Methodical Tools for Analysing and Evaluating the Effectiveness of Digitalisation of Business Processes

Vitalii Voitenko
PhD in Economics,
Head of the Department for the Development of Partner Programs
Ukrprominvest-Agro LLC, Ukraine
E-mail: vo.voitenko@upi-agro.com.ua
ORCID: https://orcid.org/0000-0002-7872-9630

DOI: https://doi.org/10.32782/2707-8019/2024-1-7

***Abstract**. The article systemises methodical instruments for evaluating efficiency of measures of digitalisation of business processes of enterprise. A schematic diagram of a general algorithm for evaluating the effectiveness of measures to digitalise the business process of enterprises has been developed. It is determined that assessing the degree of effectiveness of measures to digitalise the business processes of enterprise will also indirectly create conditions for identifying bottlenecks, based on which the management of enterprise will be able to make operational management decisions to optimise the business process through its digital development. It is substantiated that the assessment of business processes and their digitalisation should lie within the functional responsibilities of a certain entity; for this purpose, it is proposed to establish committees at the enterprise to assess the efficiency and digitalisation of business processes. In addition to formulating proposals for eliminating bottlenecks and directions and methods of digitising the company's business processes, the functional responsibilities of the Business Process Efficiency and Digitalisation Committee include the function of assessing the efficiency of an already digitised business process. For this purpose, the Committee develops analytical tools using established business process evaluation methods adapted to the evaluation of a digitised business process, which may include the PDCA cycle, internal audit of business processes, analysis of key performance indicators, functional and cost analysis, and analysis of stakeholder requirements. Each of the proposed instruments for evaluating the effectiveness of measures to digitalise the enterprise's business processes is adapted. It is summarized that when assessing the efficiency of business processes with a view to determining the need for their digital transformation or assessing the efficiency of a digitised business process, it is advisable for an enterprise to approach this issue in a comprehensive manner, namely, to develop clear policies and procedures by establishing and regulating the activities of the committee for assessing the efficiency of the enterprise's business processes by delegating to it a responsible person from each unit for managing business processes that create value or participate in this process.*

***Keywords:** digitalisation, business process, business process digitisation, PDCA cycle, key performance indicators, benchmarking.*
***JEL Classification:** D81, D84*

1 Introduction

The result of measures to digitalise an enterprise's business processes in the business process management system is a digitised business process. In turn, to evaluate the effectiveness of such measures, namely the implementation of the digitalisation strategy, it is necessary to assess the business process itself. To build an effective system for assessing the effectiveness of business processes based on the results of digitalisation measures, it is first necessary to develop a clear algorithm that would define a conceptual approach to the function of assessing business processes as a component of their management system.

The purpose of the article is to develop methodological tools for analysing and evaluating the efficiency of digitalisation of enterprise business processes. Achievement of this goal is based on the following scientific and practical tasks:

– To systematise the organisational support for evaluating the effectiveness of measures to digitalise an enterprise's business process;

– to form and adapt the tools for evaluating the effectiveness of measures to digitalise the business process of an enterprise.

The methodological basis of the study was the postulates of the theory of systemic problem solving an integrated approach was implemented.

Both general scientific methods (analysis, synthesis, induction, deduction, specification, abstraction) and special methods were used, among which are: structural and logical ordering – in developing an algorithm for assessing the effectiveness of digitalisation measures, in formulating a programme for reengineering business processes for the purpose of their digitalisation; systematicity – in building a system of tools for assessing the effectiveness of business processes.

