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CONCEPTUAL PRINCIPLES OF ORGANIZATION OF BUSINESS PROCESSES IN HIGHER EDUCATIONAL INSTITUTIONS

Abstract. *The article is a comprehensive study on the development, analysis and application of information technology for the formation of principles of organization of business process models in higher education institutions. Particular attention is paid to the management of information flows in the process of the information management system of higher education institutions, allowing them to optimize the mechanism of organizing the work of all educational structural units (departments) and applicants for educational services regarding the business processes of an educational institution. In the conditions of modern economic development, as a rule, complex business processes are used using innovations and internal and external investments, the need to take into account the requests of employers and stakeholders, ensuring the quality of educational services, and labor market challenges has increased, which has led to a significant increase in financial costs and order fulfillment cycles. The purpose of the work is to reveal the specifics of solving the problem of rational organization of business processes of information flows by creating an effective information management system, which should ensure a continuous process of collecting, processing, transmitting and storing information necessary for making management decisions to ensure a high-quality process of providing educational services within the framework of educational curricula of specialties. The competitiveness and effectiveness of higher education institutions in modern conditions directly depends on ensuring the quality of making management decisions made by its top management, which, in turn, are determined by how successfully the movement of information flows is organized both within the HEI and with the external environment. The object of the study is the information flows of business processes of higher education institutions in the aggregate of inputs, outputs and relationships between higher education institutions and the external environment. The subject of the study is the information technology of managing information flows of the formation of business processes of higher education institutions. The work uses a set of research methods and approaches that allowed for the analysis of existing computerized information systems and technologies for managing business processes in higher education institutions, and highlights the advantages and limitations of the application of the analyzed models of information management systems and technologies. The article presents the following new scientific results: a conceptual model of information technology for the formation of business processes in higher education institutions has been developed; a model of an information management system for the formation of business processes in higher education institutions has been proposed, which is endowed with cognitive characteristics; multiple models of structuring processes for ensuring stable activity in higher education institutions have been developed.*

Keywords: information technology; business processes; information system development; information flows; higher education institutions (HEI); applicants for educational services (AES)

Introduction

The main direction of development of the domestic economy during the previous period was considered to be ensuring a high level of use of available capacities and resources, personnel, achievements of science and technology, which led, to a certain extent, to increasing the requirements for graduates of higher education institutions (HEI) of Ukraine in all sectors of the national economy.

Modern information technologies are characterized by high dynamism and are associated with constant changes in the demands of the world market, orientation on ensuring high-quality business processes, continuous improvement of technical capabilities of educational processes and high competition. In these conditions, a significant change in the emphasis in educational management is taking place from the management of the use of resources to the organization of dynamic business processes.

The qualitative difference in approaches to education management in the best foreign universities, compared to domestic ones, is that they give priority to the method of target planning and flexible orientation to the graduation of bachelors and masters for new specific requirements of the labor market. The activities of higher education institutions are aimed at unconditional fulfillment of the order in a short time at minimal cost, ensuring high quality of educational services and graduation of competent specialists.

All definitions of the concept of business processes are described from different points of view. It can be said that a business process is an abstract, complex, qualitative concept. The information base for the study of the indicators of the activities of higher education institutions was regulatory materials, scientific works of modern domestic and foreign scientists and practitioners, [1; 2].

The prototype of business processes in the research and scientific works of foreign and domestic scientists was the concept of "business transaction", proposed by L. G. Shemaeva, where a business transaction was considered as a conceptual component of the management procedure of financial management and the following definition was given to it: "A business transaction is a set of transactions interconnected by certain characteristics, aimed at making a profit [2].

A popular definition of business processes in higher education institutions is the value chain method proposed by Porter M. and Miller V.: “An entity defined by entry and exit points, interfaces, and organizational devices, which partially include service consumer devices (where the value of the service is added)” [3].

