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DIGITAL TRANSFORMATION OF THE VALUE CHAIN IN ECONOMIC PROCESSES

Abstract. The article examines the impact of digital transformation on the value chain in economic processes. It is determined that the value of a product is formed on the basis of the unity of utility and the cost of its production, expressed in the market price. The value chain is considered as a network business model, which consists of separate business processes that connect different divisions of an enterprise to achieve the result necessary for the consumer. A detailed analysis of the business processes that make up the value chain is provided, dividing them into main and auxiliary processes. Core processes include logistics, production, physical delivery of goods, sales and marketing, and after-sales service. Auxiliary processes are aimed at supporting the main ones and include management, human resource management, applied research and development, and logistics. Attention is focused on the role of digital technologies, such as automation, artificial intelligence, and the Internet of Things, in optimizing business processes at all stages of the value chain. They ensure efficient resource management, optimization of logistics operations, real-time monitoring of product quality, and timely detection and elimination of malfunctions. Digital technologies help to increase business productivity and efficiency through fast and accurate data processing, which is key to making management decisions. Digital transformation also allows businesses to adapt to changing market conditions, reduce costs, and improve product quality. This is especially important for companies that constantly update their product range based on market research and experimental development. Digital technologies play an important role in strategic planning, contributing to the development of new products and services that meet the needs of consumers. It is determined that the digital transformation of the value chain in economic processes contributes to increasing the competitiveness of enterprises, ensuring their successful development in the current conditions of the digital economy. The introduction of digital technologies allows optimizing business processes, reducing costs, improving product quality and meeting consumer needs, which are crucial factors for achieving sustainable economic growth.

Keywords: digital transformation, value chain, business processes, automation, artificial intelligence

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ЦИФРОВА ТРАНСФОРМАЦІЯ ЛАНЦЮГА СТВОРЕННЯ ВАРТОСТІ В ЕКОНОМІЧНИЙ ПРОЦЕСАХ

Анотація. У статті досліджено вплив цифрової трансформації на ланцюг створення вартості в економічних процесах. Визначено, що цінність товару формується на основі єдності корисності та витрат на його виробництво, виражених у ринковій ціні. Розглянуто ланцюг створення вартості як мережеву бізнес-модель, яка складається з окремих бізнес-процесів, що з'єднують різні підрозділи підприємства для досягнення необхідного для споживача результату. Наведено детальний аналіз бізнес-процесів, що складають ланцюг створення вартості, поділяючи їх на основні та допоміжні. Основні процеси включають матеріально-технічне забезпечення, виробничу діяльність, фізичну доставку товарів, продажі та маркетинг, а також післяпродажне обслуговування. Допоміжні процеси спрямовані на підтримку основних і включають управління, управління людськими ресурсами, прикладні дослідження та розробки, а також матеріально-технічне забезпечення. Акцентовано увагу на ролі цифрових технологій, таких як автоматизація, штучний інтелект та інтернет речей, у оптимізації бізнес-процесів на всіх етапах ланцюга створення вартості. Вони забезпечують ефективне управління ресурсами, оптимізацію логістичних операцій, моніторинг якості продукції в режимі реального часу та своєчасне виявлення й усунення несправностей. Цифрові технології сприяють підвищенню продуктивності та ефективності бізнесу шляхом швидкої та точної обробки даних, що є ключовим для прийняття управлінських рішень. Цифрова трансформація також дозволяє підприємствам адаптуватися до змін ринкової кон'юнктури, знижувати витрати та підвищувати якість продукції. Це особливо важливо для підприємств, що постійно оновлюють свій асортимент продукції на основі досліджень ринку та експериментально-конструкторських розробок. Цифрові технології відіграють важливу роль у стратегічному плануванні, сприяючи розробці нових продуктів та послуг, що відповідають потребам споживачів. Визначено, що цифрова трансформація ланцюга створення вартості в економічних процесах сприяє підвищенню конкурентоспроможності підприємств, забезпечуючи їхній успішний розвиток у сучасних умовах цифрової економіки. Впровадження цифрових технологій дозволяє оптимізувати бізнес-процеси, знижувати витрати, покращувати якість продукції та задовольняти потреби споживачів, що є вирішальними факторами для досягнення стійкого економічного зростання.

