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KAZAKHSTAN'S ECONOMIC DEVELOPMENT BASED ON DIGITALIZATION

Abstract. *Digital transformation in Kazakhstan is being implemented in virtually all industrial sectors, including mining, mechanical engineering, aviation, agriculture, energy, food processing, and many others. It is noted that the digital transformation of business processes is aimed at enabling companies to make prompt decisions, quickly adapt operations to current requirements, and meet customer needs. When implementing planned digitalization projects at manufacturing enterprises in the country, assessing the effectiveness of business process modeling in the context of digitalization is crucial. The authors propose an algorithm for assessing the effectiveness of a company's business process modeling in the context of digitalization, which allows for determining the feasibility of digitalization and implementing measures to implement digital technologies.*

Keywords: digitalization, business processes, manufacturing enterprises, economy, digital technology, efficiency assessment.

Introduction

The rapid development and proliferation of digital technology over the past decade is significantly changing the face of key industries and the social sphere. More and more businesses are seeking to move business processes to the digital environment, thereby significantly reducing transaction costs and significantly increasing the volume of production activities.

In 2017, the state program "Digital Kazakhstan", important for the development of modern Kazakhstan, was launched. It is designed for 2017-2022 and is of strategic importance for the country. The main goal of the program is to improve the quality of life and competitiveness of Kazakhstan's economy through the progressive development of the digital ecosystem. The main purpose of the new state program is the progressive development of the digital transformation of the economy to achieve sustainable economic growth, improve the competitiveness of the economy and the nation, and improve the quality of life of the population. The implementation of the state program is carried out in four key areas: the implementation of the Digital Silk Road (it is the development of reliable, accessible, high-speed and secure digital infrastructure), the development of a creative society (it is the development of competencies and skills for the digital economy, work to improve digital literacy of the population, the training of ICT specialists for industries), digital transformation in industries (it is the widespread implementation of digital technologies to improve the competitiveness of various sectors of the economy)(Program "Digital Kazakhstan).

At present, the country is taking measures to implement the program "Digital Kazakhstan". Works on the implementation of key projects of this program are carried out (see Diagram 1).

Digital transformation is now being implemented in virtually all industries, including the digitalization of mining, mechanical engineering, aviation, agriculture, energy, food processing, and many others. As part of this process, there is active work with the Internet of Things, or in this case, the Industrial Internet of Things (IIoT), thanks to which:

- control and measuring devices are installed on individual units and devices of the enterprises;
- devices for data collection and transfer, as well as their visualization are installed;
- computerization of the workplaces of the enterprises' employees is carried out;
- the entire fleet of equipment and workplaces is united into one information network;
- tools for analytics and automatic interpretation of received information are used.

