
INDUSTRIAL AND CIVIL ENGINEERING AND ECONOMICS

DOI 10.15826/rjcest.2021.2.002

УДК 378.4

*L. I. Mironova*¹, *I. A. Jazovtsev*²

¹Ural Federal University, Ekaterinburg, Russia

²LLC "Net Element Software", Ekaterinburg, Russia

Email: *mirmila@mail.ru*

BUSINESS MODELING AS A TOOL FOR DEVELOPING CLOUD SERVICES IN THE «UNIVERSITY-EMPLOYER» SYSTEM

Abstract. The aim and objectives of the article is to describe the process of developing the business architecture of cloud service models, technological requirements for cloud service business models for the main business processes that determine the quality of student training and are necessary for managing the system of joint implementation of the educational process of the University, organizational requirements for the structure of the cloud management system for interaction between the University and employers, in order to obtain educational results, meet the requirements of Federal State Educational Standards and meet the needs of employers.

Keywords: system of interaction between the University and employers, business architecture, business model, cloud technologies.

*Л. И. Миронова*¹, *И. А. Язовцев*²

¹Уральский федеральный университет, Екатеринбург, Россия

²ООО "Net Element Software", Екатеринбург, Россия

E-mail: *mirmila@mail.ru*

БИЗНЕС-МОДЕЛИРОВАНИЕ КАК ИНСТРУМЕНТ РАЗРАБОТКИ ОБЛАЧНЫХ СЕРВИСОВ В СИСТЕМЕ «УНИВЕРСИТЕТ-РАБОТОДАТЕЛЬ»

Аннотация. Целью и задачами статьи является описание процесса разработки бизнес-архитектуры моделей облачных сервисов, технологических требований к бизнес-моделям облачных сервисов для основных бизнес-процессов, определяющих качество подготовки студентов и необходимых для управления системой совместной реализации образовательного процесса университета, организационных требований к структуре системы управления облаком для взаимодействия университета и работодателей, с целью получения образовательных результатов, соответствуют требованиям Федеральных государственных образовательных стандартов и отвечающих потребностям работодателей.

Ключевые слова: система взаимодействия университета и работодателей, бизнес-архитектура, бизнес-модель, облачные технологии.

Introduction

The political and economic changes that have taken place in Russia over the past twenty years have led to a serious crisis in the field of education, which can be formulated as the inability of the higher education system to adequately and promptly change in the face of rapid changes in society, politics and business. As a result, the level and quality of training of modern graduates of higher educational institutions does not meet the requirements of professional communities.

The Federal program «Development of education» for 2013-2020 noted that the basis for the development of the education system should be based on the principle of openness of education to external requests, targeting of resource support tools and the complex nature of decisions, as well as the formation of mechanisms for assessing the quality and demand for educational services with the participation of consumers by creating mechanisms for consumer participation in monitoring and evaluating the quality of education.

Thus, *the research problem* is determined by the current state of interaction between universities and employers, which requires the development of principles for building a business architecture of cloud service models in the «University-employer» system, technological requirements for business models of cloud services for the main business processes that determine the quality of student training and are necessary for managing the system of joint implementation of the educational process of the University, organizational requirements for the structure of a cloud system for managing interaction between the University and employers.

This fact determines the *relevance of the article*, which consists in the fact that there is an objective need to establish a system of close interaction between employers and universities and develop mechanisms for its management based on regional technologies. The main idea of the publication is to expand the understanding of the possibility of interaction between universities and employers in the context of the development

of Informatization of education based on cloud technologies, as well as the possibility of managing the system of their interaction.

The purpose of the publication follows from the purpose of the study and is to describe the process of developing the business architecture of cloud service models of the main business processes that determine the quality of student training and are necessary for managing the system of joint implementation of the educational process of the University.

Literary review

The interdisciplinary nature of the research required the analysis of a wide range of issues affecting the theoretical foundations of University competitiveness and the role of the University's information system, as well as the application of cloud technologies in education and the basics of business modeling.

Analysis of modern scientific publications on the competitiveness of universities have shown that a number of researchers [1, 2, 3, 4, 5, 6] agree that the existing governance structures in higher education, developed over the years of administrative-command style of management and not undergone almost no changes, do not allow the University to respond effectively to changes in the external environment and to adapt to new economic conditions, which identified the following contradiction in the development of universities: on the one hand universities are traditionally seen as state of the Institute, on the other hand, it is a subject of the market economy that has to adapt to fluctuations in demand and supply in the market of educational services. At the same time, the main task of the University remains the quality training of graduates with sufficient professional competence. At the same time, the University's competitiveness is considered as its ability to meet the needs of consumers of educational services, one of the main consumers of which are employers.

In parallel, one of the points of the Bologna Declaration, which was signed by our state, is to ensure the quality of education.

In accordance with ISO 90001-2000, the structure of the concept of «Quality» includes three defining components: meeting the needs of the consumer; meeting the needs of society; meeting the needs of employees.

The process of Informatization of society has now moved into a new phase, called digitalization, which leads to changes in the field of education, presenting graduates of higher education institutions with new requirements for the quality of education, and universities-the requirements of new priority goals and objectives for the development of modern education.