2 Organisational supports for evaluating the effectiveness of digitalisation of an enterprise's business process

Some researchers (Vorzhakova & Melnyk, 2020) adhere to the algorithm for assessing the effectiveness of business processes based on the strategic goals of the enterprise, which, in our opinion, is appropriate in the context of digitalisation, since by forming a digitalisation strategy as part of the corporate strategy of the enterprise, it seems possible to align the results of digitalisation of business processes with the defined strategic goals. In turn, the work (Bahatska & Heidor, 2019) identifies the assessment of the effectiveness of business processes with diagnostics and adheres to the resource approach to building an algorithm, revealing it through the resource support of the effectiveness assessment. This approach is also useful in assessing the effectiveness of digitalisation measures, since the assessment of a digitised business process can be carried out both with the help of human resources and technical support. The behavioural approach to assessing the effectiveness of business processes is followed in (Marchenko & Melnychuk, 2021), focusing on the opinion of the business process consumer, which can be agreed with partly because digitalisation measures may not always satisfy the stable system of views of business process stakeholders. This may be due to internal resistance to digital change, low levels of digital literacy, and unwillingness to change established standards of business process management.

Thus, following the model for assessing the level of digital maturity of a business process, it is possible to form a general algorithm for assessing the effectiveness of business process digitalisation measures (Figure 1).

The first stage of assessing the effectiveness of digitalisation measures is a preliminary assessment of the business process (stage 1), which will be an indication of the digital maturity of the business process. If the business process has not reached digital maturity, a programme for its digitisation is formed, which will include calculating the payback of the business process digitalisation measure (stage 2), determining the economic effect (added value) (stage 3) of such a measure and comparing the profitability of the business process "before" and "after" the digitalisation measure (stage 4). Only if the specified indicators of the digitalisation programme meet the established reference values, it is allowed to implement this programme, ensuring the result of such a programme as a higher level of digital maturity of the business process through the following indicators: alignment of the goal of digitalisation of the business process with the digital strategy (stage 5), increasing the level of digital literacy for the purpose of business process management (stage 6), formation of digital thinking for the purpose of business process management (stage 7) and creation of conditions for digital security in business management. If the upper level of the business process maturity assessment model is reached, it can be said that the business process digitisation measure developed by the digitalisation programme is effective.

Assessing the degree of effectiveness of measures to digitise the enterprise's business processes will also indirectly create conditions for identifying bottlenecks, based on which the enterprise's management will be able to make operational management decisions to optimise the business process through its digital development.

The fact that the assessment of business processes and their digitalisation should be within the scope of functional responsibilities of a certain entity is exceptional. To this end, it is proposed to create committees at the enterprise to assess the efficiency and digitalisation of business processes.

A business process efficiency and digitalisation committee is usually created as an interdepartmental team that monitors business processes, their digitisation, and how these processes depend on a particular group. The purpose of the Business Process Review and Digitalisation Committee is to look for opportunities to improve business efficiency and productivity where people and software-related business processes can be improved (digitised). The committee is responsible for identifying areas for business improvement, which may include updating or integrating existing software applications, creating additional software to reduce and automate manual tasks, recommending training opportunities for staff, or making recommendations for switching to another ERP software system.

To begin with, each department of the company selects a member of the Business Process Performance and Digitalisation Committee to represent their department. Each committee