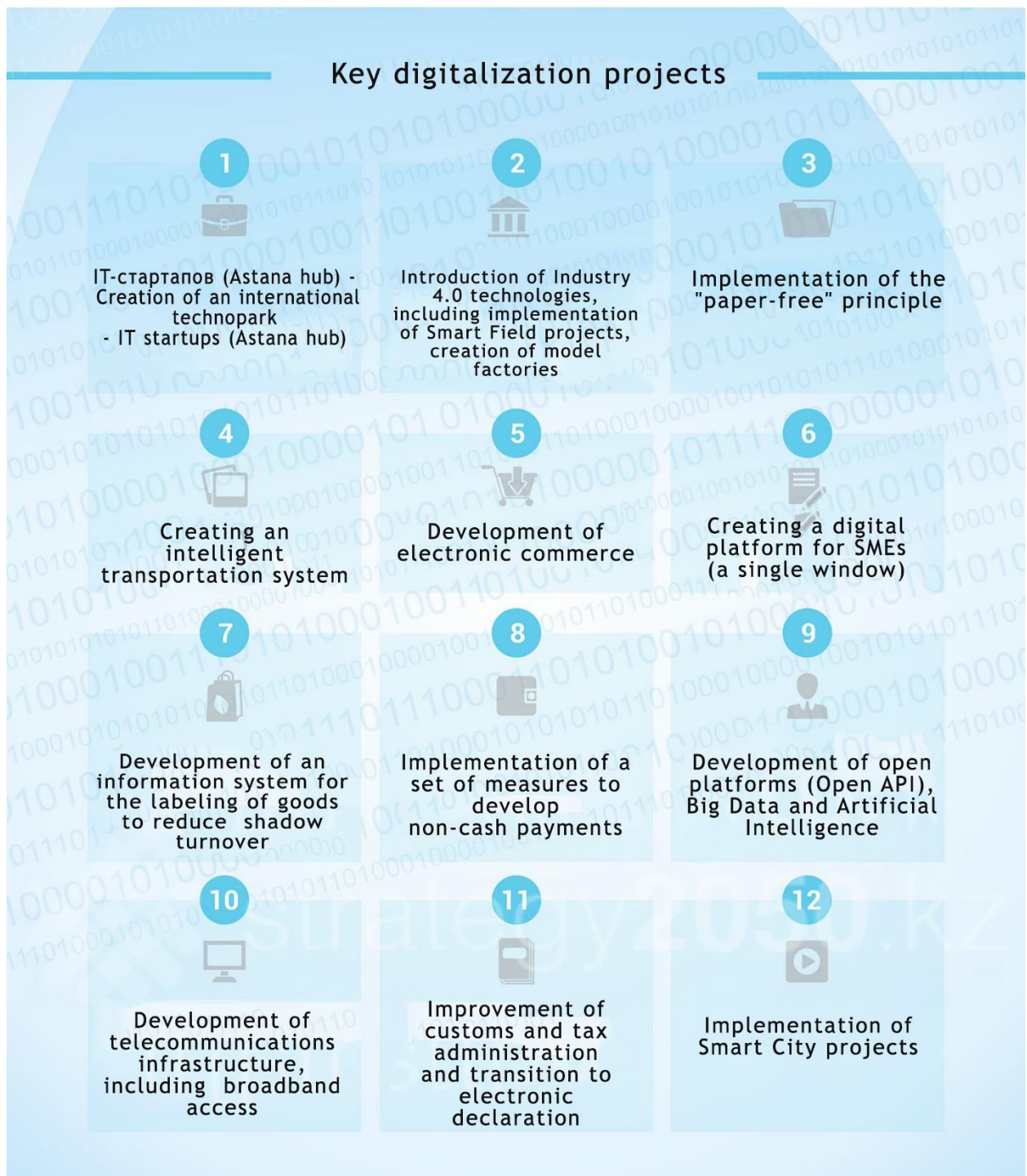


Diagram 1 – Key digitalization projects

Literature Review

Digital transformation and robotics have proven themselves in many areas of human activity and have promising prospects for development. The application of digital technology and robotics is associated with process optimization - reducing costs and time, as well as qualitatively improving results. For example, the use of digital technology and artificial intelligence in automotive factories reduces the production cycle, improves product quality, and eliminates the factor of human error [1].

Digital technology is the representation of information in bits. This technology has reduced the cost of storage, computation, and transmission of data. Research on digital economics examines whether and how digital technology changes economic activity. In this review, we emphasize the reduction in five distinct economic costs associated with digital economic activity: search costs, replication costs, transportation costs, tracking costs, and verification costs [2].

Modern technology is dramatically changing more and more industries, from industry to entertainment. But why do businesses need digital transformation? And how to do it right? Answers to these questions can be found in the heads of well-known international and Russian companies. The authors of the paper (Kulagin, 2019) explain why in the digital era the survival of business directly depends on its ability to quickly adapt to customer demands and why change is necessary even where everything is already good.

The methodology for digital business transformation has been tested by hundreds of SMB executives around the world [3]. It is based on research by MIT University of America on the impact of technology on management. Drawing on data from the Center for Information Technology Research at MIT's Sloan School of Management, the authors of the paper [4] concluded that digitalization forces companies to move from value chains to ecosystems and achieve a deeper understanding of end-consumer needs.

Peter Weil and Stephanie Warner suggest auditing your company, moving to a deep understanding of your end customers, and creating a clear action plan for developing a profitable digital ecosystem. This is exactly what the largest employers of Western companies are striving to do right now.

How does the introduction of artificial intelligence affect business? Will robots replace humans? And which industries will be automated first? These questions are answered by Ravin Jesutasan and John Boudreau, recognized HR experts in the digital age, in their paper "Reengineering Business. How to Competently Implement Automation and Artificial Intelligence" [5]. They go beyond theory alone to offer their own model of transformation, with which companies can find the best combination of machine and human labor.