The analysis of scientific publications related to the construction of the information system of the University [7, 8, 9] showed that when considering a modern University as an object of Informatization, it is necessary to apply a systematic approach and highlight the main processes in its activities (educational, research, organizational, managerial and educational) in unity and interrelation, because the result of each of them ultimately affects the formation of the graduate, his professional and personal qualities (hard skills, soft skills), which should largely satisfy the potential employer [10].

However, the analyzed publications usually consider the features of the organization and construction of the corporate information system of the University, the main existing methods and advantages of using the corporate portal to create a fully functional system are given. The features of automation of internal processes of the University, such as: office management, financial document management, providing the educational process with electronic educational resources, drawing up and editing the schedule of training sessions and training practices, drawing up ratings of student progress and the effectiveness of teachers, etc. are widely covered.

At the same time, many IT- firms in the modern software market offer a variety of software products that provide automation of a particular type of University activity. However, not one of them fully captures all the divisions and types of work that are

available in higher educational institutions. At the same time, there is no description of theoretical approaches to the development of software aimed at interaction with employers within the framework of the University's information system, either in publications or in the development of it firms.

The onset of decline in the number of universities, the Association of different levels of education under the auspices of the universities, reducing recruitment and increasing competition among Universities suggests that in the near future the successful will be those universities that are able to respond quickly to external changes in which the corporate governance framework will be information technology, working on the basis of flexible business models that will become an integral part of University strategy and create competitive advantage in the market of educational services. But at the moment, there are no mechanisms to manage the process of evaluating the quality of students' training in terms of meeting the needs of employers. This fact indicates that the problem is not sufficiently developed.

Currently, the possibilities of using cloud technologies in education are widely studied. In Russian publications [11-17], it is noted that information technologies have reached such a level in their development that almost every University develops its own paradigm of electronic education, using both classical network and Internet technologies, and cloud technologies.

However, as noted in the study [11], few universities can afford to constantly update the fleet of computer equipment in the conditions of rapid obsolescence. The same applies to software. The main reason for this situation is the high cost of possessing modern technologies. As a solution to this problem, the authors suggest using ready-made cloud solutions (in particular, the cloud package of Google Apps Education Edition services), based on web technologies, which can be used both on desktop computers and on mobile devices. The authors conclude that the rapid spread of cloud computing challenges the educational environment to integrate cloud

services into the educational institution's system, review its infrastructure, and implement innovative technologies in the educational process.

Bilan I. in his research [12] also notes the prospects for the development and application of cloud technologies in education. Due to the scalability and accessibility of cloud resources, their use is seen as extremely profitable from a financial and legal point of view.

Rybanov A. A. in [13] proposes to introduce an Internet service to improve the quality of the organization of the process of completing the bachelor's final qualification work (FQW). He proposes to create web-oriented information system (Web-IS) «Bachelor» earmarked for monitoring and managing process execution FQW, which will provide information support of process of implementation of FQW (monitoring the progress of the FQW in accordance with the time spent issuing Department schedule, prompt and regular interaction of students with supervisors). The author notes that the work of the Internet service can be carried out from various workplaces, without pre-installing special software (it is enough to have an Internet connection and a web browser) and not to worry about updating the software of system users when developing and modifying the software product.

In the publications of Bagaeva A. P., Plotko K. O., Sirotkina A. Yu., Malovoy E. N. [14, 15, 16, 17] the possibilities of cloud technologies are analyzed with varying degrees of detail and the main directions of their use in the process of implementation in education are systematized:

- ensuring the collaboration of a large team of teachers and students from different educational institutions to create information products;
- rapid implementation of the developed educational products in the educational process due to the lack of territorial binding of the cloud service user to the place where it is provided;
- organization of interactive classes and collective teaching in distance learning

mode;

- organization of independent work of students, including the development of collective projects, when there are no restrictions on the capacity of the audience and the time of classes;
- conducting joint work in a circle of peers, regardless of their location (using tools such as YouTube, wiki sites, blogs for remote communication);
- providing inclusive education for people (elderly, disabled, etc.);
- development of web-oriented laboratories for specific subject areas, including mechanisms for adding new resources, interactive access to modeling tools, various information resources and user support tools, etc.;
- ability to move training management systems used by institutions to the cloud;
- providing researchers new opportunities for the organization of access, development and dissemination of applied models.

The analysis allows us to conclude that the rich capabilities of cloud technologies can be effectively used in the design of services for interaction between universities and employers.

The «Business modeling» tool has been used all over the world for many years to describe the process of business structures, enterprises, and business algorithms. According to the definition given by V. Kotelnikov [18], the business model turns innovation into an economic value for business. The business model details how a firm makes money by clearly defining its place in the value chain.

Soolyatte A. Yu., based on the analysis [19] of a number of works, identified two approaches to the description of business models: 1) value-oriented / client-oriented (approach aimed at the external environment of the organization); 2) process-oriented/role-oriented (approach aimed at the internal organization).

Definitions corresponding to the first approach:

- The business model is how the company chooses the consumer, formulates and differentiates its offers, allocates resources, determines what tasks it can perform on its own and for which it will have to attract specialists from outside, how it enters the market, creates value for the consumer and receives profit from this. Companies can offer products, services, or technologies, but this offer is based on a complex system of actions and relationships that represents the company's business model [20].
- The business model is a representation of how an organization makes (or intends to make) money. The business model describes the value that an organization offers to various clients, reflects the organization's capabilities, the list of partners required to create, promote, and deliver this value to customers, and the capital relationships required to generate sustainable revenue streams [21].
- A company's business model is a way that a company uses to create value and generate profit [22].

