MANAGERIAL CHALLENGES IN THE CONTEXT OF DIGITAL ECONOMY

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Abstract. *The aim of the article is to present how and with what consequences the dynamic development of Information and Communication Technologies (ICT) affects the transformation of the work of contemporary managers. In accomplishing this goal, the essence and explanation of the specificity of the managerial profession were presented to confront traditional expectations addressed to managers with expectations resulting from the development of the digital economy. ICT was presented as General Purpose Technologies (GPT), which led to the third technological revolution. Next, new ICT solutions are synthetically presented, which currently have a particularly strong impact on the work of managers, their decisions and the strategies and management methods they adopt. The main attention was paid to such solutions as mobile and wireless technologies, Big Data, Cloud Computing, Internet of Things and 3D printing technology. The importance of ICT power resulting from their range and universality of the application was also emphasized and it was also indicated that such solutions as artificial intelligence, supercomputer, autonomous cars, robots, bitcoins and blockchains and neurotechnologies are also interesting. Next, an attempt was made to explain how the expectations addressed to contemporary managers change. It was pointed out that currently, managers need to revise the existing, traditional management methods. At the same time, new approaches to management should apply to virtually all dimensions of their activity and responsibility. Fundamental changes should include, among others, organization strategy, shaping organizational structures, human resources management practices, marketing, managing people and managing teams. As a consequence, managers should be able to implement new business models. As it results from the analysis, the managers' approach to the tasks they fulfill should change fundamentally. In the conditions of the digital economy, they should be ready to give up some of their power and link the organization's success with work within flattened organizational structures. In a new way, they also have to approach the implementation of organizational leadership and team management. The paper is an attempt to implement the prognostic goals of management theory and practice. It is based on a critical analysis of available, very extensive literature on the subject in the area covered by the topic. It also used the analysis of statistical data on ICT development and the results of querying reports and thematic studies of well-known consulting companies. Also included are business case studies published in reputable business journals, which particularly use ICT effectively.*

Keywords: *management; manager; Information and Communication Technologies; digital economy; e-manager; managerial challenges.*

Introduction

Managers are an extremely numerous group of specialists, occupying various managerial positions (Barabel & Meier, 2010, pp.147-250), in various types of organizations (Thiétart et al., 2007, p.1), both business and administrative, and even non-profit organizations. The nature of their work, related to management, makes them constantly confronted with new challenges. At present, Information and Communication Technologies (ICT) and the more general nature, i.e. the functioning of the organization within the so-called digital economy. Challenges appearing before managers are not only related to ICT solutions implemented in a given organization, but also result from changes in competitors, cooperating entities and, above all, clients. The lack of adequate response to market changes and the failure to take advantage of the opportunities associated with the opportunities offered by ICT may, in fact, lead to the deterioration of the competitive position of the organization, and finally to its disaster in today's extremely demanding market.

In connection with the above, the paper attempts to present how and with what consequences the dynamic development of Information and Communication Technologies (ICT) affects the transformation of the work of contemporary managers. Based on a critical analysis of extensive literature, the analysis of statistical data on the development of individual ICT elements, review of consultancy companies' reports and case studies of companies using advanced ICT, traditional expectations addressed to managers were anticipated with expectations resulting from operating in the conditions of the digital economy. Suggestions were also given on how managers should modify their management approaches.

The essence and specifics of the work of managers - a literature review

Generally speaking, the managerial profession from other professions is distinguished primarily by the fact of direct involvement in matters related to the management of organizations. It is managers who start processes related to the functioning of the organization, participate in their implementation, observe their course, introduce (or not) adjustments, control individual activities or participants of given processes, shape relations with stakeholders and the environment. Thus, managerial professions distinguish not only the positions they occupy but also the specificity of their position and completed tasks. Moreover, managerial phenomena are characterized by such imprecise nature of work, the authority they have over people and organization resources, responsibility for themselves and others, concentration on problem solving, special type of activity inside and outside the organization, creating goals, attention to results, necessity initiating pro-development activities and responsibility for management processes.

Managers are in particular professionals responsible for the entire organization or its separate part. They perform their tasks through people who are subject to them or other people who do not have to be their subordinates (Mintzberg, 2011).