After 40 years of thoughtful leadership and highly successful leadership, Tom Siebel, one of Silicon Valley's most prominent entrepreneurs and leaders, has compiled in his astounding book, *Digital Transformation. How to Survive and Succeed in the New Era* [6]. It presents insights into all the important digital technologies every leader must master: big data, the Internet of Things, cloud computing, and, of course, artificial intelligence. It engages us in an interesting discussion of changing technologies, and provides a roadmap for taking advantage of new opportunities for digital transformation in business.

Methodology

Digital transformation is about rethinking the way employees work to interact effectively with customers by using modern technology and data analytics.

It's the use of modern technology to improve productivity and enterprise value in today's world. 65% of companies report that digital technology has increased competition in their business from new players.

Digital transformation of business processes is the introduction of modern technologies into the business processes of an enterprise. This approach implies not only the installation of modern equipment or software, but also fundamental changes in approaches to management, corporate culture, and external communications. As a result, the productivity of each employee and the level of customer satisfaction increase, and the company acquires a reputation as a progressive and modern organization [7].

Digitalization technologies make it possible to organize the most personalized interaction that most customers prefer. Digital communication channels, artificial intelligence, robotization - we already encounter all of these in our daily lives. For example, the digital transformation of banks could not do without chatbots, and pharmaceuticals are actively using modern mobile devices in their work.

By customer experience we mean not only interactions with external customers, but also with internal customers. The digital transformation of processes optimizes the work of company employees, thus increasing the productivity of each individual team member. For example, automating routine operations gives more time to solve really important and complex tasks. If a company doesn't take advantage of modern technology and adapt to the crazy pace and peculiarities of doing business, it won't be able to compete with those who already do.

To be successful, you need to be fast and agile: change not when there is an opportunity, but when there is a need. Digital transformation of business processes is aimed at ensuring that companies make decisions quickly, adapt their work to the needs of the moment, and meet customer needs with lightning speed.

Digitalization of business opens the way to innovative ways of enterprise development [8].

The following technologies and applications should be used in a digitalized enterprise: Enterprise Resource Planning (ERP) application, Internet of Things IoT, cloud computing, big data, artificial intelligence, additive manufacturing, augmented reality, manufacturing management system (MES), intelligent logistics, intelligent warehouse, product lifecycle (PLC) and others. It is important to create a modular structure, which is one of the most important features of Industry 4.0 applications. Each use case developed from this perspective can be evaluated as a module, and each can produce the data or information that another module needs.

The goal of the modular structure of the digitalized enterprise is not to create the best and highest level of all the scenarios of modern technology that it uses, but to create examples of applications at appropriate levels in such a way that information is provided to as many different consumers of the enterprise's products as possible.

All these and other technologies of digital transformation create the conditions for the digitalization of business. Launching your own business and developing it has become easier due to the huge number of tools that the digitalization of industries and businesses provides. An important element of digitalization is information. Information is a key resource in today's world. Humanity generates huge amounts of digital data every second, which not only take up storage space but also help companies do business. To take full advantage of the available information, it is necessary to accumulate, structure and analyze it.

The digital transformation of the enterprise contributes to this through advanced technologies such as Big Data or Artificial Intelligence (AI). They are aimed at processing flows of information on the basis of which decisions can be made, offers can be tailored to specific customers and their behavior can be predicted.

It's hard to imagine a successful modern business without partners. Digitalization opens up new opportunities for cooperation with other companies - and these opportunities are really surprising. For example, thanks to modern technology, geography is no longer a barrier to work: you can do business and look for partners anywhere in the world. And an open API makes collaboration even easier and more convenient. For example, in the digitalization of finance, including banking, software interfaces have been used for several years.

According to BCG forecasts, in a few years a project-based approach to business and the use of data-driven solutions, machine learning and artificial intelligence, as well as modern methods of communication and continuous performance tracking will become mandatory attributes of any adequate company. Even if your business is afloat now, it does not mean that it will not become obsolete next year. The ability to change quickly in the face of constant digitalization is a key competitive advantage that every company should think about. And the sooner you get involved in this race, the better. Customers are becoming more demanding by the day, and the demand for qualified employees even now far exceeds supply.

