BUSINESS EFFICIENCY: MACRO AND MICRO DIMENSIONS

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ABSTRACT

Knowledge about the beginning and intermediate stages of production and the end of the business process is the only way to develop a modern competitive business in the market. To stay afloat, companies need to constantly evolve and maintain a high level of efficiency in the working business process and introduce innovative methods to improve the quality of activities and efficiency. Business development is impossible without receiving various support from the state. Each country should understand how decisions on freedoms and restrictions in doing business will affect the economy and business. The purpose of the study is to review the tools for determining the efficiency of business processes and improving the activity of socio-economic objects where these business processes are implemented, as well as find the levels of efficiency of a group of countries in the world and provide recommendations for achieving a potentially possible marginal level of efficiency. The meaningful essence of such concepts as business process, innovativeness, and innovative activity was determined, and the advantages of the implementation of innovative methods were revealed. Process documentation is described in detail, and methodological recommendations for using tools for improving existing business processes are developed. To understand the levels of efficiency at all stages of the process execution, possible ways of measuring efficiency are described. The value of the efficiency of the countries relative to the efficiency benchmark was obtained using the CCR and BCC analysis methods. Using the Frontier Analyst Application software analysis package, a list of recommendations for achieving benchmark performance has been created. The use of the above methods for measuring the effectiveness of the process and the presented methodology for creating a description of the business process makes it possible to determine the strengths and weaknesses of the existing business processes. Each such growth of small and medium-sized businesses as a whole provides an impetus to the development of the national economy of the country.

Keywords: innovation, process documentation, business process measurement, productivity, business process efficiency, sustainable development, economic productivity, financial access, business freedom

JEL Classification: D61, F 20, G14

INTRODUCTION

Business processes are an important part of the economic movement and the development of the country's economic component. Having the tools to improve business processes, any enterprise can become competitive in its market for selling goods or services [1]. Improvement is impossible without comparing the existing state of the business process. Therefore, it is necessary to identify possible process measurements and systematize this knowledge. Another important step is to create a business process model depicting the movement and execution of each stage of the process cycle [2].

LITERATURE REVIEW

The relevance of the research scope is confirmed by numerous publications by domestic and foreign scientists. Thus, a list of 13,651 papers from 2017 to 2022 was obtained by the search engine of the scientometric database Scopus upon the TITLE-ABS-KEY

("business process") request. The analysis of the bibliometric dataset by means of the VOSviewer software tool made it possible to create a keyword map (Figure 1) and identify the top keywords in the research.

Figure 1. Keyword relationship map. *(Source: built by the authors using VOSviewer software tools)*

So, there is a list of keywords (Figure 2): business process, enterprise resource management, business process management, data mining, process mining, information, systems, system engineering, administrative data, processing, business process model, information management, Internet of Things, blockchain, process management, use of information, decision-making, process, big data, artificial intelligence, process modeling, Industry 4.0. Each word from this list reflects the current evolutionary movement of business processes and possible development trends for all possible manifestations of business in the future.

Figure 2 –Keyword cloud image. *(Source: built by the authors based on the results of the Scopus database using ScientoPy software tools)*

While analyzing scientific publications on the topic of "business processes and possible tools for determining efficiency," the works of domestic and foreign authors should be noted. V. A. Skakun examines the ability of an enterprise to adapt to the use of the process approach in his work [3]. In the research papers of V. A. Tigareva and I. V. Stankevich the

quantitative and qualitative approach to analyzing business processes is analyzed and their shortcomings and advantages are determined [4]. M. O. Chuprina, I. A. Shekhovtsova in their research paper discuss the use of IT tools to optimize business process management in the enterprise [5]. T. I. Lepeyko describes the necessity of introducing modern methods of business process management in the article [6]. K. Ya. Erokhin presents opportunities for increasing efficiency by building optimal business processes [7]. M. Harachych, K. Tatich, M. Harachych have examined the possibilities of improving the enterprises' efficiency and performance, and business processes through the use of BPM [8]. The research of G. Lemanska-Maidzik and M. Okreglitska identifies the limitation of the process-based approach to enterprise management and analyzes the enterprise orientation in process management [9]. M. P. Vil, L. R. Marcello, M. S. Flavia describe BPM and point out the importance of BPM research for business process improvement [10]. D. Ting-Yi Ho, Y. Jin, R. Dwivedi analyze and rationalize the development of BPM research through a longitudinal literature review [11].

