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Increase of the Company Competitiveness in the Digital Economy

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Abstract

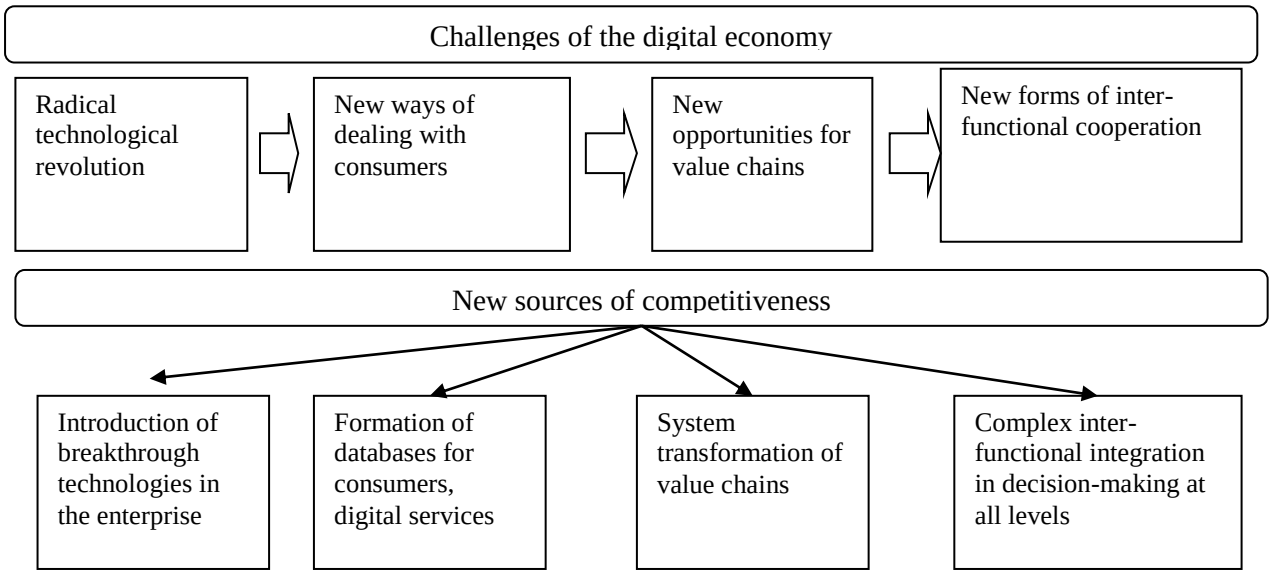
In the conditions of instability, globalization and digitalization of the economy, it is necessary to manage effectively the business processes of the organization and the data arriving at the organization or generated by it. With the transition to the new lifecycle phases in organizations, the number of business processes transforming the value chains is growing. Also during the life cycle of the organization, the amount of data is growing at all stages of the value chain. The article considers new competitive advantages that arise as a result of the system transformation of the chains under the influence of the development of the industrial Internet of things, introduction of smart devices that are integrated into larger complex systems. The complex structure of smart devices, presented in the article, creates the basis for the transformation of the whole enterprise, the organizational structure of management, the production system. Traditional approaches to ensuring competitiveness affect local changes in the value chain. Modern trends in ensuring competitiveness require complex scale transformations. The conclusion is that the current economic challenges, including radical technological revolution, new methods of customer relations, new ways of the value chains development, new forms of communication form the new sources of competitiveness of enterprises. Data and analytics become a new source of competitive advantages (Nurgaliyeva *et al.*, 2018).

Keywords: Competitiveness; Smart product; Digitalization; Value chain.

1. Introduction

From the standpoint of forming new competitive advantages, such challenges of the digital economy as a radical technological revolution, new ways of relationships with consumers, new opportunities for the development of value chains, development of the communication form the new sources of enterprise competitiveness: introduction of breakthrough technologies in the enterprises, creation of databases for the consumers, digital services, system transformation of value chains, complex cross-functional integration in decision-making at all levels (Potekhin, 2017).