How should digital transformation be done?

There is no universal recipe. Every company accumulates data differently, uses different technologies in its work, and relies on different employee skills. But there are general recommendations that are suitable for the transformation of any business. We suggest using a methodology that has already proven itself in practice:

1. *Form a transformation team.* Usually it necessarily includes the head of the company, the HR director, and the chief technology officer - whether it's the head of the IT department or the CTO, as well as other representatives of the top management. Together, you will have to do serious preparatory work, without which any change-management initiatives are meaningless.²

2. Approve the business development strategy

As we mentioned earlier, the main goal of any transformation is to improve the effectiveness of the organization. But everyone measures it differently, so the top team needs to come to a consensus on the further development of the business.

Formulate from scratch or adjust the company's mission, vision, strategy and values, as well as describe the new culture of how employees interact with each other and with customers, taking into account both market and internal contexts. Be sure to involve those around you in this work, such as through pulse surveys and 360 assessments. At the end of the day, you should have an overall picture of what you are aiming for, how you are achieving it, and what boundaries you are not crossing, as it is against the spirit of the company.

3. Update your competency model

Now you know what your company should ideally be like. The next step is to describe what your employees should then be. What knowledge and skills will they need to work effectively with new technologies and catch the desires of digital

consumers in time? Do they share the values of openness to new things, business transparency, and cross-functional collaboration? And are they ready for change in principle?

Determine what competencies your employees will need to provide your company with mission-critical capabilities and corporate values that align with the spirit of digital transformation.

4. Identify and eliminate gaps

The next stage is business transformation itself. In order to make the transition from the current state to the desired one, you need to identify and eliminate gaps in the organizational capabilities of the company and competencies of your employees.

Given that we are talking about digital transformation, digital skills become the key. Basic digital literacy includes the basics of cybersecurity and data protection, information, statistics and analytics skills, as well as the ability to use modern task trackers, messengers and solutions that automate routine tasks [9].

Hiring new employees with the right set of competencies is not the best option. We are talking about digital specialists, who are already in short supply. To some extent, the problem of staffing shortages can be solved by resorting to flexible employment. The most in-demand at the beginning of 2020 were website developers, animators and designers, e-mail marketers and target marketers.

But flexible work isn't a panacea, either. To succeed in the digital world, you need to establish a process of continuous development of existing employees. This means promptly identifying gaps in competencies and pulling employees up to the right level. For this purpose, "Centers of Competence and Digital Transformation" (CCDT) should be created at enterprises. These centers should provide:

- Preparation of the physical and technical infrastructure for the training to be provided in the enterprise, and its development and renewal according to need.
- Developing the competencies of the human resources that will be employed in digitized enterprises, and continuously improving the areas that may fall within the enterprise's competencies in the field of digitization.
- Expanding and developing options for the use of digital technologies, as well as expanding the digital skills of enterprise personnel [10].

Results

There are many new technology priorities on the 2020 agenda, including 5G, artificial intelligence, machine learning, IoT, and blockchain and distributed ledger technologies. It's a huge list of things that businesses must somehow absorb to keep up with the times. Many organizations have already learned to actively experiment with innovation, often collaborating with partners and startups, undertaking pilot projects and quickly implementing promising things into the business. Let's take a closer look at the elements of the digital transformation of the manufacturing enterprise.

Product development. In general, everything starts with product development. The specification of the future product is entered into a unified information base. Design documentation is developed for it - for example, with the help of the NX package from Siemens. (<https://blog.talenttech.ru/digital-transformation-faq>).

Then a pilot sample is produced, which is tested for compliance with the declared and expected characteristics. If discrepancies are found, corrections are made to the original design, the prototype is created and tested again, and this can happen more than once.

If we are not talking about the production of an elementary bolt, but, for example, a coffee machine, all these iterations at the enterprise scale bring significant financial losses and production time. With the Siemens software (<https://new.siemens.com> ' ... ' TIA Porta) you can perform all tests on digital models: check in advance the mechanical compatibility of components and test the planned loads, identify unauthorized overheating areas, perform electromagnetic tests without having to produce a prototype "in metal".