AIMS AND OBJECTIVES

The purpose of the study is to review tools for determining the effectiveness of business processes and improving the performance of socioeconomic entities that use these business processes.

METHODS

In the research process, using the following methods: logical grouping of macro- and micro-indicators of the efficiency of business processes, bibliometric analysis using Vosviewer software (for building and visualizing bibliometric networks on the topic of measuring and evaluating the efficiency of business processes), and ScientoPy software (for identifying top-keywords for the subject of the research, while the list of keywords is formed according to bibliometric metrics such as the value of the Hirsch index and the average annual number of citations), systematization of methods of measuring the efficiency of the business process, multi-criteria optimization linear programming using data envelopment analysis implemented in the Frontier software Analyst using CCR model (Charnes-Cooper-Rhodes model) and duality BCC model (Banker-Charnes-Cooper model), cross-country comparison of business performance (based on the values of the required factors and indicators compared to benchmarks representing best practices). The Primary CCR model made it possible to determine the influence of the input indicators of Investment freedom, and Income tax rate on the output indicator of Business freedom, namely to determine the maximum effect under the condition of minimizing the weighted input indicators in relation to the normalized output. Duality BCC DEA-model made it possible to determine the maximum effect under the condition of minimizing the weighted input indicators to the output indicator of Business freedom.

RESULTS

A business process is a set of linked tasks that find their end in the delivery of a service, product or project.

To create a clear business process, organizations need to describe business operations with sustainability in mind, which can be done through two steps: the first step includes the business process documentation; the second step provides for implementing effective process improvement techniques to ensure sustainability. Every business is based upon a variety of business processes, and their effectiveness determines survival and development in a competitive market [12]. The Law of Ukraine "On Innovation Activity" provides the following definitions: "Innovations are newly created (applied) and (or) improved competitive technologies, products or services, as well as organizational and technical solutions of a production, administrative, commercial or other nature, which significantly improve the structure and quality of production and (or) social sphere;" "innovation activity is an activity aimed at using and commercializing the results of scientific research and development and predetermine the release of new competitive goods and services to the market [13]."

The use of innovation activity in existing business processes allows us to call a business process innovative.

Innovations are designed to improve business operations by solving problems, resolving bottlenecks or making everyday processes more efficient [14].

The benefits provided by innovative business processes are improved efficiency and productivity, lower costs, and competitiveness. Innovative methods are only implemented when there are guarantees of ultimate efficiency and profitability improvements [15].

It is important to manage your business results, as well as your product or service, or project and to complement this management with process control - especially when it comes to creating a sustainable business.

An important step is to determine the end goal or outcome from the operations that provide that end goal in the process of documenting a business process. It will be possible to control the stability of the business from all facets while these two things are separated. One should document the business processes to improve them, as well as use the process documentation software because of the complexity of business operations [16]. Process documentation provides the transparency that is a prerequisite for business process improvement.

The principles of process documentation form eleven steps: step one – define and name the process; step two – define the scope of the process; step three – find the process limits; step four – identify the process triggers; step five – find the process endpoint; step six – identify the process inputs; step seven – brainstorm the business process sub-process; step eight – organize the sub-processes sequentially to create a business process flow; step nine – describe the participants and ones admitted responsibility for identifying process risks or sustainability measures to monitor the process [17]. Once all the steps of process creation are completed, we can say that the process will work efficiently and smoothly [18].

Let's consider the process improvement tools, i.e. methods to help improve quality and performance by focusing on business processes. So, process improvement tool №1: gap analysis. A gap analysis examines and evaluates performance to determine the difference between the current business and what it might be developed to. To complete a gap analysis, you need to identify the current and potential state of the business [19].

