

Transforming the Quality Management System of a Digital Company

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Abstract

This article concerns the study of transformation processes in quality management systems of companies under the influence of digital technologies. The formation and development of digital companies, as drivers of digital transformation of the economy, stacks up with a number of external and internal organizational problems. In particular, the transfer of product chains to the digital space is hampered by the insufficient level of development of automation processes, the lack of the necessary infrastructure and the degree of cooperation of stakeholders, and the low level of IT literacy of employees. First of all, the solution of the highlighted problems is hindered by gaps in the field of knowledge about the mechanisms and directions for improving product quality, increasing efficiency and effectiveness in quality management systems and forming the competitive advantages of a digital company. In this study, an attempt is being made to eliminate this gap, which caused the need to study three aspects in the development of quality management systems of companies under the influence of digital technologies: first, to study the changes in the nature of cooperation of stakeholders of a digital company in the quality management system; secondly, the development of tools for assessing the cost of these transactions of a digital company; thirdly, the study of methods to increase the efficiency of the formation of competitive advantages of a digital company with new forms of cooperation of stakeholders in the quality management system, as well as the identification of risks and threats of digital transformation of quality management systems.

Keywords: digital companies; quality management system (QMS); risks and threats; added value of the company.

1. Introduction

The formation and development of the digital economy in our country affects all spheres of public life. The transformational processes of digitalization are most clearly manifested in the change in business models of modern enterprises and organizations. Digital companies are becoming the driving forces behind the digital transformation of the economy. The term 'digital company' has appeared relatively recently and was originally used in relation to the IT business. Currently, a digital company can be called an enterprise or organization in which the main source of growth in profitability and competitiveness is computer capital. Computer capital is a supporting and connecting link between other company capitals (organizational, financial and human) based on the formation of platforms for conducting business activities (software, information systems, storage and processing systems, as well as information protection). The most important attribute of a digital company is the creation of an informational 'clone' of an enterprise or organization on the network, as opposed to automation, which made it possible to simplify the work of the company. With the help of digitalization of the company, the physical economic activity is transferred to the digital space [2., p. 45-54].

When introducing digital technologies in companies, it is necessary to take into account the specifics of their economic activities. Currently, quantum technologies, neurotechnologies, distributed ledger systems, wireless communication technologies, digital production technologies, quantum technologies, robotics and sensorics components are widely implemented. The degree of use of new digital technologies in Russian companies is shown in Figure 1.

The emergence of new digital technologies is modifying consumers' preferences, the way products and services are purchased, stored, used and disposed of, and the way they are produced and delivered. Currently, modern enterprises and organizations are increasingly using and developing digital technologies, such as artificial intelligence, Internet of things, chat bots, virtual and augmented reality, blockchain, which form a new landscape of economic activity and changes the nature of relationships in the quality management system (QMS), as well as the structure of transaction costs. As can be seen from Figure 1, by 2020, in general, a small number of companies are introducing new digital technologies into their activities. The reasons for this may lie in such aspects as: first, low demand for products which were created using digital technologies; secondly, weak financing of digital business transformation projects; thirdly, the

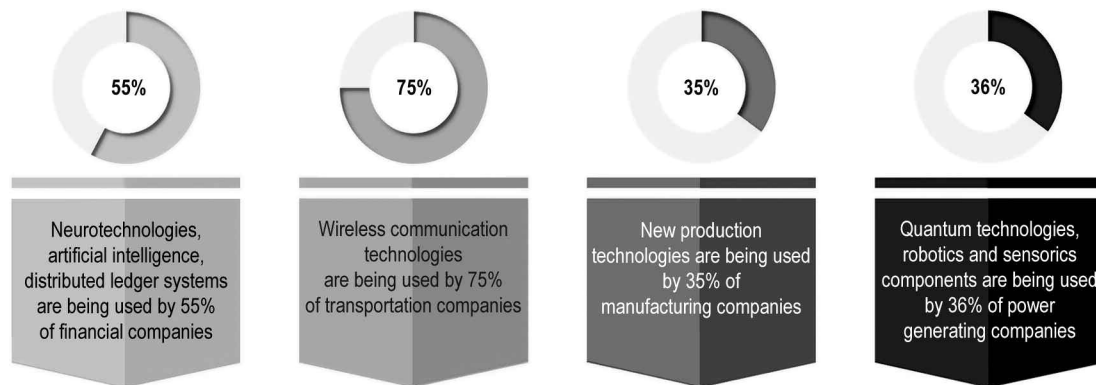


Figure 1. The degree of use of new digital technologies in Russian companies, % of companies for 2020

gap in the speed of digital transformation of the economy and companies [6., p. 24]; fourthly, problems within companies associated with insufficient level of development of automation processes, lack of necessary infrastructure, low level of IT-literacy of employees [7, p. 184]. The elimination of the above imbalances in digital development within the company, as well as between various subjects of economic and public life, is the main task of the effective implementation of the digital economy development program.