In turn, the author identifies only one definition corresponding to the first approach:

- a business model is a description of an enterprise as a complex system with a given accuracy. The business model displays all objects (entities), processes, rules for performing operations, the existing development strategy, and criteria for evaluating the effectiveness of the system. The form of presentation of the business model and its level of detail are determined by the goals of modeling and the accepted point of view.

When defining a business model, the set of features that define the content of this term can be quite broad. At the same time, the key elements of the business model of any company that determine its content are, according to the author [19]: the value for

external customers that the company offers based on its products and services; the system for creating this value, including suppliers and target customers, as well as value chains; assets that the company uses to create value; a company's financial model that defines both its cost structure and how to make a profit.

Another significant aspect of defining a business model is that a business model is often confused with a strategy, substituting one concept for another, or including the strategy as one of the components in the business model. This confusion is caused by the fact that the business model is closely related to the strategy, but not identical to it. The relationship between the business model and strategy can be illustrated using the «value equation» proposed by M. Levy [23]: $V=MS$, where V = Value (Value), M = Model (Business model), and S = Strategy (Strategy). This equation assumes that the company must determine the best business models for implementing the strategy and, based on them, deploy and implement its strategy aimed at creating value for customers and other stakeholders.

Soolyatte A. Yu. [19] identifies the following options for applying business models: to evaluate and analyze the effectiveness of the company's business in comparison with other similar companies; to assess the potential and investment attractiveness of the company's business in the future; to optimize the company's business from the point of view of strategy and from the point of view of maximizing and retaining the value that the company creates for customers and other persons interested in its business.

Ryabov V. A. and Nesvizh A. I. in [24] give the following definitions of the business model: «The Business model is a method of doing business, thanks to which a company can provide itself, that is, generate income, revenue, the business model explains how the company makes money, detally showing its location in the value chain».

Osterwalder A. and Pinier I. in their book [25] give their definition of the business model: «The Business model serves to

describe the basic principles of creation, development and successful operation of the organization». When creating a business model, they encourage you to make colorful models, supplemented with meaningful images depicting objects.

Isaev R. the article [26] defines a business model as a formalized description (graphical, tabular, in some cases textual, or in the notation of a specialized software product) of a certain aspect or sphere of activity of an enterprise. Based on this definition of a business model, it identifies 4 main ways to develop business models: in the rules of a specialized software product: a combination of graphics, tables and text; graphic: tree, flowchart, technological map, etc.; tabular; text.

The author notes that one of the most common ways to build business models is a tree (or hierarchical list), which allows you to list all the elements of the business model, show the relationships (connection, inclusion, etc.) between them and the parameters of each element. Tab faces is also a common way to build business models, which allows you to list all the elements of the business model (by row) and give them detailed characteristics (by column). The most famous example is the matrix (table) of responsibility distribution. The best option is a combination of 3 ways to develop business models (graphics, tables, text), which is implemented in all professional business modeling products.

Strekalova N. D. in [27], having analyzed the set of definitions of the concept of business model, focused on the following: a business model is a description that explains how companies work; a business model is a system consisting of elements, relationships between them and dynamics; a business model is a concept that is necessary in order to connect ideas and technologies with their economic results; a business model is a brief description of how a set of interrelated elements that reflect decisions about an enterprise's strategy, structure, and economy will be used to create a sustainable competitive advantage in certain markets. Finally, the author comes to the following

definition: «The Business model is, first of all, a conceptual tool for the study of a complex object (business system), reflecting the logic of business. It characterizes the main elements of the business, their relationships and the system of connections (mechanism) of the object with the external environment, which allows you to create a simplified holistic view of the business and reflect its most significant characteristics: what value and how it is created for the consumer, to whom and how it is delivered, and how resources and opportunities are used to create a sustainable competitive advantage, generate revenue and generate profit».

The analysis of the use of business modelling tools made it possible to conclude that they are not used enough in the system of higher professional education. However, in the conditions of market relations, when competition is increasing among universities, the development of business models in the system of interaction between universities and employers will ensure their effective management, and for the University will become a means of achieving competitive advantages in the market of educational services.

Thus, a preliminary study of the research problem showed that there is no systematic approach to its solution, specific solutions are not offered in the research text, and the problem is being investigated for the first time in this aspect.

The analysis of the use of business modeling tools has led to the conclusion that they are not used enough in the system of higher professional education. However, in the conditions of market relations, when competition among universities increases, the development of business models in the system of interaction between universities and employers will ensure their effective management, and for the University will become a means of achieving competitive advantages in the market of educational services.

Thus, a preliminary study of the research problem has shown that there is no systematic approach to its solution, specific solutions are

not offered in the research text, and the problem is being investigated for the first time in this aspect.

Method

Since the problem developed in the research is of an interdisciplinary nature, it is necessary to implement an integrative approach and take into account the provisions of the methodology of science, as well as Economics, information technology, educational management, and pedagogy. In accordance with the system approach, the work integrates classical and modern theories of various Sciences involved in solving research problems.