Once the current performance has been determined, the perfect situation can be determined based on meeting or exceeding the standard requirements for business performance. Next, a clear framework needs to be defined that will bring the current state to a perfect one, the potential. To do this, key goals, as well as the skills required to achieve these goals should be identified. An action plan envisages team skills and expertise to achieve the business goals [20].

Process improvement tool №2: root cause analysis. Root cause analysis helps to understand the cause-and-effect relationships behind the problems and sustainability of a business. This tool is used for process improvement and is recommended to be used in conjunction with a gap analysis [21].

A common way to implement root cause analysis is to implement a fishbone diagram or the Ishikawa diagram (Figure 3).
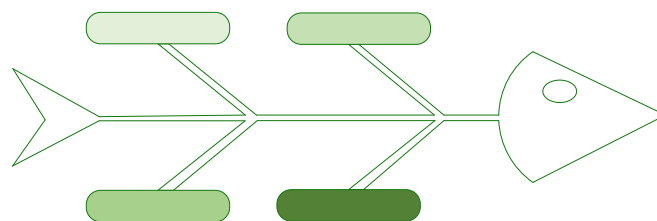

Figure 3 – A Fishbone Diagram. (Source: built by the authors based on [11])

The process improvement tool №3 – Hoshin Kanri. Hoshin Kanri is a strategic planning method that ensures everyone in the organization is moving towards the same goals [22]. This method moves away from the typical top-down deployment of organizational transformation to a bottom-up approach. That is, everyone in the organization is involved in setting priorities for improvement. The method takes improvement goals: for example, these could be goals set to address a given root cause – and then breaks these goals down into smaller goals, which are further broken down into projects [23]. The projects are divided among the team.

The Hoshin Kanri methodology creates and maintains transparent feedback loops at all hierarchical levels of the organization. The idea is to keep an open two-way stream for information sharing [24].

Sustainability goals are passed like a ball from the top-level management to lower organizational levels. The lower levels then give feedback and tactic propositions back to the top-level management. The ball may be passed several times until a sustainable goal and consensus are reached.

The process improvement tool №4 – the PDCA cycle. PDCA cycle stands for Plan, Do, Check and Act. It is a process improvement tool consisting of four steps to improve sustainability, namely:

Plan: the project team defines what they plan to change. Do: the improvement has been done. Check: the improved process is compared to the old one to determine whether the changes done were improvements at all. Act: everyone involved in the process fulfills their role in improving sustainability [25].

The PDCA cycle centers around the idea that more can always be done. The concept is a cycle, i.e. organizations will continuously assess where they are on the sustainability agenda and act or make changes to the process accordingly [26].

To work on improvement efficiently, you need to have information about the performance of the available process. The problem of measuring the business process correctly arises. When measuring performance, one must first be aware of the essence of the business process, namely the supplier-input-process-output-customer concept [27]. It logically follows that there are a limited number of process characteristics that can be measured, and the choice of these measures should be conditioned by the purpose of the business process within the overall business system and the needs of the enterprise (Table 1). The same group of measures applies regardless of the process type: manufacturing, administrative, physical, or intellectual. In these different businesses, process priorities are likely different, which determines the best measures to select to improve process productivity [28].

Table 1 – Methods to measure the business process efficiency. *(Source: built by the authors based on [29-36])*	
Method	**Method Description**
1. Process effectiveness	A measure of the ability of the process to produce the desired results or effect that can be qualitatively evaluated. This refers to the qualitative outcome of some process to measure the extent to which the goals or requirements associated with the process are achieved [29].
2. Process alignment	The conscious and systematic coordination of the three interrelated organizational drivers of strategy, culture, and infrastructure to mutually support and maximize, and effectively contribute toward the organizational goals [30].
3. Process reliability	A measure of how far a process output deviates from some expected value [31].
4. Process cycle time	The rate at which production processes and systems must complete production to meet customer demand [32].
5. Product cost	Refers to the costs incurred to create the product. These costs include direct labor costs, direct materials costs, manufacturing consumables and factory overheads [33].
6. Process profitability	Measures the costs and resources consumed by the process compared to established standards [34, 35].
7. Resource productivity	Measures the ratio of outputs produced by a process to the resources consumed by the process, including facilities, equipment, people and information technology [34].
8. Supplier effectiveness	A business practice used to measure, analyze and manage supplier performance in order to reduce costs, reduce risk and drive continuous improvement [36].
9. Process compliance.	Regulation and compliance with ISO industry standards and guidelines [37].