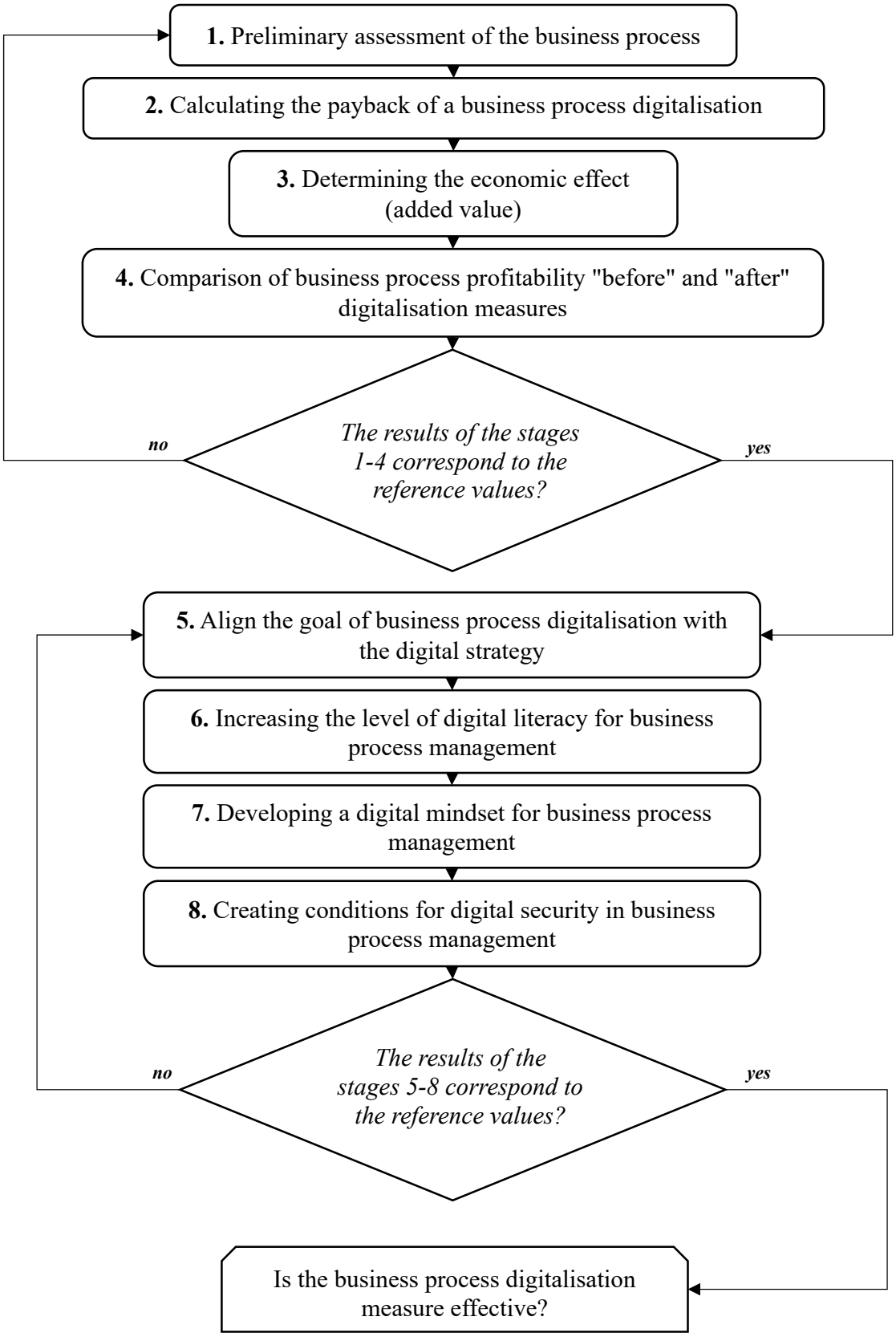

Figure 1 A general algorithm for assessing the effectiveness of digitalisation of an enterprise's business process

Source: compiled by the author

member asks each person in their department a series of questions to identify human and software-related bottlenecks and inefficiencies. It is useful for each committee member to find out what each person in their department likes and dislikes about the existing software they use to do their job. The committee representative conducts a survey of the department to identify opportunities for improvement and reports the information to the Business Process Performance and Digitalisation Committee. The committee then investigates and makes recommendations on how bottlenecks or inefficiencies can be improved through additional employee training or software implementation. If the Business Process Efficiency and Digitalisation Committee determines that the inefficiencies are related to enterprise resource planning or ERP software, then the committee will define business process management goals and create a request for proposal from ERP software vendors. After the final selection of the ERP software, the Business Process Evaluation Committee implements the new ERP software to ensure that it meets the objectives of addressing the business process inefficiencies.

The Business Process Performance and Digitalisation Committee focuses on the following objectives during projects related to the implementation of the digitalisation strategy:

– Consistent execution of the digital programme and project;

– fulfilment of commitments;

– adherence to parameters for measuring progress across the organisation;

– involving employees in the digital project;

– changing the digital culture of employees.