According to Elliott, J. J., business processes are horizontal hierarchies of internal and interdependent functional actions, the ultimate goal of which is the production of products or their individual components [4]. T. H. Davenport defines a business process as “a set of activities that have one or more input streams and form an output value that is of value to applicants for educational services (AES)” [5]. J. H. Martin and O. V. Aref’eva and a number of other scientists [1; 3; 7; 8] supplemented this definition; “A business process is a set of internal steps (types) of activity”, which begins with one or more inputs and ends with the creation of a product for applicants for educational services.

Analyzing the opinions of various scientists: O. V. Vinogradova, L. A. Ponomarenko and others [1; 6; 9; 10], it is possible to clarify the concept of a business process – it is a closed-system process that represents a workflow and is considered as a structured, sequential set of actions. This process has a beginning ("Input"), a certain number of stages of activity and the result of the work obtained "at the Output". That is, any process cannot be called a business process, even if this process leads to the creation of a product that represents value for the consumer, but does not provide additional profit.

It is advisable to combine the purpose of schematization by indicating the higher education institution, the field of knowledge and at the same time show a possible approach and use of this concept for a selected specific education institution of a certain level of accreditation.

Components of business processes – actions that are performed by scientific and pedagogical personnel using computer systems or automatically. The order of execution of actions and the efficiency of the operator's work determine the efficiency of business processes. The task of each HEI in improving its activities is to select and implement such business processes that would be effective and include such necessary actions that would contribute to increasing the number of educational processes and the profitability of the functioning of the HEI as a whole. Correctly selected and implemented business processes contribute to improving the quality of education, increasing profitability and customer satisfaction.

A rather important task in the implementation of business processes is to ensure transparency and understanding of its implementation in the HEI, because only in this case the project developer, business analyst, HEI manager and other stakeholders will have a clear idea of the progress of work, the organization of implementation and the degree of responsibility for the implementation process.

Therefore, when selecting business processes, designing and implementing business processes, there must be a clear understanding of the essence of the implementation of business processes, which allows you to correctly assess their effectiveness, quality and the need for their implementation in higher education institutions.

Any process is an orderly sequence of purposeful actions, functions, operations to transform input (data, materials, etc.) into output (product, services, information data, etc.). The main thing for a business process is its business orientation to increase the output of high-quality, competitive competent personnel upon graduation from higher education institutions.

However, HEI educational activities, the purpose of which is to train highly qualified personnel, should be considered a business process if additional profit is obtained as a result of the functioning of higher education institutions. Therefore, we will consider business processes to be a set of HEI activities, the result of which will be the training of highly qualified specialists for the needs of the national economy of Ukraine.

Studying, analyzing and comparing the essence and capacity of the above formulations, we propose to consider the business processes of higher education institutions as a process of providing educational services that meet the requirements of HEI, within the framework of ensuring competitive advantages in order to achieve the best level of strategic development.

The business process permeates all functional structures of higher education institutions, combining various works and tasks that must represent a single whole and be inseparable, and must also be simultaneously projected onto the recipients of these educational services themselves.

Objective of the work

Analyzing the existing definitions of a business process, we note that they are aimed at offering the customer (internal or external consumer of the results of the business process) an educational service, that is, a product that would satisfy him, in terms of quality and value indicators, in terms of content components, in terms of reliability and competence (attractiveness).

Business processes are inherent in all structural units of HEI, combining various functional tasks and types of work, everything must work as a "single organism" to achieve the set goals.

The definition of business processes is based on three main provisions:

The entities of processes are carried out between organizational entities. They can take place between HEI units, can be interfunctional and between individual employees of higher education institutions.

Business process objects are reduced to manipulating any objects. These objects can be both physical and informational.

Business process functions can include two types of functions: managerial (for example, to develop a draft budget) or operational (for example, to process orders from employers).

To ensure the effective operation of higher education institutions, all business processes must be clearly defined and described. At the same time, each process must have an execution procedure or have an execution technology.

The classification of business processes that make up the activities of HEIs is one of the most common researched tasks, which plays a key role in the decomposition of business processes into separate subprocesses that form the added value of educational services (Fig. 1). The classification of business processes by the degree of detail is the basis for models of complex business processes.