Ключові слова: цифрова трансформація, ланцюг створення вартості, бізнес-процеси, автоматизація, штучний інтелект

Problem statement. In today's economic environment, the importance of digital transformation of the value chain is extremely important. The value chain is a model that combines the interconnected processes of an enterprise for the production of various types of products. Each enterprise has its own unique chain for each type of product it produces. The basic concept of the value chain, first developed by M. Porter in 1985, is a key element of strategic management, but its adaptation to the conditions of modern digital transformation has its own specifics.

Digital transformation processes are developing intensively, affecting all aspects of economic activity. Therefore, the introduction of digital technologies into value chains requires solving a number of challenges and problems, including adapting traditional management practices to the new requirements of the digital economy, ensuring cybersecurity, optimizing the interaction between digital technologies and traditional processes, as well as changing strategic approaches to value chain management [1, p.40].

Thus, addressing the digital transformation of the value chain requires the development and implementation of new management strategies that take into account the specifics of digital technologies. This will help to increase the efficiency of production and management processes of enterprises and improve their competitiveness in international markets.

Analysis of recent research and publications. Among the scholars who have devoted their work to the study of the peculiarities of global value chains are M. Porter, J. Humphrey, G. Duginets, N. Cherkas, O. Hirna, and others. However, it should be noted that the peculiarities of the digital transformation of global value chains are not sufficiently covered, which necessitates further research.

The purpose of the article is to analyze the features and mechanisms of adapting the value chain to the requirements of digital transformation in economic processes.

Summary of the main material. It is well known that the value of goods is ultimately determined by buyers, and it reflects the unity of utility and costs of its production, expressed at the market price. The price of a product is the basis for the manifestation of its value in market conditions; in other words, price and value are correlated as form and content, and their identity is not allowed from a scientific point of view [2, p.63].

Considering the value chain as a whole, we can see that it is a network business model, which in turn consists of individual business processes that usually link several interacting units as components of a single production system. At the same time, the value chain can be viewed more broadly than the network structure of interaction between different market participants, whose joint activities create the result required by the consumer. Due to the specific nature of their products, some companies may participate in numerous value chains, which facilitates their entry into new business areas.

Since each enterprise has its own specifics of technological processes, production, a certain range of suppliers and customers, etc., there is no standard set of business processes. However, the common basis for all their variants is the M. Porter model. Thus, the activity of any enterprise on market conditions is known to have two sides - the creation of a useful result (goods or services) and costs expressed in a certain amount of money. Ultimately, their unity, as mentioned above, forms the value of the product. If its usefulness to the consumer is significant and the costs are not very high, the product will have a high value, and therefore a price as a monetary expression of its value; on the contrary, if the usefulness is low and the costs are high, the value may decrease to a minimum.

Business processes within the value chain are divided into main (operational) and auxiliary. M. Porter refers to the former as those related to the movement and physical transformation of the initial components into the final result, its delivery to the consumer, and, if necessary, maintenance and support.

Ancillary processes are aimed at supporting core or other supporting business processes. At the same time, today a number of processes, mainly related to the production of goods, can be transferred to other enterprises on the basis of outsourcing, which was not widespread at the time of the emergence of the value chain model and was probably not reflected in its concept [3, p.23].

According to M. Porter's model, the main business processes are:

1. Logistics is the process of acquiring the initial components of a future product, moving them from suppliers, receiving, storing, and sorting them, performing incoming inspection, and managing inventory. In other words, we are talking about commercial and logistics activities related to the acquisition, storage, and movement of resources that are the basis or condition for creating a product or providing services to consumers.