Every measurement should serve a purpose while measuring a business process – one should have a specific goal to improve the process efficiency. The head of the organization can achieve better performance that ensures the sustainable competitive benefit of the business process by making a large-scale assessment of the key elements of the process and then aligning the performance measures with the strategic goals and purposes [38].

Twelve countries were selected to calculate business process performance: Sweden, Australia, Canada, Germany, Poland, France, Kazakhstan, Ukraine, Greece, Belize, China, Japan. The data used for the study is presented in Table 2.

Table 2. Input data. *(Source: built by the authors based on [39])*			
Country	**Business freedom**	**Investment freedom**	**Income tax rate (%)**
Sweden	84,6	85	57,0
Australia	84,6	80	45,0
Canada	78,8	80	33,0
Germany	87,2	80	47,5
Poland	78,7	80	32,0
France	81,9	75	45,0
Kazakhstan	64,7	50	10,0
Ukraine	61,1	35	20,0
Greece	70,3	55	44,0
Belize	54,0	55	25,0
China	68,8	20	45,0
Japan	78,3	60	40,8

The method chosen for the calculations is data envelopment analysis (DEA analysis), which allows determining the efficiency of decision-making units using two types of data, namely, the input and output ones. DEA is an extreme point method and compares each element only with the "best" one [40].

CCR model (Charnes-Cooper-Rhodes model) was used for the analysis [41]:

$$e_0 = \frac{\sum_{j=1}^{s} u_j y_{j0}}{\sum_{i=1}^{r} v_i x_{i0}} \to max \qquad (1)$$

If the maximization conditions are met (2):

$$\frac{\sum_{j=1}^{s} u_j y_{jm}}{\sum_{i=1}^{r} v_i x_{im}} \leq 1; m = 1,2,\ldots,n; u_j \geq 0, j = 1,2,\ldots,s; v_i \geq 0, i = 1,2,\ldots,r, \qquad (2)$$

where e_0 is the efficiency value of the element under study; n – the number of units compared; r – the number of input parameters; s – the number of output parameters; x_{i0} – an expression of the i-th input parameter of the element under study; y_{j0} – an expression of the j-th output parameter of the element studied; x_{im} – an expression of the i-th input parameter of the m-th element with i = 1, …, r and m = 1, …, n; y_{jm} – an expression of the j-th output parameter of the m-th element with i = 1, …, r and m = 1, …, n; v_i – weighting of the input parameter and with i = 1, …, r; u_j – weighting of the output parameter j with j = 1, …, s;

The CCR model for minimizing efficiency indicators is determined by a dual problem of linear programming:

$$e_0 = \frac{\sum_{i=1}^{r} v_i x_{i0}}{\sum_{j=1}^{r} u_j y_{j0}} \to min \qquad (3)$$

If the minimization conditions are met (4):

$$\frac{\sum_{i=1}^{r} v_i x_{im}}{\sum_{j=1}^{s} u_j y_{jm}} \geq 1; m = 1,2,\ldots,n; u_j \geq 0, j = 1,2,\ldots,s; v_i \geq 0, i = 1,2,\ldots,r \qquad (4)$$

The direct and dual BCC model (Banker-Charnes-Cooper model) is also a widely used model for determining relative performance (e_0). BCC model for maximizing performance [42]:

$$e_0 = \sum_{j=1}^{s} u_j y_{j0} + u_0 \to max \qquad (5)$$

If the maximization conditions are met (6):

$$\sum_{j=1}^{s} u_j y_{j0} - \sum_{i=1}^{r} v_i x_{ij} + u_0 \leq 0 \ (j = 1,\ldots,n); \sum_{i=1}^{r} v_i x_{i0} = 1; \qquad (6)$$

$$u_j \geq 0 \ (j = 1,\ldots,s); \ v_i \geq 0 \ (i = 1,\ldots,r)$$

where u_0 is a free variable.

