



Enterprise competitive management based on the introduction of digital technology: A study on Russian enterprises

Md Abu Jakaria Nishat¹, Dmitry Popov², Monsura Begum³

¹ Department of Economics and Enterprise Management, Moscow State University of Technology “Stankin” (Msut Stankin), Russia

² Associate Professor, Department of Economics and Enterprise Management, Moscow State University of Technology (Stankin), Russia

³ Department of Public Administration and Governance Studies, Jatiya Kabi Kazi Nazrul Islam University, Trishal, Mymensingh, Bangladesh

Abstract

To enhance the efficiency and sustainability of enterprise's functioning through dramatic changes in the quality of management, both technological processes and decision making processes at all levels of management, based on modern methods of production as well as further use of information about the state and prediction of possible changes in managed elements and subsystems, digitalization of enterprise is necessary. It's essential to develop a classification of digital technologies on the basis of the criterion of accessibility and expediency of their implementation in the enterprise for the purpose of designing a digital transformation of an enterprise. Thus, the key digital technologies are classified into 3 groups, are: 1) basic technologies are technologies without which digital transformation of an enterprise is impossible, e.g. cloud technologies, wireless technologies, paperless technologies etc. 2) critical technologies are technologies which provide a complete digital transformation of the enterprise, e.g. big data, cloud computing, unmanned technologies etc., and 3) breakthrough technologies are technologies which realize the transition to a digital enterprise from an analog enterprise, e.g. artificial intelligence, neural networks, distributed data registry, machine learning, etc.

Keywords: enterprise competitive, introduction of digital technology, Russian enterprises

Introduction

Modern digital technologies, in the paradigm of the development of the world economy, are considered as the main productive resources which determine the growth of social welfare. Above all, the use of the real sector of the economy of modern computer and information system by the organizations and enterprises is the most significant condition for the effective functioning in the digital economy. To accelerate the efficiency and sustainability of its function through dramatic changes in the quality of management, digitalization of an enterprise is necessary in both technological processes and decision-making processes at all level of management. Modern research, however for the most part, does not sufficiently reveal the essence of such categories as ‘digitalization’ and ‘digital transformation’; today mechanisms for assessing the effectiveness as well as feasibility to initiating the economic digital technologies in the activities of enterprises and organizations have not yet being formed. Paying tribute to the significant contribution and research result of scientists and specialists in the field, due to the significance of further research in order to achieve economic entities at various levels of sustainable development, question of the methodology of the digital transformation of enterprises is still continue in this area.

Literature review

It can be noted, after analyzing modern research on digital technologies, that the lack of unity of authors regarding the

definition of the necessity of such key concepts as ‘digitalization’, ‘digital transformation’ and ‘digital organization’.

According to Plotnikov V.A, digitalization means the modern stage in the development of information, characterized by the predominant use of digital technologies for the generation, processing, transmission, storage and visualization of information that is due to the essence and dissemination of new hardware and software ^[12]. Moreover, a lot of advantages have been given by the author in his opinion that when using digital technologies, enterprise receive the following advantages:

- Due to the quick reconfiguration, dynamic changes in the characteristic of the production process, the flexibility of the production is accelerated which creates a Competitive Advantages and leads to potential production growth;
- For the stages of the life cycle of products, provide information integration from its development of disposal which allows to efficiently and comprehensively solving problems not only of optimizing products itself, but also of quality, environmental safety, creating new business opportunities etc. ^[12].

Digitalization of organization has been defined by the researchers Ananyin V.I., Zimin K.V., Lugachev M.I., Gimranov R.D. and K.G. Skripkin as ‘organization’s information in which the role of a locomotive of change is

played by the complementary asset of the computer capital including information system-data sources, data processing, transmission and storage systems, practices and processes of working with these systems, and data which generate information systems. Enterprises' digital information is transformed by the large-scale digitalization. A study conducted by Kitova O.V. and Briskin S.N. noted that the organizational strategy, operations and technology are affected by digital transformation of enterprises. They raise the following logics in favor of their discovery:

Firstly, Identification of best customer's experiences, managing unique business model and managing changes are focused by digital enterprise strategy.

2ndly, operational activities which include the integration of physical & digital entities, is a continuous progress and development as well as the creation of culture which motivates integrative innovation.

And finally, the flexibility and the use of full modern technological potential, including analytics, mobility and cognition etc. are involved by technology.