Figure-1. The space of the sources of competitive advantages in the digital economy



Source: prepared by the authors

The search for new sources of competitiveness focuses not only in the scientific and technological and innovation spheres, but also in virtual eco-space, which forms new digital formats for intra-and inter-process interaction. The introduction of breakthrough technologies in the activities of the enterprise requires a revision of the strategy of enterprises, the choice of new forms of production systems and technologies (Rashitova *et al.*, 2017). System transformation of value chains occurs under the influence of the development of the industrial Internet of things, introduction of smart devices that are integrated into larger complex systems. The networked smart industrial

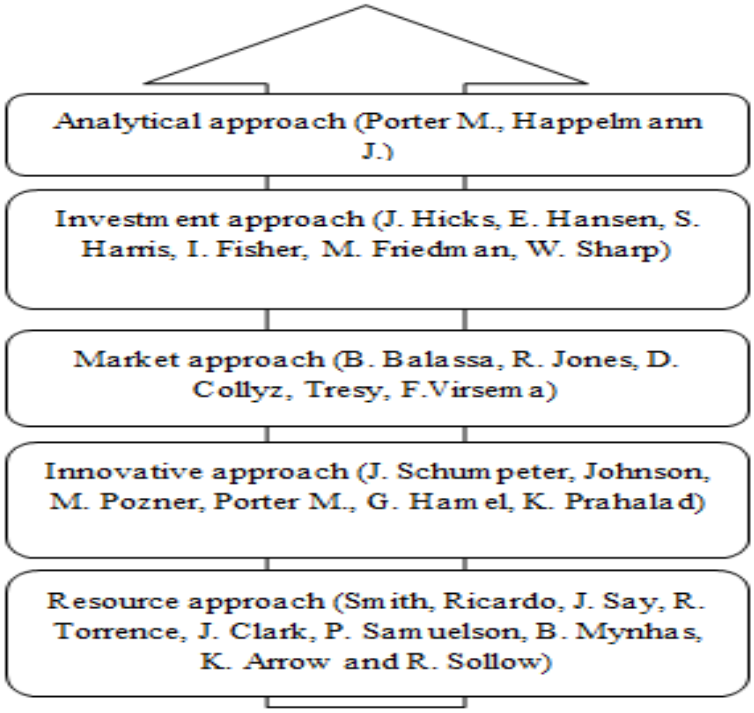
equipment optimizes its performance itself. Products evolve, even when it is in the service of the consumer. Relations between the firm and the customers - and its products - do not stop even for a minute. All these factors transform the value chains, creating new sources of competitive advantages. Smart product has three elements. This is hardware, software and cloud of the product. Hardware of the product – is a system of built-in sensors, processors, and a port for connection, supplementing traditional mechanical and electrical parts (Biktemirova and Demyanova, 2015)

The product software includes a built-in operating system and applications, an improved user interface and elements of the product management system. What important is the connectivity of the product - the ability to interact in the network. The product cloud assumes a system for collecting, systematizing, analyzing, monitoring and controlling of the information about the functioning of the product. This product structure assumes the appropriate infrastructure: user identification tools, product protection, connectivity, integration with external sources of information, with business systems. Smart product also has a digital twin - a three-dimensional virtual copy of the real thing. As data comes in, the twin shows - reproduces - how the physical object changes, how and in what conditions it functions. A real digital twin product allows the company to visualize the mode of operation and the condition of the equipment that is placed very far away. Thanks to digital duplicates, developers understand better how to improve the design, production, operation and maintenance of the equipment (Demyanova and Dimmieva, 2018).

2. Materials and Methods

The basis for ensuring the competitiveness of the enterprise are various economic theories and approaches (figure 2).

Figure-2. Evolution of approaches to ensure the competitiveness of enterprises



The resource approach for ensuring competitiveness is represented by the works of Zaidullina and Demyanova (2017). This approach is based on the comparative advantages resulting from the availability of production factors and their effective use in the production process. A wide range of competitive advantages is offered: labor, land, capital, security and labor productivity. The need to attract financial resources and their limitedness intensify the problem of evaluating and improving the investment appeal, which allows an investor provide insight into the state of an invested object, into reliability of future investments along with the expected outcome of their usage. The increase in investment is followed by creating new leading factors of competitive ability and developing modern infrastructure. John Hicks connected the competitive performance to quantum growth rate of productivity through additional investments. E. Hansen believes the growth of investment leading to rise in industry incomes. Thus, the various theories of competitiveness emphasize the local aspects of competitiveness. However, modern conditions demand a comprehensive and systematic approach (Antúnez, 2017).

3. Results and Discussions

Smart technologies provide the basis for new competitive advantages (see Table 1).