The system approach is understood, according to Abovsky N. P., as a special way of thinking, which assumes that any object or phenomenon under study should be considered as a system of interrelated components that ensure the necessary functioning of the system and the achievement of a certain goal [29].

The philosophical dictionary defines system analysis «as a set of methods and tools that are used in the study and construction of complex objects, as well as in the analysis of methods for making and justifying decisions in the design, creation and management of systems in various areas of human activity» [30].

As noted in the study of B. Sovetov [31], the system approach is based on two important principles: consistency and hierarchy. Implementation of the principle of consistency implies that the design process of any object is considered as a whole. In accordance with the principle of hierarchy, it is necessary to multi-level consideration of any object or process being studied. These principles are the basis of the research.

Kagan M. S. [32] believes that the object of research, which is considered as a system, must have: integrity and divisibility; the presence of connections between its components; the ability to combine its individual parts into a single whole; irreducibility of the properties of the system to the sum of the properties of its components

(the author calls this property «system effect»).

Bertalanfi L. [33] divides systems into open, closed and closed. Open systems are systems that can exchange information. Closed systems are systems that do not interact with the external environment due to the specifics of the underlying model. Closed systems are systems whose design has been completed at a given time.

Abovsky N. p. classifies systems on the basis of self-organization into two classes. The first class is formed by purposeful systems based on goal-setting and expediency. These systems are artificial systems. The second class of systems is formed by casual systems, whose organization is based on the result of the action of cause-and-effect relationships and the absence of an internal goal. These systems belong to natural systems [29].

The analysis of the system approach leads to the conclusion that the process of interaction of universities and employers studied in the framework of the study, there is an open artificial system, as defined by its components and know their content, the necessity of existence of each component, all communication between the components, identifies the compliance of components within the system, determine the purpose of the functioning of the system.

The object of the research is the system of interaction between modern universities and employers. *The subject of the research* is the development of theoretical bases for managing the system of interaction between universities and employers based on cloud technologies.

To solve these problems, the following research methods were used: a set of theoretical methods and techniques that are adequate to the nature of the object under study: methods of theoretical analysis (essentially logical, comparative), synthesis, abstraction and generalization, which were used in the complex study of various scientific views on the problem of research, reflected in scientific sources, as well as in the understanding of practical experience;

system-structural method that allowed us to consider the phenomena under study in all their diversity, interconnectedness and integral unity of their components; modeling method used for visual description of system objects. The content of the applied research methods, the specific problems solved with each of them, as well as the results obtained are described in the corresponding section of the article.

The results of research and discussion

In the modern world, the business modelling tool has proven itself well in the business community in a short period of time. According to one of the most established definitions, given by Osterwalder A. [21], the business model logically describes how an organization creates, delivers to customers, and acquires value-economic, social, and other forms of value. Against the background of the actualization of the problem of attracting business structures to the educational system, the research suggests applying a business modelling tool to solve this problem through the creation of a number of business models. When choosing the described business models, the work takes into account the needs of a modern educational institution for up-to-date information about the state of the labor market, the current needs of the employer, the need to attract «external» consumers to the results of the educational process, to the process of checking the quality of educational services provided, to help students and graduates in their professional career (in employment). In the course of the study, five business models were created, which will be discussed below.

The present time is characterized by a gradual reduction in the influence of the state on the activities of universities and, accordingly, a reduction in the influence of employers on education in General. Communication between employers and universities is almost non-existent. As a result, the level of training of graduates does not meet the requirements of employers, which is confirmed by statistics, according to which 75% of graduates can not perform their

professional functions and need to be retrained. The main reason for this situation is the lack of operational communication between universities and employers.

In the context of the studied problem the essence of the following concepts is clarified:

- a high-quality educational service is a service received at a University that has such characteristics and properties that meet or even exceed the needs and expectations of consumers. Customer satisfaction in this case is the perception of the degree of fulfillment of their requirements;
- an educational service provider is a modern higher education institution, where management is carried out in the conditions of the University's information system (IS), which allows unifying access to corporate data and improving the manageability of the entire complex of information resources;
- the end user of educational services is an interested employer, whose needs and expectations the University, which is a provider of educational services, is able to respond in a balanced way, improving its business processes in order to ensure value for the end user;
- the business model in higher education is a schematic representation of the process of creating, promoting and delivering value, which is a high-quality educational service, to its final consumer (employer).
- management of the «University-employer» system - an automated process for coordinating the requirements of the employer and the characteristics of the educational service, implemented using cloud technologies.

Many aspects of educational activities have been successfully informatized for a long time. As a rule, Informatization was directed inside the educational institution, which did not allow to influence the educational process from the outside. As a result, information

technologies, mass in nature, remained local within educational organizations.

Current trends are such that every year higher education institutions are increasingly moving closer to their employers. Currently, universities provide services in the educational market, the final product of which is graduates of the University who have certain professional competencies. Their main consumers are employers.

The use of information technologies for organizing communications between employers and universities (similar to the electronic market for goods and services) will improve the quality of the educational process by meeting their requirements, which in turn will make graduates more prepared for future professional activities.