In a number of industries, product design is unspecific - for example, for oil and gas processing, metal melting, etc. For such applications, the Siemens portfolio includes software packages for simulating various environments. The data generated by these tools can be transferred to recipe management systems through integration, which also enables further production optimization.

Production planning. In the second step, Siemens software can be used to fully design and simulate future production. Siemens tools can effectively simulate not only robots, conveyors, extruders, rolling mills and other mechanisms, but also human biomechanics. This makes it possible to evaluate the labor input of personnel and the degree of human fatigue, as well as to identify the risks of interaction between an employee and collaborative machinery. Siemens software makes it possible to assess in advance the ergonomics of various production operations and health risks for employees.

Using digital models of machines, process units and personnel, it is possible to simulate the operation of entire production areas and shops, as well as the associated supply chains. This makes it possible to determine in advance how long it takes to produce a unit of product, to prevent situations where machines could damage personnel, to build material flows and to understand in advance which stock of raw materials is optimal and will guarantee the rhythmic operation of the production plant. As for the continuous technological plants (such as power plants, chemical reactors, furnaces), it is also possible to describe them in COMOS and build a complete digital twin, including the technological part, control logic, electrical circuits, automation, 3D visualization, etc.

The COMOS object-oriented platform allows you to create a process unit (e.g. a drive mixer) once and then use it many times in different parts of the project. COMOS automatically monitors the consistency of features and transforms the representation of the object. By dragging and dropping the stirrer from the object list, various graphic representations of the assembly can be obtained - in the process diagram, single-line diagram or wiring diagram. All this is done without human intervention, which saves time and engineering resources and is a form of plant lifecycle optimization.

Having a complete model of the technological installation, it is possible to test different modes of operation on it in advance, including frontier modes, without any risk of man-made disasters or personnel trauma. It is also possible, when the

technological installation is still under construction, to start training personnel in advance, immersing them in virtual reality with the help of an avatar or virtual glasses. Thanks to the COMOS Walkinside virtual reality tool, a future employee can get acquainted with the production layout, walk up to any technological unit. The process parameters generated by a digital model of the process unit are available to the employee. The employee can instantly access the technical documentation for the node he has "approached", understand the logic of operation in a few clicks, and switch to the process flow diagram to quickly understand which process chain fragment the object of interest to him is a part of. As a result, we get a complete digital project and can start creating production in the real world.

Production preparation and engineering. At the stage of detailed design of production, application software for APCS appears, which implements the logic of process control, operator interfaces are developed. All this requires many months of work by qualified programmers. Siemens technologies enable to generate program code automatically, based on digital models of technological equipment, created at different stages of the life cycle of the enterprise. Such code for an industrial logic controller can be downloaded into both the physical controller and its digital copy. And, accordingly, then transfer individual stages of commissioning into virtual reality, protecting expensive technological equipment from damage. It is also possible when cabinets with automation have already arrived at the site under construction, but the process unit is not yet ready. In this case it is possible to connect physical control systems to a SIMBA gateway device which will simulate the presence of a real "field" based on a technology model created, for example, with the SIMIT package from Siemens. The use of such technologies significantly reduces the time required to commission industrial facilities.

In Kazakhstan, the task of digitalization of industry was first set by the First President of Kazakhstan - Yelbasy N. Nazarbayev in 2017 in his address to the people. The message of the next year, 2018, initiated the development of the third five-year industrialization plan, dedicated to the formation of the "digital era" industry. In accordance with global trends, work on the digitalization of industrial enterprises has been initiated and is actively carried out. Today, there are pioneering companies in this area that are introducing new digital technologies and innovations. As part of the fourth industrial revolution "Industry 4.0", large domestic companies have formed their development strategies, allowing to consider a number of issues such as minimization of production costs, competitive positioning of the company through the implementation of digital solutions. In order to demonstrate the benefits of Industry 4.0 to the Kazakh business, it was decided to select 7 enterprises and make them "model digital factories". At the same time, there are already positive developments in the example of "model digital factories", which are created to popularize the implementation of Industry 4.0 technologies and will become demonstration sites of digital technology opportunities by 2025. In total, more than 40 projects are being implemented within the project of creating 7 model digital factories.