2. Direct production activities related to the transformation of initial components into a finished product (service). Since the latter is consumed at the time of production, the value chain in this case undergoes a significant transformation at the final stages. This is where production operations (processing, assembly, quality control, etc.) are carried out, as a result of which the initial resources are transformed into a product or service.

3. Physical delivery of goods to the consumer, including warehousing operations, processing of customer orders, shipment, and transportation. In other words, operations are carried out here through which the goods are distributed between intermediaries or end users.

4. Sales and marketing are business processes related to the promotion of goods to the market, advertising, sales, pricing, and customer information support.

5. Activities related to after-sales customer service (installation, maintenance, and repair of complex equipment, provision of spare parts, technical advice, service directly at retail outlets, etc.)

Auxiliary (supporting) business processes include those that can exist either independently or as an integral part of other business processes:

- Infrastructure (management of core and ancillary activities, current and strategic planning, financial and accounting operations, legal support, security);
- human resources management (organization of employee recruitment, selection, training, education and development, professional development, and social services);
- applied research and development, design of new products and technologies, improvement of existing ones, regulation of technological processes, development of communication systems, formation and filling of databases, etc;
- logistical support of key business processes, and organizational operations with suppliers and contractors.

Auxiliary business processes, as a rule, apart from applied research, development, and design, do not add value to the product, but by optimizing them, they save costs, so they also contribute to the growth of its value.

The value chain model as a whole, its individual components, and the network links between them are the objects of management, which aims to achieve competitive advantages for the enterprise by optimizing and improving its structure and activities. Structural optimization of the value chain model may include, for example, adding, deleting, dividing, merging, and other manipulations with its links, and process optimization may include increasing the efficiency of resource use, improving the organization of interaction between individual links, as well as interaction with suppliers and consumers [4, p.113]. It is worth noting that digital technologies affect both of these aspects, and an attempt to reveal the specifics of this impact is the purpose of further analysis.

First of all, it is important to reiterate that the value chain model is a rather abstract model that focuses on the components rather than on their sequence and the links between them. And this is understandable, since, as already mentioned, the configuration of business processes based on it can be completely different. Without delving into the analysis of the production profile and technology features of different enterprises, we can distinguish two fundamental approaches to building their network business process in general.

Companies that produce a stable range of products with little variability in composition (changing only volumes depending on market conditions) interact with traditional suppliers, intermediaries and end users, for example, in the oil refining or large-capacity chemicals industries.

Enterprises that constantly update or regularly improve their product range, in particular through comprehensive market research, identifying future needs, conducting experimental development and designing new or improved models, creating investment programs, as well as finding new suppliers and customers [5, p.13].

It is obvious here that the structure of the "contracting" business process in the latter case is more complex, and the actions within it have their own peculiarities compared to the first option. However, with successful and smooth implementation, this process naturally evolves into the first option.

The first step in implementing the second option of the enterprise business process is market research. When it comes to the market for traditional products, digital analysis makes it easy to identify surplus or shortage of goods and calculate the price that maximizes profit under various conditions, which is quite difficult to do manually. When it comes to identifying the potential need for new products, digital technologies can be used to quickly conduct research on the needs for the products being offered, summarize opinions and make appropriate decisions. However, artificial intelligence cannot identify unconscious needs, i.e. those that can only emerge when consumers become aware of the possibility of satisfying them.

The second stage of the business process is the infrastructure stage when the collected information is submitted to the planning service, which works with it in two ways. In the case of traditional products with small changes in volumes due to market conditions, the procurement department is tasked with concluding appropriate contracts with old or new suppliers if the previous ones cannot continue to fulfill their obligations or have significantly increased their prices. Today, the search for favorable suppliers, taking into account transportation costs, and the conclusion of contracts, if the parties' representatives can sign electronically and there is mutual trust, can be carried out using digital technologies.

In doubtful situations, digital technologies can provide remote analysis and control of the quality and environmental characteristics of the purchased goods in most cases. However, for objects with which the contractor has direct contact, such technologies become less effective, as they do not allow for the assessment of convenience and subjective perception (e.g., colors, shapes, etc.).