The study analyzed 11 of the country's largest universities (Ural Federal University (UrFU), Novosibirsk state University (NSU), Southern Federal University (SFU), Siberian Federal University (SFU), Northern (Arctic) Federal University (NAFU), North-Eastern Federal University (NEFU), Kazan (Volga region) Federal University (KFU), Emmanuel Kant Baltic Federal University (BFU), Tyumen State Oil and Gas University (TSOGU), Ural state University of Economics (USUE), The Ural State University of railway transport (USURT) has shown that 10 of them have career and employment Centers (CCE) for future graduates, but the list of services provided by them differs significantly. The table 1 shows the list of services provided in the analyzed 11 universities in Russia.

Table 1

List of services of career and employment centers of leading Russian universities

Name of services provided in the CCE	Number of Universities, %
Conducting job fairs (career days)	81
Presentations of large companies	63
Placement of current vacancies of the employer on the University's website and information stands of the center	63
Organization of all types of industrial practice and internships for students (as well as temporary employment)	63
Organizing meetings of senior and graduate students with employers	54
Research activities (analysis of the labour market, analysis of competitiveness of graduates)	54
Career counseling for students and graduates	54
Primary selection for a competitive job	54
Seminars, trainings, consultations	45
Career guidance work with applicants	36

Current trends are such that every year higher education institutions are increasingly moving closer to their employers. Currently, universities provide services in the educational market, the final product of which is graduates of the University who have certain professional competencies. Their main consumers are employers.

The use of information technologies for organizing communications between employers and universities (similar to the electronic market for goods and services) will

improve the quality of the educational process by meeting their requirements, which in turn will make graduates more prepared for future professional activities.

As part of the research, it is advisable to solve the problems of communication and collaboration between universities and employers on the basis of cloud technologies, which are currently widely used [11-17].

Their use allows to standardize and automate business processes of interaction between participants of the educational

process and consumers of educational services.

The business model of «The managing the process of co-creating curricula»

The curriculum is the main document for obtaining any specialty at the University, as it contains all the disciplines, the development of which allows you to form the required competencies.

Currently, educational plans are drawn up by educational institutions based on the Federal State Educational Standards of Higher Education (FSSES HE). At the stage of formation of its variable part, the content of which is determined by the higher education institution according to the FSSES, it is advisable to involve employers in order to include the «necessary» educational disciplines for employers.

However, it should be noted that the main problem in the interaction of employers and universities in the issue of joint creation of curricula is the lack of a standard algorithm for their interaction, as well as the lack of qualified specialists (on both sides to work together). To solve this problem, a cloud-based system «Managing the process of joint curriculum creation» has been created. This system will combine many educational institutions and employers, regardless of their location. With this solution, educational

institutions will be able to build analytical tables of the relevance of various specialties, subjects, and competencies. The algorithm of the business process of the cloud system «Joint creation of curriculum» has the following form:

1. The Higher Educational University (HEU) forms curricula in the areas of training carried out at the University.
2. The HEU places curricula in the cloud service with pre-editing of fields (blocking fields that are not editable and unblocking available fields for modification).
3. Employers choose the curricula of the areas of training they are interested in.
4. The Employer edits the editable fields in the curriculum.
5. Modified curricula are returned to the cloud system.
6. The Cloud system generates statistics on curriculum changes to highlight the most popular changes.
7. Statistics are redirected to the educational institution for making management decisions.
8. The Higher Education University changes its curriculum in accordance with management decisions based on the received statistics of changes.

A graphical representation of the business model of the cloud service is shown in Fig. 1.

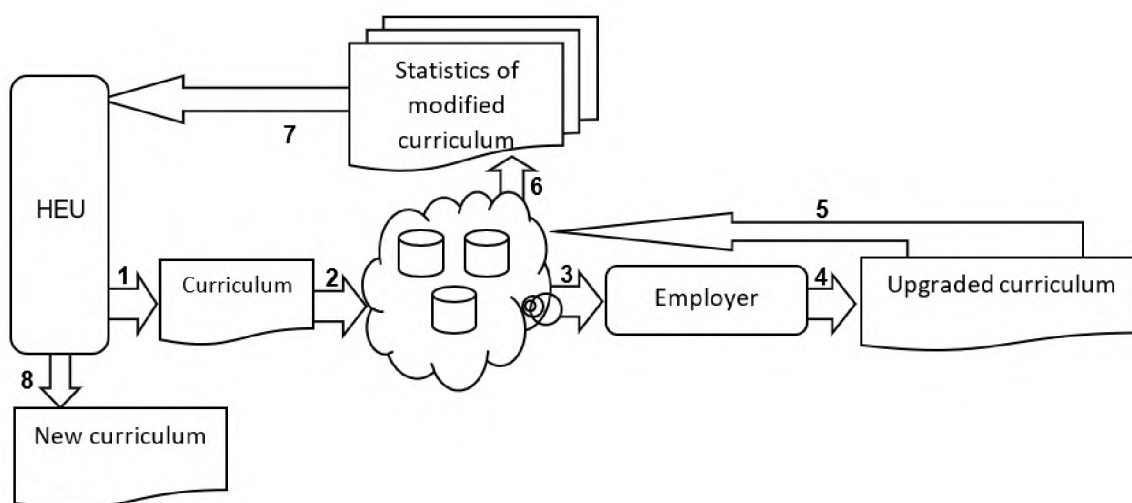


Fig. 1. Business model of the cloud service «Managing the process of joint curriculum creation»

The limited scope of the article does not allow us to describe in detail the process of developing other business models of cloud services. We will only present a description of the algorithm and a graphical representation of the developed business models.

