue that the skill sets of senior managers should change to develop new markets in parallel with the constant change in market conditions, to rapidly adapt to emerging markets, and to transform enterprises in parallel with the rapid change in consumer preferences.

Sousa and Wilks (2018) investigated the occupational skills and competencies that will be needed in the near future, especially by small and medium-sized enterprises. In their study on artificial intelligence, nanotechnology, robotics, internet of things and augmented reality technologies, they concluded that critical thinking, adaptation, network collaboration, and creativity skills will be of great importance in the future for

SMEs. Sousa and Rocha (2019) examined the effects of the internet of things, cloud technologies, big data, mobile technologies, artificial intelligence and robotics on professional competencies. They defined the necessary skills in three main areas. In their study on innovation, leadership, and management, they stated that the Internet of things would redefine job types and change the nature of the workplace.

IV. CONCLUSION

The widespread use of DTs in economies and the use of new DTs in the workplaces is seen as an indispensable condition for enterprises to adapt to today's competitive conditions. Under these circumstances, the organizational structure, organizational behavior, and organizational culture of enterprises and the structure of human resources, which is the most fundamental building block of this structure, are changing rapidly. Nowadays, when the knowledge and skills of DTs have become a professional necessity, the distinction between blue collar and white collar is decreasing day by day; the transition between labor and capital is accelerating with the widespread use of technologies such as robotics, sensors, artificial intelligence and the internet of things. With the increasing use of intelligent machines in workplaces, the importance of concepts such as continuous learning, lifelong learning, and human-machine communication skills are becoming more important in terms of human resources.

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