The digital transformation of companies especially affects the quality management system. In the course of studying transformation processes in quality management systems of companies and under the influence of digital technologies, several modern concepts can be distinguished that give an understanding of their essence and content:

1. The concept of noonomics explains the general trend in the development of production, which consists in a significant decrease in the attraction of material resources (natural, raw materials and materials, natural energy) for its manufacture. At the same time, the role of more and more complex tools and knowledge necessary and used in its production increases sharply in the structure of production [3, p. 50];
2. The concept of wikinomics describes the emergence of new forms of mass cooperation in the invention, production, promotion and distribution of goods at different levels of the market using low-cost collaboration tools (Internet telephony, open access programs, etc.) [10, p. 25-78];
3. The concept of econotronics and "cellular economy" form the institutional design of transactions in a digital company and methods of their institutional modelling [8, p. 4-7];
4. The concept of a shared economy is a model of reasonable management, in which consumers of products or services actively participate (form their share of participation) in the development of these products or services [9., p. 767];
5. The concept of decamling, explains the tendencies of the dematerialization of production, the need to reduce the consumption of material resources in the activities of economic entities.

The highlighted modern concepts and theories explain that the use of digital technologies helps to replace the relationship between the company and the consumer, as well as other interested parties, for the formation of economic transactions between equal participants in the relationship. So, we can conclude that this area of scientific research is of great interest. In particular, the issue of studying changes in quality management systems creates the need for additional study of the nature of cooperation between stakeholders of a digital company in the quality management system, research of methods to increase the effectiveness of the formation of competitive advantages of a digital company with new forms of cooperation of stakeholders in the quality management system, as well as identification of risks and threats of quality management systems' digital transformation.

2. Materials and Methods (Model)

Within the framework of the article, the authors assessed the nature of cooperation between stakeholders of a digital company in the quality management system; the effectiveness of the formation of competitive advantages of a digital company with new forms of cooperation of stakeholders in the quality management system, as well as the identification of risks and threats of digital transformation of quality management systems.

When assessing the effectiveness of a model of a quality management system for digital companies, the value added coefficient (VAC) should be calculated. It is the growth of the added value of products that serves as an indicator of increased production efficiency and, as a result, the profitability and competitiveness of the company. An increase in the added value of products is facilitated by a decrease in production costs. The value added coefficient of production of material resources (computer capital) and intangible resources (human capital) is proposed to be calculated by the formula:

$$VAC = CEE + HCE + SCE \quad (1)$$

where, CEE (Capital employed efficiency) is the added value of physical capital, measured by the ratio of value added to investment capital and showing the amount of added value of one unit of physical capital;

HCE (human capital efficiency) is the added value of human capital, determined by dividing the added value by labour costs and showing the ability of the labour force to create added value;

SCE (structural capital efficiency) – structural capital has an inverse relationship to human capital and is calculated by the ratio of the difference between value added and human capital to value added.

When calculating the value added coefficient, it should be understood that the growth rate should be maximum and increase from year to year. According to the results of a study by KPMG, a direct correlation was found between the volume of investments and the waiting time for a return. The more resources are invested, the higher the expected rate of return, the average payback period should be no more than 3 years. So this ratio of transaction costs and gross income can be expressed in the formula:

$$\max(R; IC) = \frac{\Delta R}{\Delta IC} = 1 \quad (2)$$

where, ΔR is the rate of growth of transaction costs; ΔIC is the rate of growth of gross income.

According to formula 2, the rate of increase in transaction costs should be equal to the rate of increase in gross income. Thus, an increase in IC costs by 1% should lead to an increase in income by 1% [8].

3. Results and Discussion

The modern quality management standard ISO 9000-2015 identifies several interested parties (stakeholders) involved in the process of creating the quality of a product or service: owners, consumers, suppliers, staff, regulators and bankers, labour market, partners or competing communities, science community, investors. Stakeholders are resource owners in a cooperating team created by concluding formalized and non-formalized agreements, the purpose of which is to obtain cooperative income through the implementation of a separate transaction through an appropriate permanent form of management [5]. In the QMS of a digital company, stakeholders combine their individual production advantages and in this way, through cooperation, achieve a higher level of profit than if they disposed of their resources individually. Co-production of a product or service means that stakeholders, through a specific fusion of resources and competencies, gain a competitive advantage, which in turn leads to the fact that cooperative

income can and should be distributed among stakeholders in accordance with the contribution of resources made by each of them. When considering the issue of identification and prioritization in the relationship of stakeholders, the problem of identifying all those who are potentially "involved" arises [11., p. 47-48]. According to Freeman's concept, all the stakeholders can be divided into the primary (definitional) – these are the stakeholders with whom the company has a contractual relationship and they are responsible for the formation of added value, and secondary (instrumental) ones – stakeholders, the contract with whom can be established or potentially they can participate in the formation of added value [1].