This committee should meet monthly or quarterly, or however often business issues require them to. The committee is dedicated to continuous business improvement by digitising business processes. It helps business owners prioritise digital projects and future budgets to help each department of the business increase productivity and drive profits.

In addition to formulating proposals for eliminating bottlenecks and directions and methods of digitising the company's business processes, the Business Processes and Digitalisation Committee's functional responsibilities include assessing the effectiveness of an already digitised business process. For this purpose, the Committee develops analytical tools using established methods for evaluating business processes adapted to the evaluation of a digitised business process. In other words, certain principles and methods of business process analysis should be the basis for analysing and evaluating the effectiveness of business process digitalisation measures. The following methods are widely used in analytical studies of business processes:

1) The PDCA-cycle (Plan-Do-Check-Act);
2) internal audit of business processes;
3) analysis of key performance indicators;
4) functional and cost analysis;
5) analysis of stakeholder requirements.

Let us consider in more detail each of these methods in the context of assessing the effectiveness of business process digitalisation measures.

3 A toolkit for assessing the effectiveness of digitalisation of an enterprise's business process

To ensure the desired efficiency and effectiveness of business processes, they need to be managed, which is possible according to the Schuchart-Deming PDCA management cycle adapted to digital business process management, which shows the procedure for the operation and continuous improvement of business processes (Figure 2).

The PDCA cycle includes four stages of managing the digitalisation of a business process: planning (Plan), execution (Do), analysis of process performance and efficiency indicators (Check), and process adjustment (Act). The circular cycle is the essence of the implementation of general digitalisation management functions (strategic marketing, planning, organisation, accounting and control, motivation, regulation) aimed at ensuring all conditions for creating a digitised business process.

The Strategic Marketing function is a set of activities aimed at forecasting development standards based on strategic market segmentation, identifying strengths and weaknesses, as well as the state of the external environment in order to create conditions for a competitive digitised business process. The planning function determines the goals of digitalising a business process, the means and the most effective methods for achieving these goals.

The organisation function forms the structure of the digitised business process and provides it with everything it needs (personnel, means of production, funds, materials, etc.), creating the conditions for achieving the digitalisation goals. Control and accounting as a management function involves analysing the effectiveness of the results of the digitalisation of a business process and assessing the degree of achievement of the enterprise's digitalisation strategy.

Motivation is the process of encouraging staff to improve digital literacy through material and moral incentives for employees, creating the most favourable conditions for the manifestation of their abilities and professional growth.