It seems that managers can be assumed to be *employees of organizations who, because of their position, define the framework and principles of functioning of teams, cells or entire structures, and through significant participation in the disposal of resources and*

management of people are responsible for setting and achieving the goals of the organization or part of it.

Inspired by the concept of H. Fayol (Minzberg, 1990, pp.24-25), traditional approach to the work of managers was presented for example by L. Gulick in the classification of the POSDCORB acronym, i.e. Planning, Organizing, Staffing, Directing, Coordinating, Reporting, Budgeting (Martinet & Pesqueux, 2013, pp.9-10). P.F. Drucker saw this issue sooner a little bit differently and distinguished five basic operations carried out by managers, namely: setting goals, organizing, motivating and informing, measuring performance and developing people (Drucker, 2006). For some time, these classifications have been simplified and it is usually assumed that managers are responsible for the implementation of functions: planning, organizing, managing people and controlling (Schermerhorn, 2004).

The above approaches to the work of managers have been questioned (or, as some people prefer - developed) H. Mintzberg in the authorial concept of managerial roles (Barabel & Meier, 2010, p.179). He distinguished 10 roles, which he divided into three groups. He included the following roles for the interpersonal group: representative (symbol), leader and connector. In the information group, he distinguished the roles: active observer, relay, and connector, while in the decision group he indicated the roles: entrepreneur, regulator, resource manager and negotiator (Mintzberg, 1984). The authors of the work titled "Becoming a Master Manager" have distinguished eight managerial leadership functions. These are the functions: mentor, moderator, monitoring, coordinator, director, implementer, intermediary and innovator (Quinn et al., 2003). The classifications presented here do not exhaust the diversity of managers' job approaches but seem to suggest enough how it can be heterogeneously perceived, and how this perception has changed over the last decades.

It should also be added that in practice the matter is additionally complicated, which can be exemplified by the analyses of the work of managers such as: L. Gerstner (IBM) (Slater, 1999) or S. Jobs (Apple) (Isaacson, 2011), presentations of his own management approach to J. Welch (General Electric) (Welch & Welch, 2005) or A. Morita (Sony) (Morita, Reingold & Shimomura, 1986), as well as extensive research on the work of managers carried out by The Gallup Organization or H. Simon's research on the management of small and medium-sized companies. The analysis of various sources leads to the conclusion that the implementation of managerial functions largely depends on the personality of managers, their views on management, and also that it is strongly culturally determined.

Management, which is the subject of managerial activities, is a social technology with a very rich history. But since the first scientific concepts on this subject came into being, almost everything has changed. There are other markets and competition, there are completely new legal regulations, organizations operate in other structural arrangements, and managers are confronted with more and more challenges (Gonciarski, 2012). However, as R. Norman aptly notes, as in the times of the industrial revolution, technology is the driving force behind change. With the fact that this time, it is digital technology (Norman, 2012, p.35).

Information and communication technologies as general purpose technologies

The analysis of the relationship between the development of technology and management allows distinguishing technologies that have such a powerful impact that they have changed the course of civilization development. In the literature on the subject, these phenomena are often referred to as a revolution, in the sense of sudden and radical changes, and the consequences of which concern economic and social systems and lead to the formation of new management concepts.

In socio-economic analyzes the technologies that trigger revolutionary changes are referred to as General Purpose Technologies - GPT. Consequently, technologies included in this category can also be analyzed from the perspective of their impact on management, including the work of managers.

In general, GPT is a set of core technologies that are critical in generating and spreading incremental and radical innovations in various fields, sectors and economic sectors, and affect social and economic systems. They are technological innovations so powerful that they disrupt and accelerate the normal rhythm of economic development (Brynjolfson & McAfee, 2015a, p.29). Therefore, as GPT develops, it will spread throughout the economy, lead to overall productivity gains, and from the point of view of management change the rules of functioning of markets and organizations (Brynjolfson & McAfee, 2015b, p.15).

It is usually assumed that the first major breakthrough under the influence of GPT took place at the end of the 18th century (the first industrial revolution). His driving force was the invention of a steam engine and the development of railways. The next major changes occurred due to the second technological revolution, whose driving forces were electricity, a mobile technological line and mass production (Schwab, 2017, p.18).