Table-1. Competitive advantages depending upon the competitiveness approach

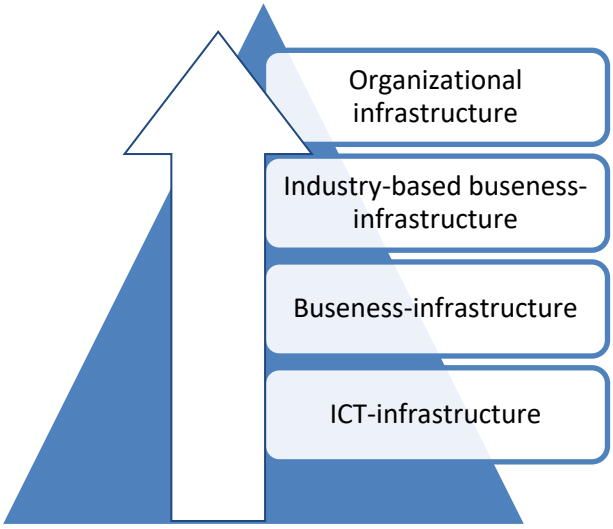
Approach	**value chain**			
	development	**production**	**marketing and sales**	**after-sales service**
Resource-based		effective and well-resourced		
Innovative	new mechanical systems development			
Market-based			consumers investigation, sales promotion	
Investment-based	access to investment			
Analytical	large complex systems development Low modernization costs Constant designing	Constant quality control Remote maintenance Ongoing production	New user interfaces New methods of consumers segmentation and equipment customization	Remote maintenance One-visit service Preventive maintenance New services

Therefore, a resource-based approach focuses on effectiveness and sufficiency of production resources being applied, an innovative approach – on development of new mechanical systems, a market-based approach – on marketing and sales promotion, investment-based approach – on increasing investment appeal of an enterprise (Porter and Heppelmann, 2014). The above-mentioned traditional practices enabling competitive performance affect only one change in one of the value chain stages. Analytical approach modifies the entire value chain. So as the approach to product development is being changed for complex integrated system, it has become much easier and cheaper to upgrade smart products; the development, design and improvement are of an ongoing nature now. The production of smart technology brings new demands and new opportunities. For example, the last stage of assembly – loading and configuration of software – can be done directly at the customer's. However, the headline is that the production now goes beyond creating a physical object: smart products require cloud systems for operation during their whole lifetime. There is also a need for change in the enterprise management system:

- Ensuring IT security of all departments at an enterprise;
- Staffing requirements of manufacturers are shifting from mechanical engineers to programmers, from the sellers of goods — to the sellers of service, from maintenance personnel — to those specialists able to provide technical support throughout the equipment life-cycle;
- Elaboration of new forms to encourage the personnel, such as flexible working hours, personal assistant services, periodic multi-month vacation, time to work on their own projects;
- Staffing and organizational support for new work types, such as all data management, building permanent relations with the consumers;
- Broad and deep cooperation, integration of IT and R&D;
- They start establishment of three new subdivisions: the combined data units, mixed groups of developers and producers (Dev-Ops) and units responsible for the fact that company's clients have succeeded owing to its equipment or services;

As the scale of changes is enormous, and there is lack of knowledge and experience in the field of smart technologies, most of the companies will create a hybrid or transitional organizations: this will allow them to gather all the best professionals in one place to avoid work duplication and to master all required knowledge and skills. Any restructuring can harm the organization, cause intense competition and create new data security threats. However, the smart technologies offer progress to economy and society. Digital transformation involves several stages (see figure 3) (Bart and Puntoni, 2014).

Figure-3. Digital transformation stages of the company



Stage 1- ICT-infrastructure (Database service, Data processing service, Queuing service), resources enable data creation and generation;

Stage 2 - Business infrastructure (Service automation management Service Delivery Catalog, Service Development Portal and API, Operational and Business support services) – resources enable regular management, monitoring, functional management services;

Stage 3 - Industry business-infrastructure – agriculture automation, medicine management ecosystem, and media control ecosystem, etc. These resources represent ecosystems of the digital economy.

Stage 4 - Organizational infrastructure – innovative practices, regulations, protocols, standards. These are core resources to create ecosystems.

Therewith the development of business infrastructure is impossible without developed ICT-infrastructure.

To ensure competitive ability in a digital economy the projects to develop the product functionality should be developed, so that the market perceived this product development as significant one and partially innovative. Many of these sections of the design solution concept are only suitable for external projects, the project offered is internal. Business-objectives of the project execution Development of functional capabilities of the system bpmonline:

1. An additional way to attract customers;
2. Building up customer loyalty and long-term cooperation;
3. Extension of clients' needs to refine the system (up sales).