The prospects for the development of digitalization and robotization are primarily related to the mining, metallurgical, and petrochemical industries. In the

mining industry, the level of competitiveness of a company is determined primarily by productivity and operational excellence. Digitalization and robotization are becoming a determining factor that will enable mining companies to remain profitable and competitive in the future. Large enterprises in Kazakhstan, such as "Kazakhmys", "Kazminerals", "Kazzinc", and "ArcelorMittal Temirtau", are robotizing mining operations. These enterprises have developed digital modernization plans; they are embarking on modernization programs such as "smart mine," "smart mine," where new technologies are introduced: advanced sensors, sensors, robotics, unmanned vehicles.

When implementing the planned projects of digitalization and robotization of production enterprises of the republic, it is important to assess the effectiveness of modeling business processes under digitalization. Our proposed algorithm for assessing the effectiveness of modeling business processes of a company under digitalization allows us to determine the feasibility of digitalization of companies and implement measures for the implementation of digital technology [11].

Business processes of a company in the context of digitalization should be assessed in terms of their efficiency / feasibility of input and modeling. We have developed a corresponding algorithm shown in Figure 1

This algorithm for assessing the effectiveness of modeling the company's business processes in the context of digitalization is a detailed scheme with certain options for the execution of stages and decisions (with their positive and negative development), which is shown graphically (Fig. 1)

The proposed algorithm for assessing the effectiveness of modeling a business process can be conditionally divided into several stages, based on the results of assessing indicators, an intermediate control of the results is assumed with the necessary adjustments to the business process. So, for example, if at the initial stage it turns out that the business process is unprofitable, then the assessment of the efficiency of the use of labor resources does not matter, as well as the assessment of the degree of participation of the monetary assets of business processes in the total current assets of the organization, and other actions.

The algorithm for assessing the effectiveness of modeling the business processes of a company in the context of digitalization begins with a study of the business process, its organization, the degree of implementation, including an overall assessment. The next step in the proposed methodology is to assess the payback of the proposed business process. This stage is calculated, the calculation of the payback of the proposed business process is carried out according to the formula (1):

$$PP = IF: CF_n; \quad (1)$$

where PP is the payback period of the proposed business process;

IF - the amount of investment funds that are directed to the implementation of the proposed business process, thousand tenge;

CF_n - the average amount of cash flow from the implementation of the proposed business process, thousand tenge;

n - is the number of periods.