Another major breakthrough, referred to as the third technological revolution, took place due to the development of technologies related to Information and Communication Technologies – ICT (Jarrosson, 2009, pp.43-46). This term is understood as a broad set of techniques and technologies, which mainly consist of devices and applications related to the flow of information. The ICT conceptual scope includes, above all, co-existing techniques related to microelectronics, data processing (hardware and software), ICT and a variety of communication media, in particular, the Internet, wireless networks, Bluetooth networks as well as cellular and satellite networks. The term 'ICT' used in the analyzes hides in itself various types of techniques and technologies that, taken together, meet the criteria for being included in GPT.

It can be assumed that since the beginning of the 1970s ICT has started to meet the basic GPT criteria (Brynjolfson & McAfee, 2015, pp.107-108), which are according to B. Jovanovic and P.L. Rousseau: ubiquity, the ability to constantly improve and the ability to create new innovations (Jovanovic & Rousseau, 2005, pp.1181-1224). They also fulfill the additional condition defined by Wright, namely the ability to exert a significant influence on many economic sectors (Wright, 2000). This is confirmed by in-depth studies in which the impact of ICT on the economy was analyzed and which showed that it was unambiguously positive. Of course, these positive results were not only generated by ICT but were generated by transforming business entities, innovative business models and generally a new management approach implemented by managers. It should

be noted that ICT is changing at a dizzying pace and in addition, significantly changes the rules of competition and generate radically new customer expectations (Danneels, 2004, pp.246-258). These technologies are therefore a challenge for both engineers and managers.

It should be emphasized at this point that there are currently classifications distinguishing the fourth technological revolution (Skilton & Hovsepian, 2017). The authors of this paper believe, however, that it is too early to make such distinctions. Technologies that are treated as discriminants are in ICT, difficult to separate from others, and moreover, do not seem to meet GPT criteria by themselves.

ICT determining the work of contemporary managers

ICT - since the first computers - has undergone a far-reaching transformation over the last few decades. Particularly many new opportunities arose at the beginning of the 21st century when the Internet from Web 1.0 was transformed into a Web 2.0 version (Fayon & Tartar, 2014; Gonciarski, 2010; Świątkowski, 2015). As aptly noted by M.R. Dugage this new version is a kind of innovation platform that creates the conditions to reveal the real potential of the network (Dugage, 2008, pp.74-45). Apart from technological aspects, one should notice three extremely useful features of this new version of the Internet (Scheid, Vaillant & de Montaigu, 2012, p.28), namely:
1.   The ability to facilitate and share any content at any time.
2.   Making the Internet user from the passive content recipient an active network user.
3.   The ability to create communities, connect to existing ones and initiate relationships with other users.

In the first and second decade of the 21st century, new solutions and technologies appeared that significantly modify the functioning of the organization, and thus the work of managers. In particular, it should be distinguished:
1.   Increase in the popularity of mobile and wireless technologies that allow the use of digital technologies in any place and time, in professional and private life.
2.   Big Data, which allows the analysis of unstructured, partially structured and structured huge data streams flowing through different channels, both from the inside of the organization and from its environment (Germain, 2014, p.37). As proven by research, this technology gives the opportunity to raise performance and profitability ratios by approx. 6% above the results of companies that do not use this solution (Barton & Court, 2013, p.62). In addition, Big Data has the potential to release enormous value, create new winners and losers (Mayer-Schönberger & Cukier, 2014, p.251).
3.   Cloud computing, that is, storage and processing of data in the so-called digital clouds. It is a solution that reduces the costs for IT, paying for the actual use of resources, enabling access to solutions that are not offered as standard and greater data security (Mateos & Rosenberg, 2011, p.260).
4.   Internet of Things- IoT is a network of interconnected devices that communicate themselves and acquire data. Then - with the help of appropriate systems - these data are analyzed, leading to conclusions and automated actions. This guarantees organizations that use IoT solutions achieve the expected business benefits (Choroś, 2015, p.4; Witkowski, 2017). Cisco introduced the term Internet of Everything (IoE), which is now treated as equivalent to IoT. At the same time, the IoE system is created not only by things, but also by processes, data, people, and even animals or

atmospheric phenomena, because everything can be treated as variables. Many experts say that IoT will soon overtake the Internet of people in its present shape in terms of size, significance and generated revenues (Miller, 2016, p.29). According to the World Economic Forum report published in 2015 (Deep Shift … Survey Report, 2015), the critical size of IoT development is to connect 1 billion sensors to the network, which will probably be achieved in 2025.