Business model «Managing the process of temporary employment»

The implementation of the cloud service «Managing the temporary employment process» will significantly increase the coverage of higher education institutions by employers, while universities will have a much greater choice of vacancies available. By placing one job on the portal, the employer will have access to all educational institutions connected to the system. Using the system settings, an employer can restrict access to posted vacancies and even hide themselves (the name of the employer company), leaving only «essential» job parameters. The algorithm of the business process of interaction between an employer and a higher educational institution in the cloud service «Managing the temporary employment process» consists of the following actions:

1. The employer creates a vacancy for the recruitment of new employees.
2. The Vacancy is placed on the server and becomes available for all educational institutions, or for selected ones, depending on the configured availability policy.
3. Educational institutions analyze available new orders for training new specialists.
4. The Educational institution selects personnel that meet the selected vacancy.
5. The search results are uploaded to the server.
6. The employer shall review the proposals of the institution.
7. The employer returns its decision about hiring selected students (in the case of adoption of suggestions from the University).
8. The University sends employers a list of selected students for provisional employment in a company of the employer.

A graphical representation of the business model of the cloud service «Managing the

temporary employment process» is shown in Fig. 2.

Business model «Managing the knowledge verification process»

Two different algorithms have been developed to control the process of checking students' knowledge:

Algorithm 1: managing knowledge verification without revealing the details of testing-final control.

Algorithm 2: managing knowledge verification with preliminary preparation (through disclosure of testing details) - current control.

Both types of testing are offered through the corresponding cloud services. This solution will help reduce the time spent on creating and approving tests, conducting testing, and determining test results.

The Algorithm of the cloud service «Managing knowledge verification without disclosing details» has the following form:

1. The employer generates a series of tests to validate professional knowledge.
2. Tests are moved to the cloud service.
3. The HEU choose tests for conducting them inside the educational institution.
4. The HEU tests students for «current» professional aptitude.
5. A package of test results is Generated.
6. Test results are forwarded to the cloud service.
7. The employer analyzes the test results.
8. Based on the results of testing, the employer company employs students who have shown the best results, or issues them certificates of successful testing.

A graphical representation of the cloud service business model that corresponds to the described algorithm is shown in Fig. 3.

Algorithm of the cloud service «Managing knowledge verification with pre-training»:

1. The Employer forms requirements for potential employees.
2. The transfer of requirements in a cloud service.
3. The University selects the requirements for existing specialties.

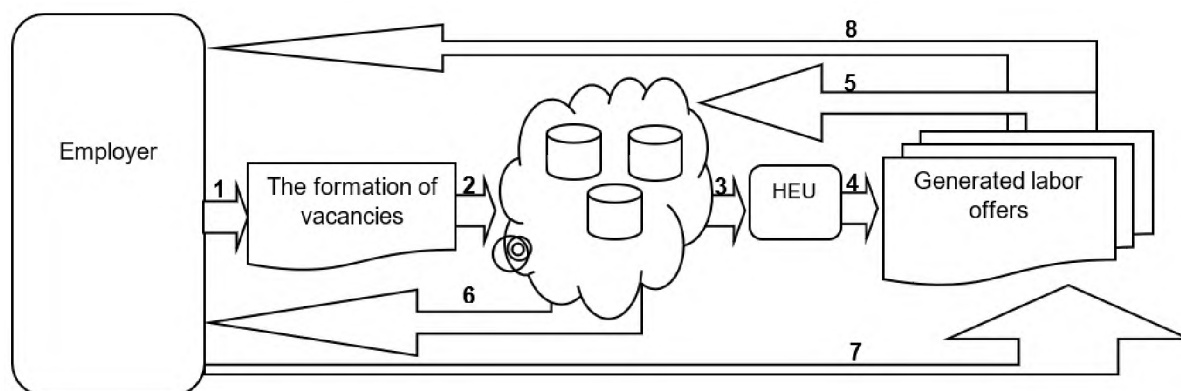


Fig. 2. Business model of the cloud service «Managing the process of temporary employment of students»

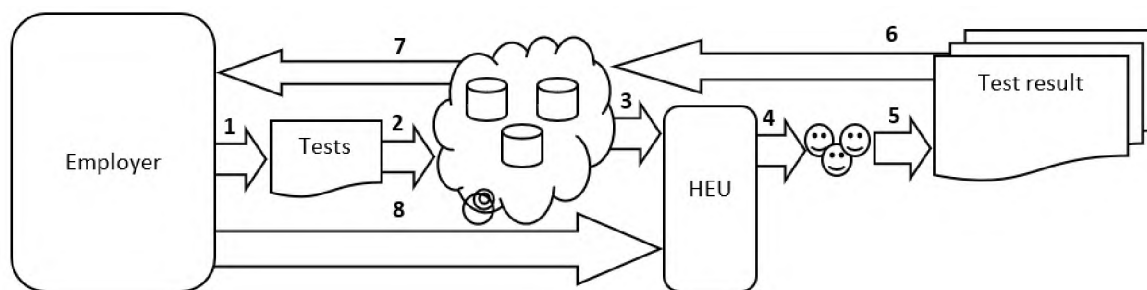


Fig. 3. Cloud service Business model «Managing knowledge verification without disclosing details»

4. The University prepares students according to the requirements put forward by employers.

5. The employer prepares verification tasks for students, prepared in accordance with their proposed requirements.

6. Tests are exported to the cloud service.

7. University imports from the cloud service tests to test the knowledge of trained students.

8. Students are tested on tests compiled by employers.

9. The test results are formed into the final package and exported to a cloud service.

10. Data on test results is processed on the server and sent to the employer.

11. Based on the results of testing, the employer company employs applicants who have shown the best results or issues them certificates of successful testing.