When it comes to manufacturing fundamentally new products and entering unknown markets, digital technologies are not widely used today, except for surveying a wide audience, because developing the right strategy for this is a creative process that is largely based on taking into account psychological factors and non-standard approaches that artificial intelligence has not yet fully mastered. The same applies to strategic choices, where subjective factors also have a significant impact. Artificial intelligence can only be used for strategic choices if they are based on quantitative parameters. Artificial intelligence can also take on the development of specific plans for implementing a new strategy, their logistics, and appropriate control. Digital technologies can greatly facilitate this process by providing accurate forecasts and optimal solutions based on large amounts of data [6;7].

The resources acquired by an enterprise in accordance with M. Porter's model begin their movement within the logistics process, all stages of which can be controlled by artificial intelligence. Firstly, as already mentioned, it is the search for suppliers and the conclusion of contracts, ensuring compliance with the quality parameters of the ordered products and the terms of their delivery. Secondly, modern artificial intelligence is able to effectively solve logistics problems, such as the selection of transport organizations, optimization of transportation routes, and allocation of resources in warehouses.

At the production stage of the network value chain, the following types of processes take place:

1. Technological processes related to the transformation of initial elements into a finished product. For example, digital technologies can effectively manage the timely delivery of the necessary elements stored in warehouses or from the previous technological stage to the place of their execution and create an optimal current inventory.

2. Organizational processes. Digital technologies can help to solve, for example, problems of optimizing the location of equipment and its utilization. Artificial intelligence can also optimize the transfer of technical or other production activities to third parties. This principle of cooperation is not just work at the contractor-customer level, but joint development.

3. Control processes. Modern digital tools allow automation and monitoring of production parameters in real-time, which allows you to quickly identify and eliminate malfunctions, ensuring product stability and quality at every stage of production.

4. Repair processes. Digital technologies, receiving information from sensors, allow timely detection of malfunctions and failures in the operation of equipment and provide operators with the necessary recommendations. At the sales stage,

digital technologies can be used to optimize the sales and goods flow system (planning, transportation of finished products, storage in intermediate warehouses, and sales organization in terms of minimizing costs).

So, in general, digitalization allows us to solve problems that in many cases are similar to the logistics stage,

It is also worth mentioning the use of digital technologies at the after-sales service stage. They can ensure effective interaction with customers through automated systems for monitoring and processing requests. This will allow you to respond promptly to requests for service, support, and repair, ensuring a high level of customer satisfaction and maintaining a positive company image. Thus, the introduction of digital technologies at each stage of production and afterward not only optimizes processes but also increases the overall efficiency and competitiveness of the enterprise in the market.

If we look at the network value chain as a whole from the point of view of digitalization, we can identify the main problem as the problem of unevenness, which has two aspects: one that is fully justified over time, and the other that is partially justified in the distant future. The first aspect is related to the fact that, for various reasons (technical, economic, psychological, etc.), elements in the value chain network have been digitized to different degrees, which can create bottlenecks in the product movement process and lead to economic losses due to incomplete use of the digitalization capabilities of elements. The second aspect is due to the fact that network links in the chain cannot be equally digitalized in principle. Here, too, there is the task of equalizing the capabilities of the links in the overall chain network, on the one hand, by improving the efficiency of employees' creative activities, which should be addressed by the enterprises themselves, and on the other hand, in the general scientific process of improving digital technologies that allow artificial intelligence to solve more complex creative tasks than today.

Conclusions. The value chain model is an important tool for achieving competitive advantages of an enterprise through optimization and improvement of business processes. The use of digital technologies significantly increases the efficiency of each stage of production and after-sales activities, ensuring efficiency, accuracy, and cost reduction. An important problem remains the uneven digitalization of the network value chain, which can lead to economic losses. Solving this problem requires both improving digital technologies and increasing the efficiency of employees' creative activities.

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