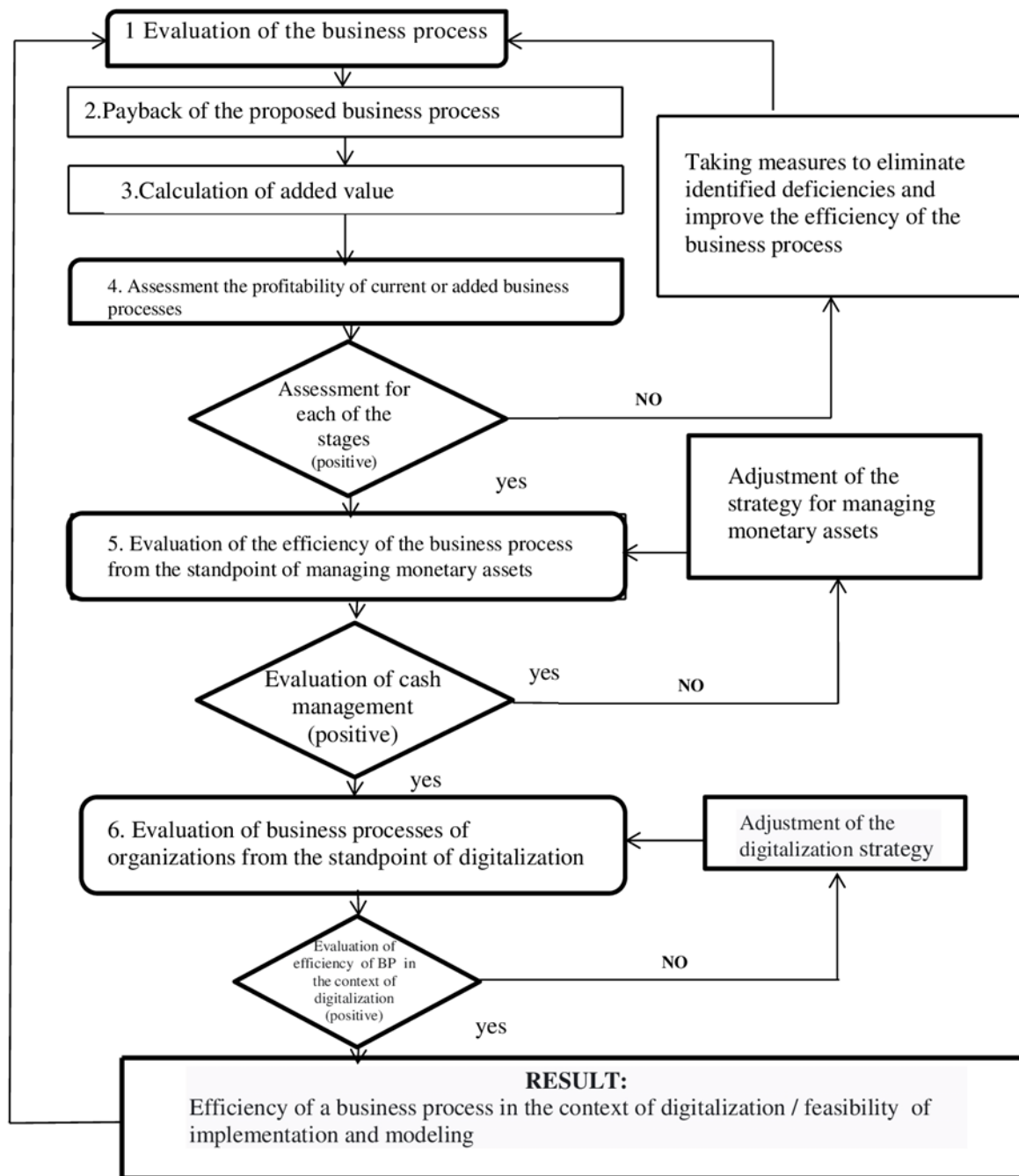


Figure 1 - Algorithm for assessing the effectiveness of modeling the company's business processes in the context of digitalization

Characterizing the above indicator, one should pay attention to the fact that it can be used to assess not only the effectiveness of the proposed business process, but also the level of risks [12]. The next stage in the algorithm for evaluating the effectiveness of modeling the company's business processes in the context of digitalization is the calculation of value added.

Value added is a theoretical concept that expresses the relationship between market value and actual costs incurred from the proposed business process. The value added (VA) can be calculated using the formula (2):

$$VA = V_a - V_b \quad (2)$$

V_a - is the value of the business process after processing;

V_b - is the value of the business process before processing.

In order to assess the effectiveness of modeling business processes that add economic value (costs), in a separate business process, this value can be expressed as a specific specific indicator.

Evaluation of the profitability of current or added business processes is the next stage in the developed algorithm for assessing the effectiveness of modeling the company's business processes in the context of digitalization. This indicator is the relative level of profitability from the proposed business process in the company.

The profitability of current or added business processes (Pr) is calculated using the formula (3):

$$Pr = P : R \quad (3)$$

P - profit from current or added business processes in the organization, thousand tenge;

R - revenue from current or added business processes in the organization, thousand tenge.

In the conditions of obtaining the optimal value (more than 4%), increasing it in dynamics (in comparison with the current indicator, that is, the indicator of the reporting period), it is necessary to proceed to the next stage in the developed methodology. In conditions of a value of up to 4%, its reduction in dynamics, measures should be taken to eliminate the identified deficiencies and increase the efficiency of modeling the business process in the company, in order to subsequently return to the stage and move on to the next one according to the developed methodology.

Evaluating the effectiveness of a business process from the standpoint of managing monetary assets is the fifth stage in the algorithm for evaluating the effectiveness of modeling a company's business processes in the context of digitalization. At this stage, the calculation is carried out according to the main indicators of efficiency: the degree of participation of monetary assets of business processes in the total current assets of the organization, the average period of turnover and the number of turnovers of monetary assets of business processes in the period under review, the number of revolutions of the average balance of monetary assets in the period under review for business processes, the coefficient of profitability of short-term financial investments for business processes, as well as the planned amount of the operating balance of monetary assets of business processes [13].