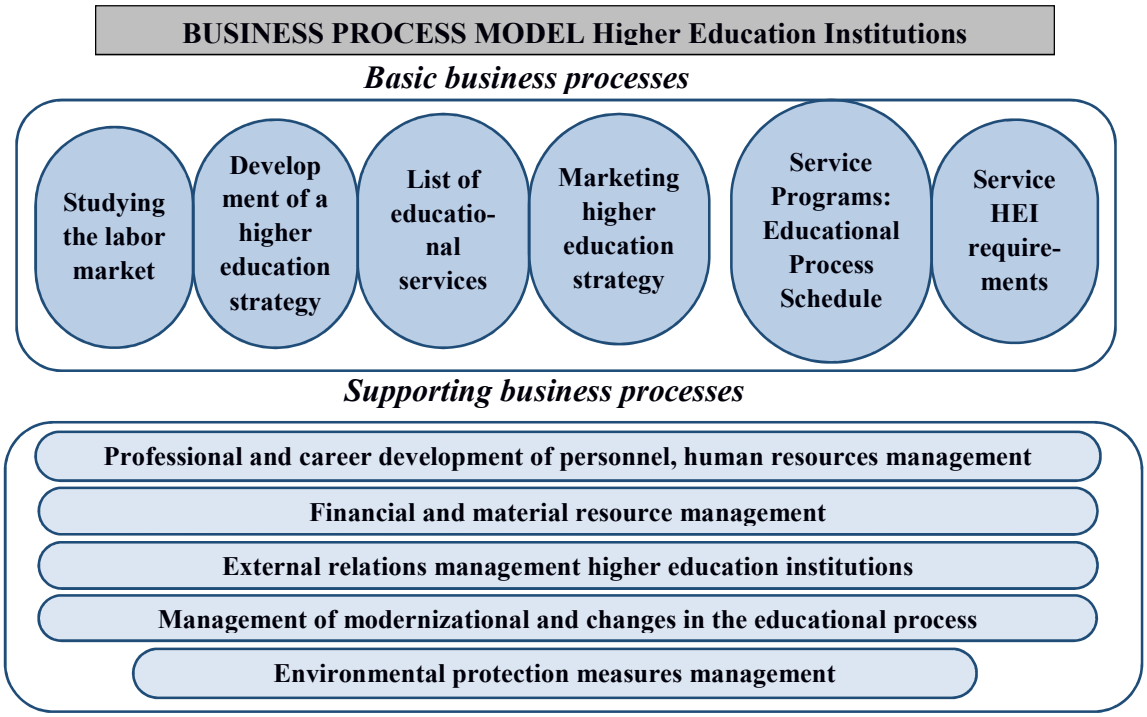

Figure 1 – Business process model higher education institutions

In recent years, models have been used that reflect the composition of business processes of higher education institutions, which have combined experience and expert knowledge in the transition to project and process management systems. Based on the widespread "process model", which provides a clear division into main and auxiliary business processes (Fig. 1).

Summary of the main material

The basis of the given (proposed by the author) model is the multi-level model of business processes of the American Benchmarking Cleavinghouse in Houston and the European Foundation for Quality Management (EFQM), which some scientists attribute to the American Productivity & Quality Center. The "value chain" is the basis of their concept of the composition of business processes, and on its basis a creative classification of business processes is proposed, which can serve as the basis for determining the composition of business processes of any HEI (Fig. 2). However, it is impossible to develop a unified model due to the fact that each higher education institution has a unique set of business processes and independently (autonomously) determines for itself which processes should be highlighted and which classification features to rely on depending on the specifics of its own activities [1 – 4; 9].

Regarding the practical experience of implementing the problem of isolating business processes, it should be noted that leading European universities, when using process orientation in the management of HEIs, have analyzed their work and determined the composition of business processes, but these lists often reflect the specifics of the processes inherent in these autonomous higher education institutions. Attention is focused on the business processes of large corporations (stakeholders) involved in the fields of information technology, the provision of educational services and the industry of Ukraine as a whole. Research in the field of higher education institutions, aimed at the tasks that are set before them in the economic sector and are rapidly developing and bringing fairly stable profits.