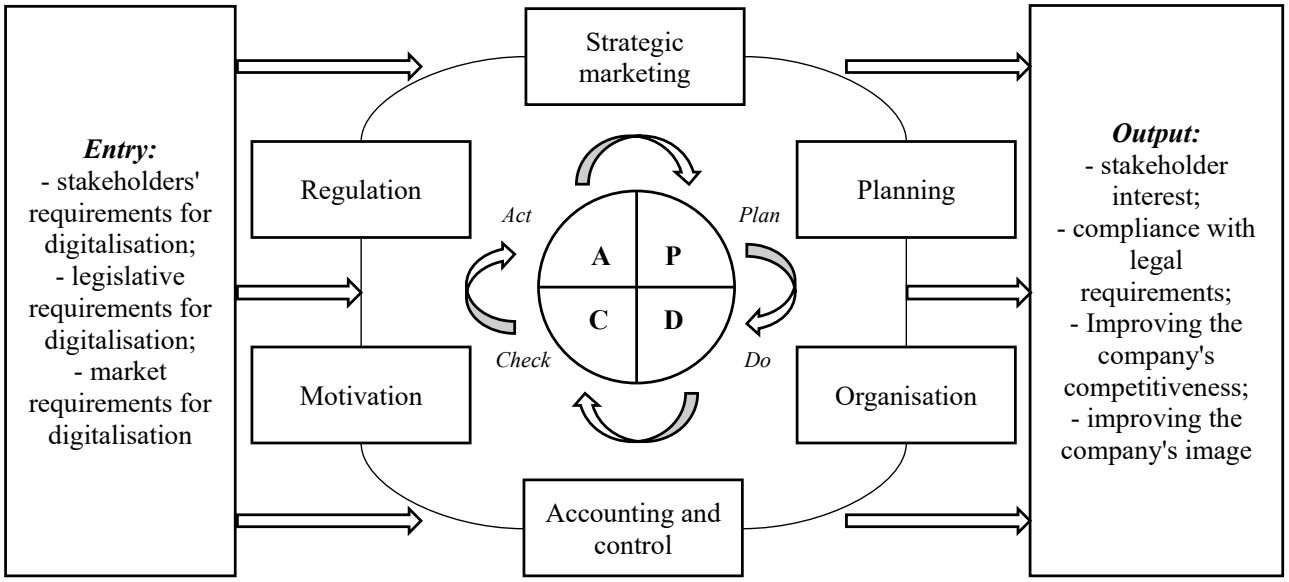

Figure 2 PDCA management cycle adapted to evaluate the effectiveness of digitised business processes

Source: compiled by the author based on Tytenko & Bohdan (2020)

Regulation is a management function that studies change in environmental factors that affect the quality of management decisions and the efficiency of managing a digitised business process and takes measures to bring the input parameters of a system or process to new output requirements. In this context, an enterprise is seen as a transformational business model that, in dynamic interaction with the external environment, receives various input data, digitally transforms them and generates a certain output of the business process.

Internal audit of business process efficiency is a systematic process by which a competent independent person collects and evaluates evidence of information characterising the business operations of a business entity to determine and express in his or her opinion the degree of efficiency of the implementation, coordination and digitalisation of business processes in terms of their impact on the creation of internal business value.

Analytical procedures are not only a part of the analysis in the audit of business processes, but also a tool for obtaining audit evidence on the need for digital transformation of a business process or assessing the effectiveness of a digitised business process.

The internal audit of business process efficiency includes the following stages and procedures:

1. Preparatory stage: description of existing business processes; drawing up a technological map of business processes of the audited entity.

2. Preliminary diagnostics: assessment of the compliance of each digitised business process with the organisation's digital strategy; assessment of the risks inherent in each digitised business process; assessment of the internal control system for each business process.

3. The main stage: identification of the main business processes; analysis of efficiency and performance of substantive audit procedures for the main business processes.

4. The final stage: forming an opinion on the degree of efficiency of the implementation, coordination and digitalisation of business processes in terms of their impact on the creation of internal business value; forming an opinion on the need to optimise and/or reengineer business processes.

The most important task of conducting a business process audit is not only to identify deficiencies and violations in regulations and their implementation, but also to preserve and consolidate specific knowledge and know-how, which strengthens the company's key competencies and helps protect them from unauthorised copying. Subsequently, they become the most important tool for focusing the organisation's digital development strategy on the main strategic perspectives: customers, staff and business processes (Table 1).

Internal audit of business processes involves collecting and verifying information on existing process regulations, their compliance with rationality requirements, and assessing the compliance of actual practice of operations and their stable sets (processes) with the regulations developed in the organisation. The state of the processes is assessed from the point of view of the formation of critical factors for success (Critical

Table 1 Internal audit of digitised business processes as an assessment of key business competencies

The prospect of improvement	Areas for improvement
Focus: stakeholder engagement	1) Improvement of consumer qualities through digitalisation of the process; 2) organisation of flexible and high-performance digital business processes; 3) forming a team-based workflow within hierarchical structures to increase responsibility and develop self-control.
Focus: staff and their digital literacy	1) Creating chains of operations that allow for the transfer of responsibility to employees and control; 2) development of digital self-learning skills, interchangeability and mastery of related operations; 3) implementation of end-to-end information systems with the creation of automated workplaces for employees; 4) continuous improvement of business processes with amendments to regulations.
Focus: digitised business processes	1) Achieving synchronisation of digital business and technological processes based on information unity; 2) improving the reliability of processes by recording early warning signals and implementing feedback in the control loop; 3) development of internal regulations and systems for standardisation of target and critical values of status and development indicators; 4) studying and expanding the potential of digital business processes.