Next step is describing functional scope of the project. You need to provide a list of all functional tasks planned to be solved within the current project and brief way to implement them. Functional requirement responds to the question what should be done? And implementation answers - What can help you to solve the business task? To achieve business goals the following functional requirements must be implemented in the system functional requirements, as follows in table 2.

Table-2. Labour inputs of the project Development of functional capabilities of bpmonline system

No.	Functional requirement	Deadlines
Block Document flow		
1.	The system requires a new section Document flow	11 days
2.	The possibility to implement the documents confirmation, signing and introduction in the system is required.	24 days
3.	The possibility to execute several stages of confirmation is required	9 days
R&D projects management unit		
4.	Collecting ideas, their qualitative and quantitative assessments, meeting tab page	35 days
5.	R&D platforms management section	35 days
Knowledge management unit		
6.	Building ontologies. The object, where the information will be stored (documents, articles, links for learning), and the necessary connections between them are required.	67 days
7.	Information about trainings and competencies that are to be developed at one or another position.	11 days
Staff unit		
8.	Create the section Candidates in the system and online testing	66 days
9.	HRM strategy section	25 days
Total		247 days = 8.2 months

The above functional requirements will be added to the module Sales, if the client requests these sections in other modules, they can be introduced with the updates. Next following step is estimating risks of the project; they are presented in the table 3.

Table-3. Risk map of the project Development of functional capabilities of the system bpmonline

No.	Risk	Probability	The level of impact on the project timelines	Strategy for risks handling
1	Severe man-hour shortage allocated to the project	high	critical	Prioritizing the requirements, selecting the least labor-consuming ways to implement the requirements
2	Delaying functional documentation approval	average	critical	Close control of regulations enforcement of the design documentation by the project leader
3	Error in price formation	Low	average	In the pricing process the company's pricing policy and strategic targets should be considered, the prices should be compared with the prices of rival companies
4	The wrong timing of the product marketing launch	Low	average	To release the product in the right season (autumn, winter)
5	Wrong architecture of the product	Low	critical	Alignment of architecture, gathering opinions
6	A large number of bugs	Low	critical	Extensive testing, several employees

Therefore, you need to set the price, which will allow competing successfully in the market.

4. Conclusions

The current economic challenges, including radical technological revolution, new ways of consumers relations, new opportunities for the value chains development, new forms of communication, are generating new sources of enterprises competitive ability. Radical technological advance, smart technologies and devices modify industries and markets, forcing companies to reconsider their activities and strategies in general. The expansion of Internet technologies, big data feasibility and smart products functions change the whole system of relations with consumers providing opportunities for digital services. Data and analytics are becoming the new source of competitive advantages. The traditional value chain has assumed a standard set of units (R&D, IT, Production, Logistics, Marketing, Sales, After-sales service, Personnel management, Procurement and Finance). Digitalization, introduction of industrial Internet of Things and smart technologies alter all these types of activities in the value chain. M. Porter and Heppelmann () conclude that if the main data sources were operations and transactions within the company, updated with information from interviews and research, the introduction of smart technologies adds another data source – the product itself. Smart devices provide the information of unprecedented scope and variety in real time. Along with people, technology and capital the data is becoming one of the main sources of competitive advantages of enterprises (Bagautdinova and Nikulin, 2017).

To gain maximum benefit from the data generated by smart devices, the Defense Advanced Research Projects Agency (DARPA) invented the digital twin – a three-dimensional virtual source data item of the real thing. Once data become available, the digital twin demonstrates – plays – how a physical object is changing, and the conditions in which it operates. In the same way as the real product icon, the digital twin allows the company to visualize the operation and status of equipment that is located miles away. Owing to the digital twins, the developers have a better understanding on how to refine the design, manufacture, operation and maintenance of the equipment. The concept Industry 4.0, that is the Fourth Industrial Revolution, foresees end-to-end digitalization for all physical assets of an enterprise and their integration into a unified ecosystem. Apparently, with a new paradigm new opportunities for all come as well. However, history demonstrates that a change of formation could be the beginning of the end for those businesses that were not ready for it. Thus, in order to strengthen the competitive ability the management needs to consider the answers to the following questions:

What properties and functions should the company's smart products exhibit?

What features should be inserted into the product, and which ones are to stay in the cloud?

Whether the company itself has to develop a set of smart product's functions and its infrastructure or outsource the work to contractors and partners?

What data does the company require to improve products?

Whether the distribution channels and service networks should be fully or partially canceled?

What digital services will our customers be interested in?

Whether the company should extend the scope of activities, associated with the sales data on their products and others (HASANOVA, 2018).

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