There are several basic classifications of business processes, the impetus for them was the concept of Harvard Business School professor M. Porter [3], who, as part of the value creation (growth) chain, identified primary and auxiliary activities, which became the basis for dividing business processes into main and auxiliary. Based on this theory, a model of the HEI business process is proposed (Fig. 2).

In modern dynamic market conditions, the survival of HEI is possible only if they adapt and adjust to constant changes in the external and internal environment.

Further improvement of the business process, taking into account the automation of the processes of processing information flows using new technical means and programs, is called engineering. Engineering activities are carried out both by higher education institutions themselves and by engineering consulting centers.

<table>
<tr><td rowspan="7">input data (funding, applicants for educational services)</td><td colspan="5">MAIN BUSINESS PROCESSES</td><td rowspan="7">source data (qualified specialists)</td></tr>
<tr><td colspan="5"><u>Infrastructure processes higher education institutions</u>
Structure, planning, financing, investments, information system</td></tr>
<tr><td colspan="5"><u>Human resources management</u>
Staff, training, advanced training, incentive and incentive system</td></tr>
<tr><td colspan="5"><u>Information technology development</u>
System architecture development, business process structure development higher education institutions</td></tr>
<tr><td colspan="5"><u>Material and technical support</u>
Quality indicators of ZOP, ZOP procurement, advertising, business process maintenance</td></tr>
<tr><td colspan="5">AUXILIARY (DERIVATIVE) BUSINESS PROCESSES</td></tr>
<tr><td>Logistics of material resources storage, data collection, customer contacts</td><td>Operations of producing competent specialists, etc.</td><td>Scientific and technical support order processing, storage, activity reports source data (qualified specialists)</td><td>Management and Marketing Advertising, exhibitions, customer complaints</td><td>Postgraduate education Lifelong learning</td></tr>
</table>

Figure 2 – Business process classification chain higher education institutions

Engineering in the educational sphere is aimed at improving the work and organization of the educational space of higher education institutions on a competitive basis in the labor market. All business process problems that are solved by the engineering method (by complexity and importance) are divided into two groups: evolutionary (improvement) and radical (global transformations – the reengineering method).

Business reengineering (BPR – business process reengineering) is a fundamental rethinking and radical reconstruction of business processes in order to improve the level of productivity criteria, such as cost, quality of services, speed of making management decisions, etc. The difference between improvement and reengineering of business processes is given in Table.

*Table – **Analysis of business process improvement and reengineering***

№ п/п	Business processes	Improvement	Reengineering
1	Level of change	Gradual growth	Radical
2	Starting point	Existing process	“Clean board”
3	Purity of changes	Continuous / simultaneous	Simultaneous
4	Direction	Bottom – up	Top – down
5	Spread	Narrow, at the function level	Broad, between functions
6	Risks	Very	High
7	Main tool	Static management	Information technology
8	Type of change	Cultural	Cultural / structural

HEI business process benchmarking is the process of systematically comparing the business processes of higher education institutions against market requirements.

Classification of business processes depending on the purpose of higher education institutions. At this stage of development [3; 4; 11], the following example of the allocation of business processes of HEI activities is given, classifying them by levels of significance in the quality management system. Under the condition of a larger-scale provision of educational services, it is necessary to allocate and group business processes into groups: hyperprocesses and superprocesses.

In some cases, the above concepts are of a general nature, which does not allow practical application for a specific higher education institution. Thus, we propose to consider the concept of “business process” for HEI as a cyclic set of logically interconnected in time and space internal activities of higher education institutions, which, using certain optimal terms, convert resources (inputs) into certain measurable results that have value for the customer (internal and external) according to the qualitative indicators of the educational process.

Thus, the work on the development of business processes for the objects of research continues by structuring higher-level business processes to the Deming-Shewhart PDCA cycle and the "strategic development map" of higher education institutions, as well as by decomposing higher-level business processes (subprocesses) and developing a "goal tree".