BCC, a model for minimizing performance indicators, is defined as:

$$e_0 = \sum_{i=1}^{r} v_i x_{i0} + v_0 \to min \qquad (7)$$

If the minimization conditions are met (8):

$$\sum_{j=1}^{s} u_j y_{j0} - \sum_{i=1}^{r} v_i x_{ij} + v_0 \leq 0 \ (j = 1,\ldots,n); \sum_{j=1}^{s} u_j y_{j0} = 1; \qquad (8)$$

$$u_j \geq 0 \ (j = 1,\ldots,s); \ v_i \geq 0 \ (i = 1,\ldots,r)$$

where v_0 is free variable.

The business efficiency of the countries under study using the CCR model, where the input parameters are business freedom and investment freedom, and the output parameter is the income tax rate, is described further in the article.

The efficiency level of business management according to the CCR model (1), calculated by means of the Frontier Analyst Application software, is as follows: Sweden – 29,8%, Australia – 35,6%, Canada – 48,5%, Germany – 33,7%, Poland – 50%, France – 33,3%, Kazakhstan – 100%, Ukraine – 47,2%, Greece – 25%, Belize – 44%, China – 23,6%, Japan – 29,7%.

Business management efficiency levels when applying the BCC model (5) are as follows: Sweden – 100%, Australia – 95%, Canada – 97,5%, Germany – 100%, Poland – 100%, France – 84.1%, Kazakhstan – 100%, Ukraine – 50%, Greece – 42,7%, Belize – 54,7%, China – 36,5% and Japan – 76,9%.

A country is recognized as effective (benchmark) when it achieves 100% of the target parameter; countries that score between 90 and 99.99 points have a medium efficiency level. Otherwise, they are inefficient.

DISCUSSION

The results of these relative efficiency calculations allow generating a recommendation list on possible ways to minimize the input value – the income tax rate. Thus, for China, it is possible to reduce the income tax rate by 76,37% from 45% to 10,63% by increasing investment freedom by 165,84%, i.e. from 20 to 53,17 points. For Greece, it is possible to reduce the income tax rate by 75% from 44% to 11% by increasing business freedom by 1,24%, that is, from 70,3 to 71,17 points. For Japan, it is possible to reduce the income tax rate by 70,34%, from 40,8% to 12,1%, by increasing the investment freedom by 0,85%, that is, from 60 to 60,51 points. For Sweden, it is possible to reduce the income tax rate by 70,18%, from 57% to 17%, by increasing business freedom by 30,01%, i.e. from 84,6 to 109,99 points. For France, it is possible to reduce the income tax rate by 66,67% from 45% to 15% by increasing business freedom by 18,5%, i.e. from 81,9 to 97,05 points. For Germany, it is possible to reduce the income tax rate by 66,32%, from 47,5% to 16% by increasing business freedom by 18,72%, i.e. from 87,2 to 103,52 points. For Australia, it is possible to reduce the income tax rate by 64,44%, from 45% to 16% by increasing business freedom by 22,36%, i.e. from 84,6 to 103,52. For Belize, it is possible to reduce the income tax rate by 56% from 25% to 11% by increasing business freedom by 31,8%, that is, from 54 to 71,17 points. For Ukraine, it is possible to reduce the income tax rate by 52,78%, from 20% to 9.44% by increasing investment freedom by 34,91%, that is, from 35 to 47,22 points. For Canada, it is possible to reduce the income tax rate by 51,52%, from 33% to 16%, by increasing business freedom by 31,37%, i.e. from 78,8 to 103,52. For Poland, it is possible to reduce the income tax rate by 50%, from 32% to 16% by increasing freedom of business by 31,54%, that is, from 78,7 to 103,52. Nothing can be done for Kazakhstan – the country is the benchmark for efficiency balance among the twelve selected countries of the world and establishes the marginal border for the other countries in the group to reach.