5. The 3D printing technology consists in the fact that the digitally designed model is reproduced in a special printer as a physical object through layered, gradual application of molten plastic, molten metal or other raw material. The use of this type of production revolutionizes traditional production methods and causes that the possibility of production is not limited by space, and both corporations and prosumers can benefit from it (Rifkin, 2016, pp.101-105). As argued by R. D'Aveni (2013, pp.55-65), spatial printing technology has already gone far beyond the prototype phase.

From the point of view of management, the strength of digital technologies results from their range and universality of the application on a global scale. All this is now strengthened by such solutions as interactive websites, blogs, and microblogs, social networking sites, wikis, instant messaging, etc. In practice, this means - for both companies and customers - the possibility of a continuous presence in networks and their implementation professional and private tasks.

Volumetric constraints of this article make it impossible to even characterize other new ICT solutions. It should be pointed out, however, that such solutions as artificial intelligence, supercomputers, autonomous cars, robots, bitcoins and blockchains, neurotechnologies are noteworthy. All of this, taken together, creates a synergic arrangement that creates the basis for new management paradigms, which puts managers ahead of new challenges. Under these circumstances, at the end of the second decade of the 21st century, managers must make a significant return on management.

Managers against challenges posed by the ITC

Managers in the twenty-first century are confronted with all kinds of new phenomena, sometimes so surprising that they fall into the category of so-called Black Swans described by N. Taleb (2007, 2012). In this part of the article, however, only some consequences will be indicated - determining the work of managers - resulting from the spread of ICT in areas related to the management of organizations.

The most general consequence of the spread of ICT is the transformation of the traditional market into a version known as e-business and e-commerce extracted from it (Chaffey, 2014). The new economic system created in this way by M. Volle defines the interesting neologism "Iconomie" (Greek: eikon - image and nomos - organization). The term means "(...) a society whose economy, institutions and ways of life are based on the synergy of microelectronics, software and the Internet" (Volle, 2013, p.11). Others describe this new type of economy as the electronic economy, network economy (Benkler, 2008), Macrowikinomics (Tapscot & Williams, 2011), e-economy, information economy, Economy 2.0 (Jarrosson, 2009) or the digital economy (Gonciarski, 2013). Recognizing the differences between these terms, it seems that for general considerations they can be treated as synonyms.

Operating in these new conditions means for managers the need to revise traditional strategies and management methods. The power of the digital market is demonstrated by the data presented in the report from January 2018 (We are a social agency, report, 2018). It shows that currently, over 4 billion people around the world use the Internet. Which means that more than half of the world's population is now connected to the network, and more than a quarter of a billion new users arrived in 2017. The number of users of social networks in 2018 is 3.196 billion, an increase of 13% year on year, and the number of mobile users increased by 4% and is 5.135 billion.

Necessarily, managers become so-called digital managers who are expected to have skills related to the use of ICT and know how to apply digital management techniques in practice to increase the efficiency of their teams and thus increase the efficiency of the entire organization (Zara, 2016). This requires the implementation of often fundamental changes regarding company strategy, market positioning, customer relationship management, the transformation of structures, implementation of new procedures for formalizing activities and reporting as well as flattening the hierarchy and ensuring effective control over communication (Boyer & Equilbey, 2013). This last issue is extremely important, because digital connections implemented in a continuous system (24h/24h) cause that the boundaries are blurred, both for companies and their leaders, managers, and employees. The boundaries between the interior and the environment of the organization disappear, as well as between professional life and private life (Reyre & Lippa, 2015, p.32).

From the manager's point of view, it is important that ICT caused radical changes in the production of goods and provision of services, including globalization of product development, an adaptation of workplaces to technology and expansion of service sectors. Increasingly, they enable digitization and virtualization of products as well as the individualization of services. They have changed the traditional relations between the state, business and consumers and create opportunities for creating a new type of services. They significantly increased the possibilities of individuals' access to information, created new forms of tracking individual behaviors and created favorable conditions for communication at a distance, facilitating the exchange of information and maintaining social relations (Souter et al., 2010, p.17).

Digital technology lets us end with the era of Taylorism through digital transformation, which concerns in particular (Delorme & Djellalil, 2015, p.11-12): business models, the scope of business and sectors, ecosystems, cooperation within the company, recruitment, marketing plans, customer relations, distribution, services, pricing mechanisms, promotional activities, gaining customer loyalty, communication and shaping brand value and reputation.