A graphical representation of the business model of the cloud service is shown in Fig. 4.

Business model «Managing the process of tender training of specialists»

The algorithm for implementing the cloud service «managing the process of tender training of new specialists» has the following form:

1. The company-employer forms a list of competencies that

the required specialists must be available.

2. The list is exported to a cloud service.

3. The University imports a list of competencies for the required specialists.

4. Based on the created list and the resources available form the proposals for employers.

5. The list of offers is sent to the cloud.

6. The employer receives a list of sentences using the cloud system.

7. The Employer responds to the proposals put forward by the University within the framework of negotiations.

8. The University takes the decision to start training of students (future professionals) in accordance with the underlying agreements.

9. Prepared students pass the control of the acquired knowledge and are sent to the employer.

A graphical representation of the cloud service business model corresponding to the described algorithm is shown in Fig. 5.

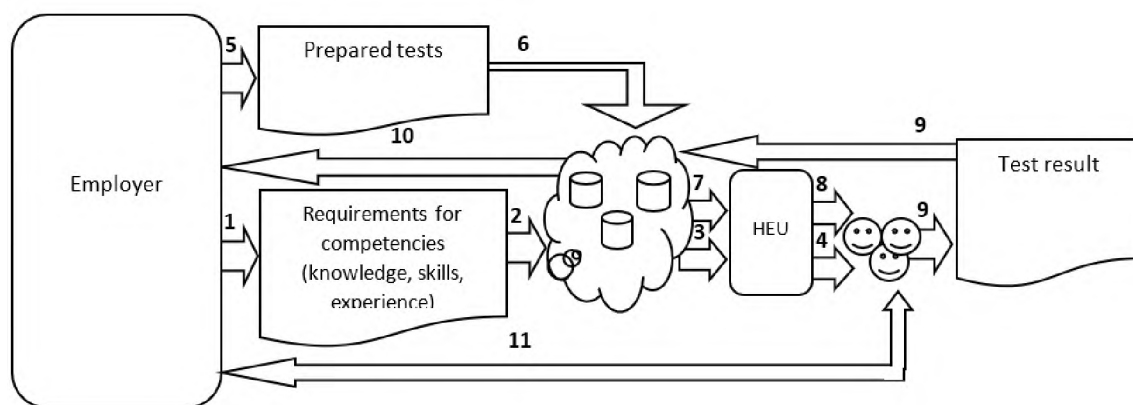


Fig. 4. Cloud service Business model «Managing the knowledge verification process with pre-training»

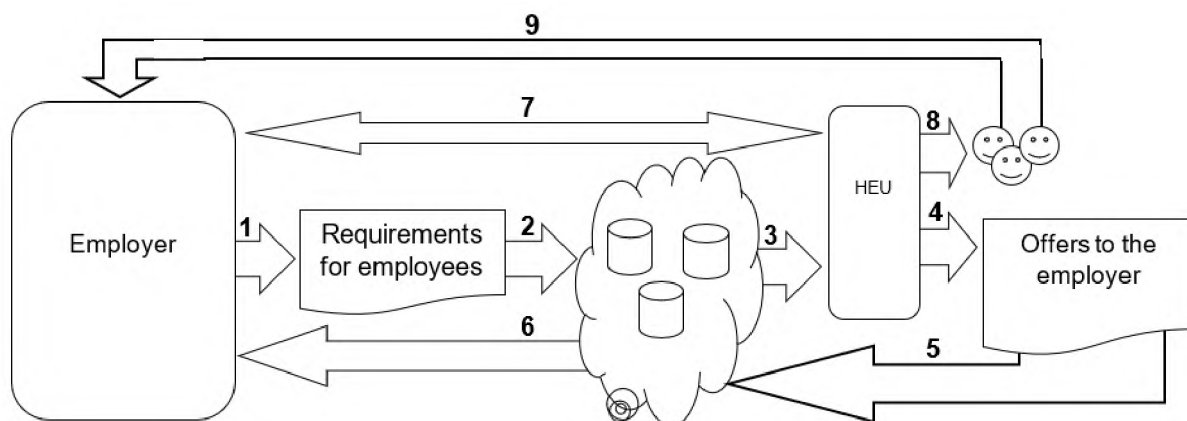


Fig. 5. Cloud service Business model «Managing the process of tender training of specialists»

Figure 6 shows the structure of a cloud-based system for managing interaction between universities and employers.

The cloud is managed by one main University

In this case, all newly connected educational institutions are consumers of resources, without the right to vote when making a strategic decision. The entire technical side of the project development and support falls on the shoulders of the main educational institution. In this case, universities connected to the cloud will use

only ready-made solutions, focusing all their attention on interaction with employers. In this situation, it is also possible that users will be able to access both the computing resources of the system and the interface for accessing the infrastructure of the cloud system. In this case, developers will be able to create completely independent applications, as well as integrate into existing ones using available files and databases.