The researcher Arenkov I.A in his empirical study explores the impact of transformation on enterprises competitiveness discovered that in the process of digital information, enterprise goes through strategy of qualitative change which influence the development of production process, financial, material as well as information spheres of its activities.

According to researchers Ananyin V.I., Zimin K.V., Lugachev M.I an organization in which the assets of computer capital are the most volatile complementary asset of an organization is called digital organization.

The authors further give sign of digital organization:

- Digital products: The whole content of products is shifting to digital form from material one. The material form of the product is not disappeared at the same time as without digital representation the use of product become impossible. It's called 'digital double'. For example, in engineering, the main value will begin to be represented by the electronic model of the products instead of material products itself and documentation of it. With many services which also become digital products, the electronic layout of product is overgrown;
- Digital business model: Combined with the continuous monitoring of all its elements and processes, the possibility of using the 'digital double' of the supplied, sophisticated equipment has led to the emergence of fundamentally new business models. Together with deep digitalization of all internal value chains of an enterprise, creating close partnerships among the businesses and all of its counterparts is required for digital business model. The creation of a common integrated information and communication space is the most important element of such a deep partnership;
- Digital value of the management: The digital organization business specializes and integrates into a deep cooperation network with all of its counterparties and customers. An organization is embedded in value chains in the market in this network. Along with the level of organization itself, business management is necessary at the level of the entire value chain in the market in this case. A general contractor, an experimental design bureau, component manufacturers, is the examples of value chain of mechanical engineering. Each organization is independent, but enters into many chains at the same time and therefore

must coordinate its operational activities together with its interactions with all participants in each chain. A lot of global companies have begun to create business platforms in recent days. Business platform is a company's business model on which company's counterparties can rapidly buildup value chain, attracting more and more new participants, while the company itself receives a mechanism to manage these chains;

- Digital business process: The process of conducting a digital product itself has become digital. This is particularly an evident in the case of document only using special applications.

Users, in the case, can work with a digital document only using special application, the logic of coordinating the actions of these users also required special application and data at the same time [3].

So, summarizing the approaches, the authors' definitions of the studied economic categories have been formulated as follows:

- digitalization- the process of introducing modern digital technologies into the production process and the process of managing the enterprise;
- digital transformation-a qualitative chain in the strategy and business processes of the enterprise under the influence of large-scale digitalization of the production process and the process of managing the activities of the enterprise;
- a digital organization is a digital double of a physical enterprise formed as a result of its digital transformation.

The mutual mediation of the studied categories is schematically presented in Figure 1.

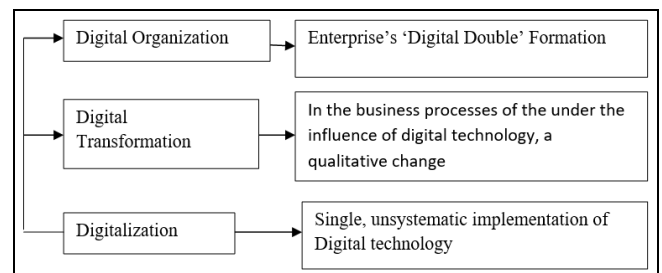


Fig 1: Stages of the introduction of digital technology in the enterprise.

To accelerate enterprise's competitiveness as well as provide conditions for increasing the economic efficiency of production activities is the main goal of a digital transformation of enterprise, is our opinion. In accordance with the goal of the task of digital transformation, enterprise can be defined as follows:

- Organization of production of competitive products
- Achieving high degree of efficiency, production adaptability as well as organizational processes
- Accelerating enterprise's investment attractiveness
- Enhancing the management system's flexibility and transparency

Enterprise, in the process of digital transformation, goes through stages of qualitative change which are reflected in the improvement of processes in the production, financial

and material, information spheres of its activity, which allow adapting to modern conditions of economy and consolidating competitive advantages^[13].

Challenges, in the process of enterprise management, arise related to the growing share of intangible component in the final cost of goods, combined with the increasing ease of access to digital technologies, platforms and advanced technologies as well as marketing, which will affect the level of competitiveness associated with what place in the digital ecosystem is occupied by the enterprise. In the production process and the process of managing enterprise, the introduction of digital technologies has become an objective requirement which ensures its survival and is not so much a competitive advantage as a vital necessity, a mandatory requirement for competition.