The ultimate goal of digital technology in the work environment and management is to create added value. New expectations formulated in relation to managers are connected with the need to reconcile several paradoxes (Zara, 2016, p.9):
- traditional enterprise culture with the culture that ICT introduces, based on listening, co-creation and collective intelligence;
- managerial control with the need for employee autonomy, in a very open and transparent digital environment;
- real operation with functioning in a virtual environment;
- previous skills with expected new competences.

It is also important to be aware that digital technology is an important aspect of managers' actions, but what really matters most is the management implications that this technology causes. I. Reyre and M. Lippa argue, in this context, that managers should have the following new skills (Reyre & Lippa, 2015, pp.42-46):

1. Ethical and kind behavior;
2. Conduction using teamwork;
3. Creating innovation;
4. Using collective intelligence;
5. Thinking and intercultural activities;
6. Developing recursive thinking;
7. Efficiency in the use of new media;
8. Transdisciplinary activities;
9. Make full use of the potential of all employees;
10. Organizational knowledge management;
11. Agile operation as part of virtual cooperation.

A particularly difficult field for managers in the digital age is the need for a new approach to managing people, organizing teamwork and leadership. Managing people in new organizational structures, using new ICT technologies also requires a new type of leadership. In this regard, it is worth approving of the position of H. Mintzberg, who claims that there is no reason to distinguish between managers and leaders - "instead of separating management from leadership, we should treat managers as leaders and conceive leadership as well-performed management" (Mintzberg, 2011).

Targeting in today's - created under the influence of ICT - virtual, flexible, flattened organizational structures requires a readiness to give up some of the managerial authority. Therefore, the popularity of the so-called distributed leadership, whose characteristic feature is the assumption that the leader can become any employee who is ready in a given situation and able to gather supporters around him and at the same time take responsibility for the tasks being carried out (Ciuk, 2012, p.435). However, the challenge for many managers is to limit the typical control functions for coaching or mentoring. Therefore, the basis of modern people management are partner relations based on trust, participation and effective communication (Barabel & Maier, 2010, pp.597-598). These conditions give the potential to involve colleagues in effective organizational processes.

It should be noted that ICT enables employees to perform their tasks remotely. Dispersed teams can be created in this way, which usually operate in different places - in different cities, regions or countries, and even continents. This new situation creates a number of possibilities for cooperation. The possibility of employing the best specialists, regardless of where they live, if they only have access to the Internet, seems particularly important.

Team managers are able to use new technology to keep remote workers plugged into the home team. Meeting software, instant messaging, video chats, project management software and mobile applications make it easier than ever before to stay connected. Some examples of new, modern communication technologies are given in table 1.

Table 1. Examples of IT communication tools appropriate for dispersed teams
(Own study, based on the idea of S. Sałek, 2016, and websites of individual tools)

Tool	Examples of IT tools	Ways and situations of application
Communicator	Skype, MSN, Messenger, WhatsApp	Immediate communication The need for fast, not extensive information Need of quick answer the questions
Shared services	Microsoft Exchange	Task delegating Storage of important data in one location Current list of contacts to team members and checking their availability
Remote access	Remote desk, WebEx	Sharing desk with other team members if needed
Video-conference, Teleconference	WebEx, Skype, VoIP	Possibility to discuss the project's progress and gaining its requirements Discussing the problems and finding the solutions
Traditional e-mail	Many different www. Sites	The ability to quickly transfer information and send electronic documents
Knowledge-based and company social media	Confluence, Jira, Intranet, Wiki	Informing about the events in the organization The ability to create thematic forums, sharing knowledge, solving problems and storing documents

An example of an interesting innovative solution using ITC and integrating the organization's personnel at the same time is the construction of internal inter-unit networks at Procter & Gamble (P&G). There are 30 communities in the company, which include volunteers from various parts of the group, whose task is to solve various organizational problems. These communities take part in technology summits every month along with representatives of ten business units (Hansen & Birkinshaw, 2011, p.126).

Currently, the so-called collective intelligence, which is a synergistic sum of intellectual resources of the organization. From the manager's point of view, it is associated with simultaneous building, sharing, transforming and implementing intellectual (internal and network) resources in activities (Zara, 2008, p.25).