Source: compiled by the author based on Tytenko & Bohdan (2020)

Factor Success, CFS), i.e. factors sufficient to achieve the mission (usually no more than seven or eight). Diagnostics is carried out based on the main and auxiliary business processes. An important point is to determine the correspondence between the real owner of the process and the nominal person responsible for its implementation (ideally, one person). Business experience shows that it is desirable to avoid cross-functionality of processes, because in this case it becomes difficult to determine the degree of responsibility of each of the co-owners for the identified inefficiency. The quality of a digitised business process can be assessed on a scale:

A – Excellent performance, in line with regulations and best business practice;

B – good operation, which complies with the applicable regulations, but differs in terms of efficiency and effectiveness from best practice;

C – satisfactory operation, which complies with the applicable regulations and does not correspond to the average state of efficiency and effectiveness in comparable conditions;

D – sufficient operation, which is carried out in violation of the applicable regulations and does not meet the specified criteria of efficiency and effectiveness;

E – unsatisfactory functioning, i.e. activities carried out in the absence of regulations and with critically low efficiency.

With the development and application of the process approach at enterprises, issues related to the assessment of business processes based on the results of the enterprise's activities become relevant. Enterprise results (key performance indicators) are a quantitative expression of the output of certain business processes, which can be assessed against the achieved internal level (efficiency of digitised business processes); the average industry level and the global level (benchmarking of digitised business processes).

The first area of evaluation is the most studied – the effectiveness of business processes, which is based on the effectiveness of the enterprise. The management theorist P. Drucker (Drucker, 1969) writes that effectiveness is the result of "doing the right things", and M.H. Mescon gives the following definition: "Performance is the external effectiveness that measures the achievement of an enterprise's goals" (Mescon, 2016). Another area of evaluation – benchmarking of business processes – is the least studied in the scientific literature and the least used in domestic practice. In general, the classical definition of benchmarking is that of the founder of this method (Tytenko & Bohdan, 2020): benchmarking is "the search for the best methods that lead to improved performance".

Within the framework of the first area of assessment, namely the effectiveness of digitised business processes, it is advisable to use the method of determining key performance indicators. Based on the assessment, measures are developed to improve performance, for which goals, resources, methods and tools are identified. To determine the key performance indicators (KPIs), the following may be used: current values of indicators or data from

previous periods; stakeholder results. An example of the formation of key performance indicators for the digitalisation of business processes is the construction of the following maps (Table 2).

In the absence of supporting special measures and continuous monitoring of business process efficiency, the level of performance indicators of almost all digitised business processes tends to decrease. Issues related to the effectiveness of an enterprise's business processes should be considered from two perspectives. Firstly, from the inside, considering the business process as an independent system and giving preference to the factors that ensure its effectiveness. Secondly, from the outside, considering the business process as an element of a more complex system – the enterprise – and paying attention to the factors that influence the performance of the enterprise.

Therefore, business process improvement is an ongoing activity that includes increasing the productivity of a digitised business process, reducing the time and/or cost of a business process while improving its quality. One of the most effective and recently recognised tools for improving business processes is benchmarking, which is the search for companies that have the best achievements in a particular area of activity for their detailed study. The study of the best digital business processes involves examining the mechanism of functioning of the process of interest to the company's management and comparing its performance with the results of a similar process of your own company. The knowledge gained from the benchmarking is adapted and implemented in business processes (Lazebnyk, 2018). To position the enterprise in a competitive business environment and to carry out strategic controlling of business processes according to the key performance indicators given in Table 2, it is advisable to form a strategic gap map, which is shown in Table 3.