The digital transformation of an enterprise, as a theoretical concept, based on the following theoretical and methodological principles:

- N.D. Kondratie and G. Mensh's cyclic development
- J. Schumpeter's innovations
- Technological dynamics and economic growth which are based on idea of the concept of modernization as a process of changing technological structures
- The evolutionary approach in economic science^[11]

As a practical activity of enterprise, taking into account of modern technological requirements, digitalization is based on the terminology of the 3rd industrial revolution which has not been fully formed due to the speed and scale of modern change and following 4th industrial revolution:

- Industry 4.0-the concept of digital enterprise's creation based on the digitalization of all enterprise systems as well as their integration into digital ecosystem along with partners involved in the value chain;
- C. Anderson's the new industrial revolution- the concept of mass customized production with the possibility of an interactive exchange of ideas and developments;
- based on the development of 3D-design and 3D-printing and the use of additive technologies;
- K. Schwab's the 4th Industrial revolution-the concept of transition from simple digitalization:
 1. innovation on the basis of combinations of technologies
 2. information platforms which combine supply, demand and violate existing production structures
 3. new business model and organizational forms, e.g. sharing economy as well as on-demand economy
 4. P. Marsh's the 5th industrial revolution-in developed industrial nations a new industrialization of economy which will affect industry around the world.

Moreover, in practice enterprise's digital transformation, there are also the following concepts:

- Industrial Internet
- Connected enterprise
- Smart manufacturing
- Smart factory
- Internet of everything
- Internet of things for manufacturing

Thus, for the formation of an effective, sustainable as well as competitive production, the digitalization of enterprise is one of the key areas. The worldwide introduction of digital technologies in the enterprise's activities lead to its full-

fledged digital information which under the influence of large-scale digitalization of the production process and the process of enterprise management is proposed to mean a qualitative change in the strategy and business processes of enterprise.

The production system, by dint of digital transformation, has reached a different, more high-tech level of production and a high level of controllability and functioning, while changing to a more flexible system from the old one. In the restructuring of production facilities, the essential of the digital transformation of enterprises is manifested, changing the goals and objective, the formation of new approach to the methods of production and management of enterprises.

The essential component of the digital transformation of enterprises is manifested in the restructuring of production facilities, changing the goals and objectives of their activities, the formation of a new approach to the methods of production and management of enterprises.

Methodology

In production management, modern technology plays a very significant role and gradually expands their influence on all other sectors of global economy. In the use of digital technologies in production, the following main technologies are identified by the Eurasian Economic Commission.

- In production facilities, mass introduction of smart sensors
- Human labor is being substituted by mass introduction of smart sensors
- Storages, proceedings as well as information management on 'cloud' resources
- The effective and efficient utilization of end-to-end automation, horizontal and vertical integration of production & management processes into a single information system
- To form analytics for the purpose of making management decisions, the effective use of structured and unstructured information
- For technical documentation and electronic document management, the use of common digital standards
- The introduction of digital design & modeling of technological processes, objects, products, total control on complete life cycle of an industrial product from generating ideas to operation, further services, repair and disposal
- Instead of stamping and casting, the proper application of additive technology
- For the automatic order of raw materials, consumables as well as component for the production of products, the use of global digital platform
- In transport systems including delivery of goods, the use of unmanned technologies
- For monitoring, control as well as management of production processes and industrial flows, the use of mobile technologies
- For the automatic delivery of finished products to the customer, bypassing the chain of intermediaries, the transition of the sale of goods through digital platform (2)
- From the technological and technological issues, experts signal out basic digital technologies which are promising for implementation in the enterprise, among them:
 - Industrial Internet of things

- Artificial intelligence
- Big data
- Fuzzy computing
- Robotization
- Paperless technology
- Mathematical modeling
- Cyber physical systems
- Additive
- Unmanned
- End-to-end technology
- Identification technology
- Quantum
- Block chain technology
- Technology of open production (2)

Over the past decades, the analysis of digital strategies and measures adapted by the world community shows that in the field of digital transformation of industry technological trends characterizing a change in production paradigms within the framework of the 4th Industrial Revolution. The factors can be grouped in the following order:

1. The formation of end-to-end automation & integration of production as well as management processes into a single information system
2. In physical element and objects of production lines, a mass introduction of smart sensors
3. For storing information and performing calculations the effective use of cloud technologies
4. The introduction of robotic technologies
5. The creation of analytics using technology of big data [7]

A number of strategic documents have been developed with a view to intensifying the digital transformation of enterprises in Russian Federation. Thus, the strategy for the development of information society in the Russian Federation for 2017-2030 was approved by the decree of the President of the Russian Federation dated 09.05.2017 No. 203 [1].