ICT also enables such new solutions as flexible working time, employee leasing, outsourcing and offshoring of personnel functions, teleworking, e-learning, etc. New

managerial skills are also needed to manage these new employee systems (Gonciarski, 2013a, p.147).

ICT sets new expectations for managers in the area of shaping relationships with clients who, thanks to new technologies, have clearly strengthened their position and have become significant market partners. Currently, the especially innovative relationship potential can be launched thanks to the Web version of the Internet, and especially to social networks. In special situations, this leads to the creation of an innovative community-based partnership production model (Benkler, 2008, p.78). This phenomenon applies in particular to the so-called Generation Y, which becomes truly prosumer (Tapscott, 2010, p.351). In this situation, managers have to adapt the organization's structure to a new type of relationship in which stakeholders should be able to have direct, mutual contacts (Ramaswamy & Goullart, 2011, p.104). Unfortunately, management using these solutions is not easy, because they undermine current views on the role of management, especially the ability to control customer experience (Cook, 2009, p.122).

The obligation to shape new customer relationships leads managers to seek innovative solutions in the field of marketing. The reason is that marketing moves to the web and social media, both in market research and in shaping relationships, public relations, advertising and promotion. This is reflected in the concept of Marketing 2.0 (Laurent, 2008, p.209) or Digital Marketing (Scheid, Vaillant & de Montaigu, 2012). It should be emphasized, however, that regardless of associations, these are concepts that definitely go beyond online marketing and are actually more social than technological phenomena.

It should also be noted that at present some specialists are already formulating Marketing 3.0 paradigms (Kotler, Kartajaya & Setiawan, 2010, p.21 and next), and even Marketing 4.0 (Kotler, Kartajaya & Setiawan, 2017). The latter is, on the one hand, the answer to the latest ICT solutions, and on the other is extremely homocentric.

The impact of ICT on the work of managers is particularly visible in the possibility of implementing new business models that are gradually starting to displace traditional ways of running companies. Among these new business solutions, the following models deserve particular attention: models focused on the client, common infrastructure, virtual communities, net value integrators and digital content providers, co-creation, and sharing.

Conclusions

Digitization is probably one of the biggest and deepest changes that our societies have ever experienced (Delorme & Djellalil, 2015, pp.201-202). Generally, it changes the nature of work (De Saint Laurent-Kogan, pp.27-32) and makes it possible to create innovative technical and organizational solutions (Caseau, 2015, pp.17-22). It is not surprising that it causes radical changes in the functioning of the organization, and thus poses a number of challenges to managerial profession.

For decades, the task of managers was to control the structures they managed. In the digital era, however, the task of managers is not to rule, but to accompany, attend and listen. This is because the digital economy smoothes the hierarchy, "horizons" organizational arrangements, and in social networks, every employee can "take over"

and create formal activities without formal titles. As a result, the managerial profession in the 21st century refers more to the relation of expression and natural authority than to the power relations. The manager's position in the organization results in more from what he does than what is associated with the title on the business card (Rey-Millet & Rey-Millet, 2017, pp. 57-60).

Digital technologies are a difficult challenge for managers, but in the end, they allow a management revolution as a system and free the manager as a person (Rey-Millet & Rey-Millet, 2017, p. 298). The response of managers - for radically changed operating conditions - should be the creation of new organizational arrangements and the gradual implementation of a new art of management, shaped by the strength of coherent ideas built on experimental organizational and managerial innovations (Brilman & Hérard, 2011, p.47). In these circumstances, flexibility has become an obligation, a type of categorical imperative, and the conditions and means of its implementation have become elements of the current management and the coming years (Boyer & Equilbey, 2013, pp.72-73).

The management of organizations (especially virtual ones) requires a break with traditional management based on hierarchy and order, and the transition to decentralized management based on trust. In this situation, managers from supervisors should become coordinators who are responsible for creating an atmosphere that allows these new teams to function freely.

Unfortunately, the transformation of a manager into a digital manager is a real challenge, because shaped habits - anchored in procedures and traditional management principles, reinforced by many training - are not easy to change (Zara, 2016, p.122). To achieve this, managers have to go through the so-called management 2.0, which presents the new dimensions of managers' work in the digital economy in a systematic way.

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