The implementation of business processes, as ordered by a sequence of actions, operationally operating in higher education institutions or in its individual structural divisions, is aimed at producing qualified specialists, taking into account the requirements for the provision of educational services in higher education institutions, the needs of the labor market, etc. All of the above processes are interconnected and explicitly presented using information, which is a set of information from the external environment (input information), is issued to the environment (output information), is used by the system itself, forms control actions for the educational process and is stored within the system itself.

All processes of society's life occur through the transfer of information flows of data, which is a form of communication between objects, where one is a source of information, and the other is the personnel who receive this information to make appropriate management decisions to optimize the processes of managing the HEI object.

At each level of management, reliable information is needed, which is acquired and distributed in the process of communication, stored and moved in the system across all levels of the HEI (from the highest level to the lowest and vice versa), as well as through horizontal communications to coordinate the tasks and actions of managing business processes and information flows.

The expansion of relations between subjects in the information activity of Ukraine is provided for by law, namely: the Law of Ukraine "On Information" dated October 2, 1992 No. 2657-XII [12] enshrines the right of citizens to information, the legal foundations of information activity. The law regulates relations regarding the creation, collection, receipt, storage, use, dissemination, protection, and protection of information. Where it is stated that information is the object of property rights of citizens, organizations, and the state.

The main directions of the information policy of Ukraine in the field of education are:

– creation of national educational computer technologies;

– ensuring the development and use of effective information systems and technologies;

– promoting the constant restoration, preservation, and archiving of national information resources;

– promoting international cooperation in the field of educational computer technologies.

The Law of Ukraine "On Information Protection in Automated Systems" [13] establishes the foundations of the regulation of legal relations regarding the protection of information in automated systems.

To study and reflect certain properties of complex real economic objects, economic-mathematical models (EMM) are created, with the help of which the assumptions of economic theory are analyzed, economic regularities are substantiated, and empirical data and knowledge are systematized. EMM (prefixed as a list of mathematical equations), which together are used as a tool for forecasting, planning and managing the economic activities of higher education institutions and society as a whole.

One of the main directions of their development is the development of complex models of the functioning of economic systems, which consider the totality of all the main processes: planning, own scientific activity, management of the implementation of the curriculum, marketing, etc. The main means of analyzing such complex models of systems are numerical experiments on a PC with the appropriate static processing of their results and use in the modeling process.

In general, a statistical EMM can be presented as follows:

$$Y = F(x, \omega, \alpha), \quad (1)$$

where x – is the input variable; ω – is the uncontrolled variable; Y – is the output variable; F – is the type of functional dependence.

When studying the dynamics of an economic system, the equation will take the following form:

$$Y(t) = F(x(t))\ \omega(t)\ \alpha. \quad (2)$$

The basis of successful modeling is the methodology of a multi-stage process of creating a model of the corresponding object, or its separate part.

Stages of the modeling process:

1) analysis of the problem and definition of the general research task;

2) decomposition of the general problem into a number of simple tasks that together form an interconnected complex;

3) clear formation of goals;

4) selection of a system of variables, necessary parameters;

5) recording of obvious relationships between them;

6) selection of initial variables that meet the goals;

7) analysis of the resulting model and the beginning of its implementation.

Creating an economic-mathematical model is a creative process and reveals the abilities of the researcher.

One of the mandatory stages of studying the economic indicators of HEI activities is conducting factor analysis, i.e. studying the nature and degree of influence of individual indicators on the results of the initial indicator and their relationships. Relationships between indicators (factors) are divided into functional and stochastic. Stochastic relationships are divided into correlation (as the relationship between the average values of two features) and regression (as the dependence of one random variable on other random variables). The study of correlation relationships involves conducting dispersion (with a small number of observations) and correlation analysis, which, in addition to deepening the dispersion analysis, provides a quantitative characteristic and mechanism of interaction of factor and effective features, shows the way to find the regression function.

Based on this, to study cases of slowdown in the activities of higher education institutions, for which certain business processes were previously implemented that did not give the desired results, modeling should be carried out for them using factor and regression analysis.