It is necessary to develop a classification of digital technology according to the criterion of accessibility and expediency of their implementation in the enterprise for the purpose of designing a transformation of an enterprise. So, the key digital technologies are combined into 3 groups, are:

1. Basic technologies-are technologies, without which digital transformation of an enterprise is impossible, e.g. cloud technologies, digital communication technologies, paperless technologies etc.
2. Critical technologies-are technologies which provide a complete digital transformation of the enterprise, e.g. big data, cloud computing, unmanned technology etc.
3. Breakthrough technologies-are technologies which implement the transition from "analog" to a digital enterprise, e.g. artificial intelligence, neural networks, distributed data register etc.

The following types of models of digital transformation of an enterprise can be determined: Process, industry, technology, matrix, when summarizing the main approaches

to digital transformation of industry (Figure 2).

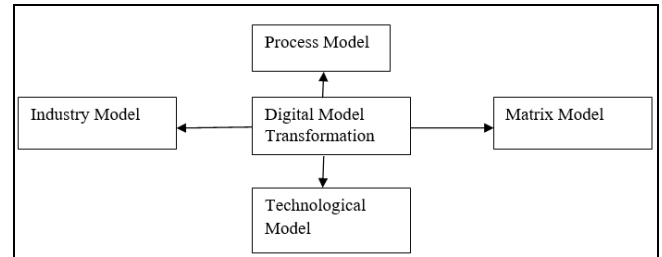


Fig 2: Types of models of digital transformation of the enterprise.

The process model of digital transformation builds a series of digitalized elements of the value chain, for example, first a digital center for research and development first and a digital factory, a digital warehouse, digital transport and electronic commerce etc. then.

When direction production takes the position of an equal object in the value, the objects of the chain interact sequentially. On the basis of the unified data management systems, digital factory is understood usually as an integrated complex of digital models, methods and tools interconnected. The integrated planning, evaluation as well as continuous progress of all of the basic structures, processes and resources of the enterprise is the key objective of a digital factory.

There is no need to build a specialize lines for the production of certain categories of products with decentralization and virtualization of resources. "For the digital transformation of industry, the first tools can be creation of a Eurasian technology transfer network and a Eurasian network of industrial cooperation and subcontracting"- noted in the EAEC Informational and Analytical Report [2].

Digital transformation of an enterprise's industrial model is based on industry approach and the links of industrial enterprises with enterprises of other sectors of national economy. It is planned to create a digital infrastructure and organize functional interactions between its elements within the framework of this model: a digital production system, food and water delivery, smart energy generation system, effective and efficient distribution of energy system, smart factories, smart homes, unmanned automobile system, unmanned aerial vehicles, digital financial technology, digital telecommunication, electronic commerce, e-ob azovanie digital culture interact with each other by functional relations and mutual requests. The TechNet direction is highlighted in the model as the most important element [9]. In the digital transformation of an enterprise, the construction of a technological model is based on the priority use of certain technical and technological tools of global trends. The growth of significance rapidly in innovation technologies including digital design and modeling of technological processes and objects, big data analysis, machine learning and artificial intelligence technologies leads to the formation of a digital transformation technological model in which production is managed by introducing a specific set of digital transformation technologies enterprises. To change condition, the growth of significance of these technologies also adapts the production system of the enterprise. The transition to digital trade in products using digital platforms for placing orders, consumables, raw materials and

equipment for the production and delivery of goods to the customers on time, bypassing intermediary chains, leads to resource saving and increased income for the enterprise.

The technological model has following advantages from the economic point of view: the introduction of a particular set of technological and technical components, e.g. industrial internet, digital platform for purchase and sale of industrial products, and sale of products to the customers.

The matrix model of enterprise's digital transformation is a system of matrices of 'goal-means' which allows to identify redundancy and duplication or on the contrary, the inefficiency of technological advancements and progress as well as scientific analysis in the objects of the model which combines objects by goals and objectives, such as the matrix 'Technology-research', The matrix 'Tasks-products, the matrix 'Products-technologies' etc. Thus, on the basis of the matrix and industrial models, the integration model of end-to-end digital transformation will make it possible to build an integration interdisciplinary digital network in the digital economy, in which the whole resources are accessible globally and remotely, and enterprises are digital production center for technological group which are created and interacted on the basis of the principle of openness provided by harmonious software support and access within the integration space.