Table 1 clearly shows that as part of the transition from the "supplier model" to the "ecosystem driver model" in a digital company, the instrumental (secondary) stakeholders are transferred to the definitional (primary) category. The categorization of priority in relations with stakeholders in different models of the QMS of a digital company allows for a more objective assessment of the cost of transaction costs.

Stakeholder	Category of stakeholders in QMS models of a digital company			
	Supplier	Omnichannel	Modular Manufacturer	Ecosystem Driver
Business Owner	Definitional			
Personnel	Instrumental	Definitional		
Consumers				
Suppliers	Definitional			
Regulatory Authorities	Instrumental	Definitional		
Banks				
Partners and scientific community				
Investors	Definitional			

Table 1. Priority of stakeholders in different models of quality management systems for digital companies

There are the following types of transaction costs and the nature of their change during the transition from the "supplier model" to the "ecosystem driver model" of the QMS of a digital company:

- ❑ The costs of working with information flows are increasing, a more detailed and large-scale analysis of the market and customer needs is required for their fuller satisfaction and selection of a supplier;
- ❑ The costs of concluding contracts can be reduced by saving the legal costs of completing the transaction, costs of negotiations when using digital communication channels, online presentations for ecosystem participants;
- ❑ The costs of producing and promoting a product or service may increase due to the development and updating of channels of interaction with the consumer, updating programs and upgrading the product or service;
- ❑ The costs of opportunistic behaviour of ecosystem participants are reduced due to a more complete understanding and reflection of the contribution of each participant to the final result;
- ❑ The costs of control and motivation can be reduced due to the savings from reducing the opportunistic behaviour of stakeholders;
- ❑ The costs of a digital company on strategic planning are increasing because it is constantly necessary to monitor customer needs, modernize the systems for using technical resources to improve the quality of work, introduce new technologies and equipment, and train specialists.

In a digital company, product quality is shaped more by the technical sphere than by natural and material components. The technical sphere includes the conditions for the implementation of production activities – knowledge, skills, relations between stakeholders in the production process. Accordingly, the quality of a product in a digital company can be determined by its complexity, determined by the multiplicity of stages of its production and processing and the corresponding volume of knowledge embodied in it [3].

In these conditions, the process of interaction of stakeholders in the process of creating the quality of products of a digital company changes significantly. There are four models of transformation of quality management systems for digital companies: "Supplier model"; "Omnichannel model"; "Modular manufacturer model"; "Ecosystem driver model" (Fig. 2) [4., p. 18-25]. Each of them has specific features of interaction between stakeholders, delineation of their priority for the company, as well as different ways of forming financial indicators of a digital company (Table 1).

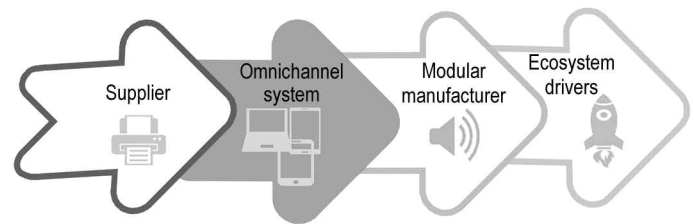


Figure 2. Directions of transformation of digital companies' quality management systems

The models of transformation of quality management systems of digital companies highlighted in Figure 2 in their classification basis have two components – awareness and the consumer, his goals, needs, features and the level of control over value chains. The supplier model is used by manufacturing companies selling their products through other companies, the impact on the consumer is minimal, the number of transactions is minimal (for example, the sale of household appliances through a dealer network). In the omnichannel model, an integrated value chain is used, a multi-product, multi-channel customer experience is created basing on the analysis of events in the life of a consumer. In such companies the relationship with the consumer is "appropriated" (for example, the sale of insurance, banking services). Companies with a modular manufacturer model use omnichannel system and are able to adapt to any system of economic relations and "integrate" into it (for

example, the PayPal electronic payment system). The most advanced in terms of leveraging customer experience and controlling the value chain is the ecosystem driver model. As an ecosystem driver, a digital company itself forms a knowledge base about the client, selects a supplier for the client's requests and regulates the interaction of stakeholders within the value chain and distributes cooperative income between the participants in the relationship (for example, online stores).