As a result of solving the scientific problems set, the following theoretical and practical results were obtained.

Conclusions

1. In the process of analyzing scientific research on the development and implementation of business processes, it was established that traditional methods of information management include program-targeted methods, methods of typical design solutions and process-oriented methods, etc. For the management of higher education institutions, it is advisable to use process-oriented methods, which in practical activities will allow to form a scientifically substantiated dynamic information technology in assessing the effectiveness of business processes of an organizational, educational and process nature.

2. As a result of the analysis of scientific research, the concept of a business process and the classification of business processes by types and characteristics were substantiated, which allowed to distinguish the main and additional business processes; methods and models for building an innovative technology for forming a class schedule for applicants for educational services.

3. Having analyzed the stages of development of methods of information systems management, it is clear that active development and application of methods of knowledge management, development of science and information technologies have been received for the purpose of effective management of values and interaction of participants of the educational process, as evidenced by the conducted research.

The development and proposals obtained according to the results of the research can be used in the practice of functioning of higher education institutions as one of the components of the integrated management system of higher education institutions.

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КОНЦЕПТУАЛЬНІ ЗАСАДИ ОРГАНІЗАЦІЇ БІЗНЕС-ПРОЦЕСІВ У ЗАКЛАДАХ ВИЩОЇ ОСВІТИ

Анотація. *Стаття є комплексним дослідженням з розробки, аналізу та застосування інформаційних технологій для формування принципів організації моделей бізнес-процесів у закладах вищої освіти. Особлива увага приділяється управлінню інформаційними потоками в процесі функціонування системи інформаційного менеджменту закладів вищої*

освіти, що дозволяє їм оптимізувати механізм організації роботи всіх освітніх структурних підрозділів (кафедр) та здобувачів освітніх послуг щодо бізнес-процесів освітнього закладу. В умовах сучасного економічного розвитку, як правило, використовуються складні бізнес-процеси із застосуванням інновацій та внутрішніх і зовнішніх інвестицій; зросла необхідність врахування запитів роботодавців та стейкхолдерів, забезпечення якості освітніх послуг та викликів ринку праці, що призвело до значного збільшення фінансових витрат та циклів виконання замовлень. Метою роботи є розкриття специфіки вирішення проблеми раціональної організації бізнес-процесів інформаційних потоків шляхом створення ефективної системи інформаційного менеджменту, яка має забезпечити безперервний процес збору, обробки, передачі та зберігання інформації, необхідної для прийняття управлінських рішень задля забезпечення якісного процесу надання освітніх послуг у межах навчальних планів спеціальностей. Конкурентоспроможність та ефективність закладів вищої освіти в сучасних умовах безпосередньо залежить від забезпечення якості прийняття управлінських рішень їхнім вищим керівництвом, які, у свою чергу, визначаються тим, наскільки успішно організовано рух інформаційних потоків як всередині ЗВО, так і з зовнішнім середовищем. Об'єктом дослідження є інформаційні потоки бізнес-процесів закладів вищої освіти в сукупності входів, виходів та взаємозв'язків між закладами вищої освіти та зовнішнім середовищем. Предметом дослідження є інформаційна технологія управління інформаційними потоками формування бізнес-процесів закладів вищої освіти. Використано комплекс методів та підходів дослідження, що дозволили провести аналіз існуючих комп'ютеризованих інформаційних систем та технологій управління бізнес-процесами у закладах вищої освіти, а також висвітлити переваги та обмеження застосування проаналізованих моделей систем та технологій інформаційного менеджменту. Представлено такі нові наукові результати: розроблено концептуальну модель інформаційної технології формування бізнес-процесів у закладах вищої освіти (ЗВО); запропоновано модель системи інформаційного менеджменту з когнітивними характеристиками для управління зазначеними процесами; побудовано множинні моделі структурування процесів забезпечення стабільної діяльності ЗВО.

Ключові слова: інформаційні технології; бізнес-процеси; розробка інформаційних систем; інформаційні потоки; заклади вищої освіти (ЗВО); здобувачі освітніх послуг (ЗОП)

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