Result and Discussion

The Russian Federation, according to the International Network Readiness index, is ranked 41st in the readiness for the digital economy and the country ranked 38th place in term of economic and innovative result of using digital technology. Based on the targets of digital economic program, the level of readiness of Russian enterprises for digital transformation has been assessed. The results of the analysis are the followings:

Evaluation Results

1. Broadband Internet is used by more than 70% of traditional and 90% of high-tech companies of Russian Federation. The indicator indicates as global trends.
2. For traditional organizations, the level of use of other data storage and processing services is significantly lower level whereas high-tech startups have a higher level.
3. Mobile internet is used by 52% of the traditional and 85% of the high-tech companies whereas services and data centers use 25% and 66% respectively and cloud services used 25% and 66% respectively. The indicators do not correspond to global trends.

Digitalization Level of Business

1. In Russian Federation around 65% of the traditional business enterprises and 80% of the high-tech startups are represented on the internet.
2. Full-fledged websites with detailed companies' information are available for less than 50% of companies whereas for products and services the accessibility is around 45% for the traditional and 58% for the high-tech companies. These indicators do not correspond to global trends.

Automation of internal Business processes level

1. Around 65% of the traditional and 70% of the high-tech companies use electronic document management.

2. Companies, to automate business processes, use non-specialize solution with a limited set of functions and an array of management solutions, the share of complex Information Technology (IT) solution is not more than 30%.

Development of Human Capital

1. Digital skills are below the average
2. Comparatively lower attention to the training of employees in the area of digital technologies is given by the Russian companies.
3. Higher level of activities is shown by the high-tech startups in the area of digital technologies education programs are implemented to 35% of the respondents.

Informational Security

1. Information attacks which caused financial losses is faced by less the 20% of the companies in Russian Federation.
2. Companies do not have effective technologies to counter information attacks. Around 35% of the Respondents rate threats in the area of information security as probable.

Service and regulation digitalization

Public services in electronic form are used by around 55% of the traditional and 65% of the high-tech start-ups whereas these rate as positive by 30% of the companies and negative by a mere 7% of the companies.

As the result of the analysis the pace of digital transformation of Russian enterprises lags behinds the global trends.

Conclusion

In the Ever-Competitive global arena, digitalization is a strategic development priority in both developing and developed countries. Likewise, the objective of strategies and state development programs of the Russian Federation, digitalization of the economy is priority. However, in the international network readiness index Russia still lagging behinds of leading countries such as Singapore, Finland, Sweden, Norway, and the USA. Indicators of the use of internet and computer network in the organizations of Russian federation have positive dynamics though the level is still insufficient to achieve the goals and objectives of the transition to a digital economy.

References

1. Strategies for the development of the information society in the Russian Federation for 2017-2030 <https://www.prlib.ru/en/node/675250>
2. Analysis of world experience in industrial development and approaches to the digital transformation of industry of the member states of the Eurasian Economic Union. Information and analytical report <http://www.eurasiancommission.org/>
3. Ananyin VI. Business Informatics,2018:2(44):45-54.
4. Arenkov IA. Russian Entrepreneurship, 2018:19(5):1711-1722.
5. Yu O. Ermolovskaya, Economics and Management: Problems, Solutions,2018:4(4):73-76.
6. Kandalintsev VG. Eastern analytics,2019:1:35-41.
7. Kolmykova TS. Bulletin of the Southwestern State University. Series: Economics. Sociology.

- Management,2019:9(1):57-64.
8. Kolmykova T, Lukianykhina O, Baistriuchenko N, Lykianykhin V. Problems and Perspectives in Management,2015:1:203-207.
 9. Maksakova, Economics and Management: Problems, Solutions,2018:5(4):5-8.
 10. Obukhova AS, Pavlova OA, Chernykh YV. Region: systems, economics, management,2019:3(46):23-30.
 11. Parasotskaya NN. Exchange of intellectual property, 2018:17(8):13-18.
 12. Plotnikov VA. Proceedings of St. Petersburg State University of Economics,2018:4(112):16-24.
 13. Pochebut, Actual problems of the modern economy,2018:9:303-305.
 14. Kitova OV. Digital Transformation of Business http://digitaleconomy.ru/images/easyblog_articles/320/kitova.pdf
 15. Ziyadin S, Litvishko O, Dubrova MG. Smagulova, & M. Suyunchaliyeva, International Journal of Civil Engineering and Technology,2019:10(2):1055-1070.
 16. Ziyadin S, Suiubayeva S, Utegenova A. //Lecture Notes in Networks and Systems 84. P. 408-415 DOI: 10.1007/978-3-030-27015-5_49 (2020)