Thus, in the article, work was carried out to determine the essence of the business process, as well as an overview of methods and tools for determining its effectiveness. The global index of economic freedom was analyzed and the indicators shaping business efficiency were determined (business freedom, investment freedom, and the income tax rate. Business efficiency was determined using the data coverage methodology - DEA for 12 countries of the world: Sweden, Australia, Canada, Germany, Poland, France, Kazakhstan, Ukraine, Greece, Belize, China, and Japan.

Calculations were made in the Frontier Analyst software, marginal efficiency indicators were determined using the CCR model and the BCC model. In addition, the Frontier Analyst software's analytical module presents the potential to achieve benchmark country performance by identifying which sector needs to be changed to achieve the desired level of perfor-mance.

CONCLUSIONS

Firstly, the paper proposes the methodology for determining business process performance through eleven process documentation steps. Secondly, four tools for business process improvement are presented: gap analysis, root cause analysis, Hoshin Kanri, and PDCA cycle. There are opportunities to improve the efficiency and development of existing business processes due to the improvement tools. Thirdly, to understand the process, it is necessary to have the ability to represent the business process in quantitative values, according to which it is possible to measure efficiency. Fourthly, nine methods of describing and measuring efficiency are presented: process effectiveness, process alignment, process reliability, process cycle time, product cost, process profitability, resource productivity, supplier effectiveness, and process compliance.

There are definitions of innovations and innovation activity according to the Law of Ukraine "On Innovation Activity," which defines that the latest or improved technologies are innovations to increase the efficiency and profitability of business processes. Thus, when innovative methods are used, ordinary activities become innovative ones that provide an impetus to the production of new competitive goods and services on the trading floors of the countries.

A global index of economic freedom and business management efficiency-forming indicators (business freedom, investment freedom and profit tax rate) are analyzed using twelve countries as examples. By means of an analytical module of Frontier Analyst software with the use of the CCR model and BCC model of linear programming, the potential for result-improved business management compared to benchmarks has been proven.

The findings can be used to improve the efficiency of business processes of socio-economic entities and the sustainable economic development of each country.

FUNDING

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ЕФЕКТИВНІСТЬ БІЗНЕСУ: МАКРО- ТА МІКРОВИМІРИ

Знання про початок, проміжні етапи виробництва та кінець бізнес-процесу є єдиною можливістю розвитку сучасного конкурентоспроможного на ринку бізнесу. Щоб залишатися на плаву, компаніям потрібно постійно еволюціонувати, тримати високий рівень ефективності робочого бізнес-процесу та впроваджувати інноваційні методики для підвищення якості діяльності, ефективності. Розвиток бізнесу неможливий без одержання різних підтримок зі сторони держави. Кожна країна повинна розуміти, як відобразяться на економіці та бізнесі ухвалені рішення стосовно свобод та обмежень у ведені бізнесу. Метою дослідження є огляд інструментів для визначення ефективності бізнес-процесів та підвищення рівня діяльності соціально-економічних об'єктів, де ці бізнес-процеси реалізуються, а також пошук рівнів ефективності групи країн світу та надання рекомендацій для досягнення потенційно можливого граничного рівня ефективності. Визначено сутність таких понять, як бізнес-процес, інноваційність, інноваційна діяльність; виявлено переваги від упровадження інноваційних методик. Описано процесну документацію в деталях, розроблено методичні рекомендації до використання інструментів удосконалення наявних бізнес-процесів. Для розуміння рівнів ефективності на всіх етапах виконання процесу описано можливі способи вимірювання ефективності. Отримано значення ефективності країн відносно еталона ефективності за допомогою методів CCR та BCC-аналізу. За допомогою аналітичного пакета програмного забезпечення Frontier Analyst Application створено список рекомендацій для досягнення еталонного рівня ефективності. Використання наведених методів вимірювання ефективності процесу та представлена методологія створення опису бізнес-процесу дають можливість визначення сильних та слабких сторін наявних бізнес-процесів. Кожне таке зростання малого та середнього бізнесу в цілому надає поштовх до розвитку національної економіки країни.

Ключові слова: інноваційна діяльність, процесна документація, виміри бізнес-процесу, продуктивність, ефективність бізнес-процесу, сталий розвиток, економічна продуктивність, фінансовий доступ, свобода бізнесу

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