In a digital company, the development of quality management systems is moving towards a transition from a "supplier model" to an "ecosystem driver model". The change occurs in two planes. There is a concentration of control over the value added chains from the network interaction of stakeholders and an increase in awareness of the consumer, his needs and stages of the life cycle, which leads to better contact with him. In the ecosystem driver model, it becomes necessary to individualize the consumer properties of a product or service, which entails a transition from a simple offer of products or services to

solving problems and satisfying the needs of a particular consumer.

According to the data obtained, from a theoretical point of view, with the transition of the company to the ecosystem driver model, the transaction costs of the participants in the relationship increase to a greater extent. At the same time, from a practical point of view, the issue of the development of performance indicators for the application of a particular model of quality management systems for digital companies, taking into account the cost of transaction costs, is being actualized. Viewing the company as a unity of stakeholder resources, effectively identifying and prioritizing and managing these resources and knowledge becomes a prerequisite for the company's competitiveness and its ability to create added value and cooperative income.

The results of calculating the value added ratio for various models of quality management systems in different types of digital companies are presented in Table 2.

Company	Main activity	Sample QMS model	VAC	
			2018	2019
JSC "NPP" Contact	Production of powerful vacuum electronic devices for television, long-range space communications	Supplier	-1.84	-1.86
PJSC "Sberbank of Russia"	Monetary intermediation	Omnichannel	4.49	5.35
YANDEX LLC	Computer software development	Modular manufacturer	0.21	0.29
LLC "WILBERRIES"	Retail trade carried out with the help of ICT – the Internet	Ecosystem Driver	5.10	6.20

Table 2. Results of VAC calculation in QMS of digital companies

In our opinion, it is impractical to compare the effectiveness of the models of the quality management system with each other in terms of the value added coefficient due to the fact that the companies represented differ in different sizes, specific activities and other characteristics. However, according to the results of the calculation, it can be seen that the growth rate of VAC for each model of the quality management system of a digital company increases. Therefore, there is a positive effect of increasing the rate of cost recovery and income generation.

The most advanced companies in terms of control over the value chain and customer experience are those using the ecosystem driver model. As an ecosystem driver, a digital company itself forms a knowledge base about a customer, selects a

supplier for customer requests and regulates the interaction of stakeholders within the value chain and distributes overall income between the participants in the relationship (for example, online stores). The main directions of digitalization of companies and the risks when using different business models are presented in Table 3.

According to the data presented in Table 3, it can be observed that with the transition from the "supplier" model to the "ecosystem driver" model and the growth of the added value of the participating companies, the possible negative impact of economic security risks associated with the underdevelopment of digital tools and competencies may increase as well as risks in formation of digital infrastructure.

Characteristics	Business models of digital companies			
	Suppliers	Omnichannel system	Modular manufacturer	Ecosystem Driver
Examples of digital companies	JSC "NPP" Contact	PJSC "Sberbank of Russia"	"YANDEX", LLC	"WILBERRIES", LLC
Directions for the introduction of digital technologies	Implementation of digital tools	Implementation of digital tools and development of digital infrastructure	Implementation of digital tools and development of digital infrastructure, formation of digital competencies	
Potential risks to economic security	Risk of insufficient development of digital tools	Risks of insufficient development of digital tools and digital infrastructure	Risks of insufficient development of digital tools, competencies and digital infrastructure	

Table 3. Risks and threats to economic security in different QMS models

Today, only 20% of enterprises and organizations have a clear business digitalization strategy, which includes not only digitalization directions, but also the effects the company receives from the introduction and use of digital technologies in the short and long term. Of the 80% of companies that have a website and use cloud services and broadband, most use it to search for information and transfer files, only 40% use Internet technologies for business development, employee training, negotiations and meetings, and only 8% of companies use it for developing business processes and stakeholder interaction [6., p. 44-51].

Modern enterprises are not sufficiently involved in ensuring economic security, in particular information security. According to statistics [6., p. 44-51], organizations pay special attention to updating anti-virus programs (87.8% of organizations) and introduction of electronic digital signatures (83.7% of organizations). To a lesser extent, organizations are implementing spam filters (59.3%), encryption tools (51.3%), biometric user authentication

tools (5.7%), which indicates the risk of underdeveloped digital tools to combat and prevent risks in modern organizations.