Considering the cost side of assessing the effectiveness of digital business processes, it involves a functional and cost analysis, where performance indicators characterise the degree of achievement of the process goal and planned results, and efficiency indicators reflect how optimised resources and costs are in achieving the required result. At the same time, to assess the effectiveness of digitising a business process, it is necessary to use indicators that characterise economic efficiency (measured in financial resources) (Kalach & Zub, 2021). These indicators for each

Table 2 Key performance indicators for the digitalisation of business processes

№	Group of business process performance indicators	Definition of functioning attributes	Example of a KPI
1	Results KPIs	Assessment of the quality and quantity of the results obtained	Quality of the business process output
			intensity of the digitised business process
			profit (revenue) from the digitised business process
2	Cost KPIs	The amount of resources spent on business processes	Total costs
			costs of managing a digitised business process
			costs of ensuring the digitised business process
3	Functioning KPIs	Compliance of the technology with the process algorithm	Technological compliance of the digitised business process
			degree of infrastructure development
			level of use of innovations
4	Performance KPIs	The ratio of results achieved to resources expended	Productivity of individual systems (units) of the enterprise
			performance / throughput of the information system
			number of digitised business processes per unit of time
5	Efficiency KPIs	The ratio of the result obtained to the cost of resources to perform work on the business process	Economic effect of digital business process management
			cost optimisation and simplification of the organisational structure of management
			functioning of the reference business model at the enterprise

Source: compiled by the author based on Tytenko & Bohdan (2020)

Table 3 Strategic map of efficiency gaps in digitised business processes

Group of KPI indicators	KPI	Actual value	Benchmarking platform			The value of improvement
			Competitor	*Industry average*	*Leader*	
Results KPIs	Quality of the business process output	a_1	…	…	…	n_1 kUSD
	intensity of the digitised business process	a_2	…	…	…	–
	profit (revenue) from the digitised business process	a_3	…	…	…	n_2 kUSD
Cost KPIs	Total costs	b_1	…	…	…	n_3 kUSD
	costs of managing a digitised business process	b_2	…	…	…	–
	costs of ensuring the digitised business process	b_3	…	…	…	n_4 kUSD
Functioning KPIs	Technological compliance of the digitised business process	c_1	…	…	…	–
	degree of infrastructure development	c_2	…	…	…	–
	level of use of innovations	c_3	…	…	…	–
Performance KPIs	Productivity of individual systems (units) of the enterprise	d_1	…	…	…	n_5 kUSD
	performance / throughput of the information system	d_2	…	…	…	–
	number of digitised business processes per unit of time	d_3	…	…	…	–
Efficiency KPIs	Economic effect of digital business process management	f_1	…	…	…	n_6 kUSD
	cost optimisation and simplification of the organisational structure of management	f_2	…	…	…	n_7 kUSD
	functioning of the reference business model at the enterprise	f_3	…	…	…	n_8 kUSD

Source: compiled by the author based on Tytenko & Bohdan (2020)

process are established from the process goal. Once the process characteristics are defined and the process model is built, the process costs must be identified and classified. To determine the effectiveness of a digitised process, it is necessary to know the cost of the process and the profit of the enterprise resulting from the operation of the process. The ratio of results to costs will be an indicator of process efficiency. The higher the value of the efficiency indicator, the more efficient the digitised business process is (the critical value of the efficiency indicator is one, with efficiency less than or equal to one, the process is inefficient). However, this approach is quite difficult to implement in practice, as it will be difficult to determine the company's profit resulting from the operation of a single process.

Conducting research on stakeholder interest (Lazebnyk & Voitenko, 2021) allows identifying and understanding the main problems of the enterprise, based on which the necessary corrective actions and measures to improve the quality of the business process through its digitisation are developed.

4 Conclusions

Thus, when assessing the effectiveness of business processes in order to determine the need for their digital transformation or assessing the effectiveness of a digitised business process, it

is advisable for an enterprise to approach this issue comprehensively, namely, to develop clear policies and procedures by creating and regulating the activities of the committee for assessing the effectiveness of the enterprise's business processes by delegating to it a responsible person from each unit for managing business processes that create value or participate in this process. As part of the functional responsibilities assigned to this committee, it develops analytical tools for assessing the effectiveness of business processes (before or after their digitalisation) and providing operational recommendations to improve business process management to build a competitive business model of the enterprise focused on digital business process management.