In terms of the effectiveness of the indicators their positive development and dynamics (in comparison with the indicators of the reporting period), the final conclusion is made about the effectiveness and feasibility of modeling the proposed

business process of the company in the context of digitalization. With the reverse dynamics, the digitalization strategy is being adjusted.

Conclusion

Digitalization has touched every business in one way or another, and this is just the beginning. Businesses that want to succeed and grow must embrace the challenges of today's economy - only then can they become leaders. Digital transformation will help them do just that.

Digital transformation is cyclical. Technology is changing rapidly, and services of all kinds are adding new features, so one of the most important conditions for success is that the transformation must not be interrupted. Once you start that process, you'll have a flexible and competitive company with more skilled employees and satisfied customers, which in turn will have a positive impact on the financial performance of the business.

Digital transformation is not only about the introduction of digital technologies, but also the transformation of many horizontal and vertical business processes, optimization of operational procedures, changing established models and formats of interaction between participants in value chains. New technological solutions require complementary investments in improving organizational practices, development of employee competencies, culture of working with data and digital solutions.

Digital transformation contributes to the solution of systemic problems in industries, reorganization of labor and automation of routine tasks. So, in the electric power industry, the number of accidents at infrastructure facilities, in improved coordination within and between organizations, and reduced transaction costs. For example, platform solutions in logistics reduce the role of intermediaries, at the same time expanding opportunities for communication with end users.

The government and state bodies of Kazakhstan, realizing the importance of informatization of society and the development of digital technologies in determining long-term economic growth, are actively involved in the development of this area as one of the key directions of state policy.

It should be noted that the digital transformation of enterprises will require large and complex events for the use of digital technologies and software applications in production and management.

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ҚАЗАҚСТАН ЭКОНОМИКАСЫНЫҢ ЦИФРЛАНДЫРУ НЕГІЗІНДЕ ДАМУЫ

Аңдатпа. Қазақстандағы цифрлық трансформация тау-кен өндірісі, машина жасау, авиация, ауыл шаруашылығы, энергетика, тамақ өңдеу және басқа да көптеген салаларды қоса алғанда, барлық өнеркәсіп салаларында жүзеге асырылуда. Бизнес-процестердің цифрлық трансформациясы компанияларға жылдам шешім қабылдауға, операцияларды қазіргі талаптарға тез бейімдеуге және тұтынушылардың қажеттіліктерін қанағаттандыруға мүмкіндік беруге бағытталғаны атап өтілген. Елдегі өндірістік

кәсіпорындарда жоспарланған цифрландыру жобаларын жүзеге асырған кезде, цифрландыру аясында бизнес-процестерді модельдеудің тиімділігін бағалау өте маңызды. Авторлар компанияның бизнес-процестерін модельдеудің тиімділігін цифрландыру аясында бағалау алгоритмін ұсынады, бұл цифрландырудың орындылығын анықтауға және цифрлық технологияларды енгізу бойынша шараларды жүзеге асыруға мүмкіндік береді.

Түйінді сөздер: цифрландыру, бизнес-процестер, өндірістік кәсіпорындар, экономика, цифрлық технологиялар, өнімділікті бағалау.

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РАЗВИТИЕ ЭКОНОМИКИ КАЗАХСТАНА НА БАЗЕЦИФРОВИЗАЦИИ

Аннотация. Цифровая трансформация в Казахстане реализуется практически во всех отраслях промышленности, включая цифровизацию горной промышленности, машиностроения, авиапромышленности, сельского хозяйства, энергетику, пищевую промышленность и многие другие. Отмечается, что цифровая трансформация бизнес-процессов направлена на то, чтобы компании оперативно принимали решения, молниеносно адаптировали работу к требованиям текущего момента и удовлетворяли потребности клиентов. При реализации запланированных проектов по цифровизации производственных предприятий республики важное значение имеет оценка эффективности моделирования бизнес-процессов в условиях цифровизации. Авторами предложен алгоритм оценки эффективности моделирования бизнес-процессов компании в условиях цифровизации, который позволяет определить целесообразность цифровизации компаний и осуществлять меры по внедрению цифровых технологий.

Ключевые слова: цифровизация, бизнес-процессы, производственные предприятия, экономика, цифровые технологии, оценка эффективности.