It is clear that today we need people who can not only drive digital transformation, but also develop new business models for digital enterprises. Thus, digital transformation and the emerging digital economy require new specialists with different skills and key competencies, which inevitably entails reforming the education system, the emergence of modern educational institutions and the proposal of relevant training programs in the educational services market. Based on the results of an assessment of personnel risks, it was revealed that they currently constitute a significant threat to the economic security of digital companies. These risks include an insufficient number of specialists in the labour market in professions related to digital technologies, an insufficient level of automation of work functions in modern companies and organizations, the absence of programs for attracting and retaining talents in companies, companies developing digital competencies of employees [6., p. ... 152].

4. Conclusions

Summing up what has been analyzed and mentioned in this study, the following theoretical and practical results are being obtained:

A. The digitalization of companies is taking place in two dimensions, characterized by: firstly, the growth of control over the value added chain within the ecosystem based on increasing awareness about the consumer and establishing better contact with him; secondly, the individualization of consumer properties of products, transition from mass production to a proposal to satisfy specific consumer needs, solve a problem or achieve a specific goal. The process of digitalization of companies is characterized by the transition from the "supplier" model to the "ecosystem driver" model. Secondly, as part of such a transition the instrumental (secondary) category stakeholders are transferred to the definitional (primary) category, which increases the transaction costs for the constant updating of communication channels, software, modernization of products or services, work with large information flows.

B. A digital company acting as an "ecosystem driver" uses

an expanded list of digital technologies, including the development of digital infrastructure, the introduction of digital tools and the formation of digital competencies, which can reduce the costs of concluding deals, negotiations, opportunistic behaviour of stakeholders, since each of ecosystem participants is interested in creating added value.

C. When a company moves to the ecosystem driver model, there is a greater increase in transaction costs of the participants in the relationship. The growth rate of added value increases with each model of the quality management system of a digital company. Therefore, there is a positive effect of increasing the rate of cost recovery and income generation.

D. With the transition from the "supplier" model to the "ecosystem driver" model and the growth of the added value of the participating companies, there may be an increase in the possible negative impact of economic security risks associated with the underdevelopment of digital tools, competencies and digital infrastructure. In this regard, the issue of identification, assessment and minimization of the negative impact of risks and threats to economic security for a digital company is being actualized.

References

- [1] Freeman, R.E. (1984). *Strategic management: A stakeholder approach*. Boston, MA: Pitman. Freeman, R.E. 2004. The stakeholder approach revisited. *Zeitschrift für Wirtschafts- und Unternehmensethik* 5: 228-241.
- [2] Ananyin V.I., Zimin K.V., Lugachev M.I., Gimranov R.D., Skripkin K.G. (2018). Digital enterprise: transformation into a new reality // *Business Informatics*. No. 2(44). S. 45-54.
- [3] Bodrunov S.D. (2019). *General theory of noonomics. / textbook / - M. : Cultural revolution*. p. 48-51.
- [4] Wile P. (2019). *Digital business transformation: Changing the business model for a new generation organization / Peter Wile, Stephanie Warner; translated from English - M. : Alpina Publisher*. 257 p.
- [5] GOST R ISO 9000-2015. *Quality management systems. Fundamentals and vocabulary*. Standardinform. 2020 . 47 p. P. 6.
- [6] Abdrakhmanova, K. O. Vishnevsky, L. M. Gokhberg and others (2020). *Indicators of the digital economy, Statistical collection / G. I.; National Research University "Higher School of Economics"*. - M. : NRU HSE. 360 p.
- [7] Manakhova Irina, Levchenko Ekaterina, Bekher Veronika, BystrovAndrey (2020). Quality of human resources and personnel security risk management in digital economy // *Quality-Access to Success*, Vol. 21, No. 175, pp. 74-79.
- [8] Popov E.V. (2018). *The theory of econotronics*. Preprint No. 04 (18). Ekaterinburg: Institute of Economics, Ural Branch of the Russian Academy of Sciences. 63 p.
- [9] Semyachkov K.A. (2019). Toolkit for the development of the institutional environment in the context of digitalization / K.A. Semyachkov // *UrFU Bulletin. Series: Economics and Management*. Vol. 18, No. 6, pp. 766-782.
- [10] Tapscott Don, Williams Anthony D. (2009). *Wikinomics*. Advanced Management Institute. BestBusinessBooks publishing house. p. 387 p.
- [11] Kharchilava Kh.P. (2013). Stakeholder management in the corporate governance system // *University Bulletin. Management Sciences*. No. 4. pp. 47-48.
- [12] Shcherbakov A.G. (2019). A new model for the functioning of a military-industrial enterprise in the implementation of digital technologies // *Economic aspects of industrial development in the transition to a digital economy, 12/2018 Materials of the International Scientific and Practical Conference*. Moscow. pp. 232-234.

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