References

Bahatska K. & Heidor A. (2019) Biznes-protsesy v umovakh didzhytalizatsii ekonomiky [Business processes in the conditions of digitalization of the economy]. *Visnyk KNTEU: tsyfrovi tekhnolohii – Bulletin of KNTEU: digital technologies,* vol. 5, pp. 23–32. (in Ukrainian)

Drucker P. (1969) The Age of Discontinuity: Guidelines to Our Changing Society. New York: Harper and Row.

Kalach H. M. & Zub P. V. (2021) Tsyfrovizatsiia biznes-protsesiv promyslovykh pidpryiemstv [Digitization of business processes of industrial enterprises]. *Ekonomika ta suspilstvo – Economy and society*, vol. 26, pp. 1–6. (in Ukrainian)

Kraievskyi V. M., Tytenko L. V., Paianok T. M., Paranytsia N. V. & Bohdan S. V. (2020) Upravlinski informatsiini systemy v obliku ta opodatkuvanni: navch. posib [Management information systems in accounting and taxation: training manual]. Universytet DFS Ukrainy. Irpin. (in Ukrainian)

Lazebnyk L. L. & Voitenko V. O. (2021) Digital technologies in agricultural enterprise management. *Financial and Credit Activity Problems of Theory and Practice*, vol. 6(41), pp. 203–210.

Lazebnyk L. L. & Voitenko V. O. (2021) Upravlinnia biznes-protsesamy (BPM) pidpryiemstva v umovakh tsyfrovoi transformatsii ekonomiky [Business process management (BPM) of the enterprise in the conditions of digital transformation of the economy]. Tsyfrovizatsiia ekonomiky yak faktor ekonomichnoho zrostannia: kolektyvna monohrafiia. Vydavnychyi dim «Helvetyka». (in Ukrainian)

Lazebnyk L. L. (2018) Didzhytalizatsiia ekonomichnykh vidnosyn yak faktor udoskonalennia biznes-protsesiv pidpryiemstva [Digitalization of economic relations as a factor in improving business processes of an enterprise]. *Ekonomichnyi visnyk. Seriia: finansy, oblik, opodatkuvannia – Economic Herald. Series: finance, accounting, taxation*, vol. 2, pp. 69–74. (in Ukrainian)

Marchenko O. I. & Melnychuk H. S. (2021) Okremi aspekty tsyfrovizatsii biznes-protsesiv pidpryiemstva v suchasnykh umovakh [Certain aspects of digitalization of business processes of the enterprise in modern conditions]. *Zbirnyk naukovykh prats Universytetu derzhavnoi fiskalnoi sluzhby Ukrainy – Collection of scientific works of the State Fiscal Service University of Ukraine*, vol. 1, pp. 169–185. (in Ukrainian)

Mescon M. H. (2016) Fundamentals of Management. Williams.

Tkachuk V. O. & Obikhod S. V. (2020) Tsyfrovizatsiia biznes-protsesiv pidpryiemstva v umovakh perekhodu v didzhytal-seredovyshche [Digitization of the enterprise's business processes in the conditions of the transition to the digital environment]. *Infrastruktura rynku – Market infrastructure*, vol. 47, pp. 116–122. (in Ukrainian)

Tytenko L. V. & Bohdan S. V. (2020) Software and information support for business analysis in enterprise management. *Modern Economics*, vol. 20, pp. 272–277.

Vorzhakova Yu. P. & Melnyk K. H. (2020) Didzhytalizatsiia upravlinnia biznes-protsesamy [Digitization of business process management]. *Biznes, innovatsii, menedzhment: problemy ta perspektyvy* – Business, innovations, management: problems and prospects, vol. 1, pp. 52–53. (in Ukrainian)