The cloud is managed by the Council

In this form of management cloud services for each newly enrolled participant

delegates its representative to the Council for the development of the service. Depending on the intellectual (and financial) contribution of the participant to the development of the cloud service, the voice of each member of the

Council is given a certain weight. The participant's voice will influence strategic decision - making, and the project infrastructure will be available to them according to the participant's voice weight.

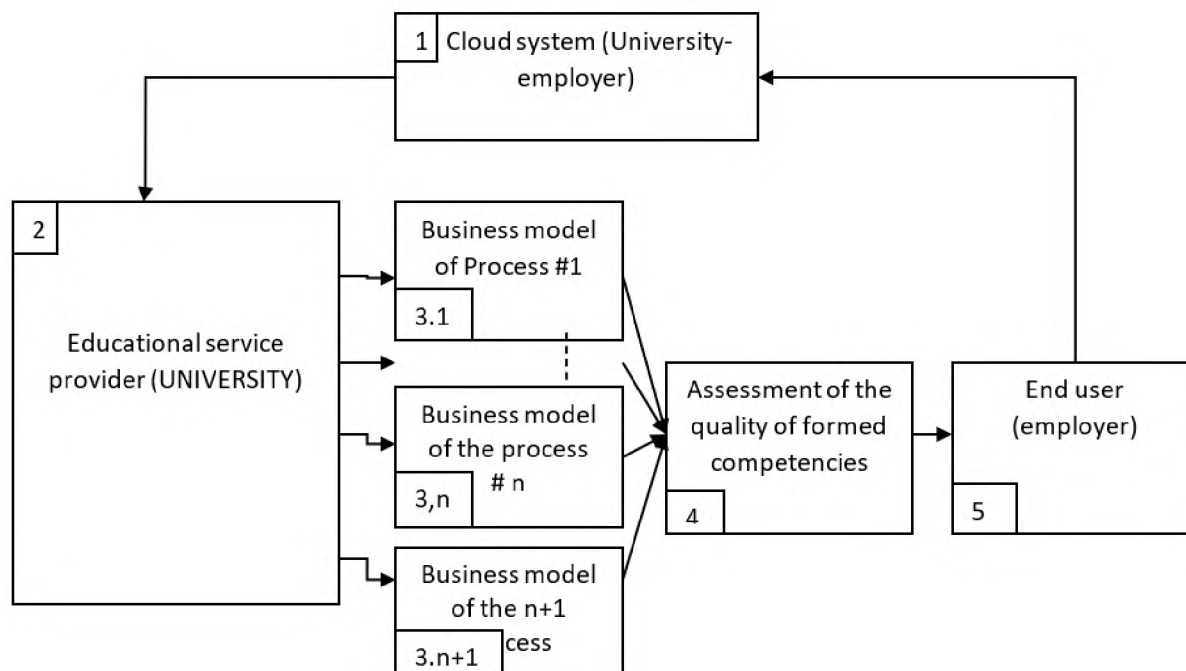


Fig. 6. Management Structure of interaction between the University and employers

The cloud is managed by an independent commercial organization

It is very likely that when creating a cloud service, the main organizer will be a commercial organization. With this approach, all technical support and creation of tools will fall on the shoulders of a commercial organization. This concept will be very beneficial for the main users of cloud services, since the implementing party will not have any motives to use the results of the activities of service consumers for profit. But, on the other hand, strategic decisions on the development of cloud services will be made by individuals who are not directly involved in the process of their application.

The cloud is managed by a government Agency

The option where a government Agency initiates the creation of a cloud service and manages it is the most advantageous for the

initial creation of a large-scale project. Thanks to its capabilities, the state structure can involve a large number of interested participants in the project, as well as Finance the creation of the entire service at a sufficient level, starting from the technical side and ending with software solutions.

The cloud does not have a control center

This option for developing a cloud service is unlikely, but it remains possible. A similar situation may arise if a project is developed by a scientist (student, teacher) as an experiment, not burdened with money problems and does not consider this project fully their own (similar to the development of the Linux operating system). In this case, the project can only exist after creating a regulatory document that describes the rules for development within the cloud system. A project with this structure may appear, but it will not last long in this form, and eventually

the management structure will change in a short period of time (if the project turns out to be relevant).

5. Conclusion

Results: within the framework of the research, an innovative mechanism for managing the system of interaction between the University and the employer is proposed, which assumes implementation on the basis of cloud technologies. The following business models are considered: «Managing the process of joint curriculum creation», «Managing the process of temporary employment», «Managing the process of knowledge verification», «Managing the process of tender training of specialists», and also developed forms of cloud system management.

Theoretical contribution consists in: substantiating the feasibility of using cloud technologies to create cloud services as an innovative mechanism that contributes to improving the efficiency and quality of educational services; identification of the composition and content of components included in the business architecture models of cloud services; identification of the main business processes that determine the quality of student training and are necessary for managing the educational system (government and commercial structures); justification and development of options for managing the system of interaction between universities and employers based on the use of cloud technologies.

The practical significance of the research results lies in the possibility of using the proposed innovative approach by universities when creating their own information systems, in the structure of which it is advisable to have a substructure that provides interaction with employers. In addition, the proposed approach can be applied by state Supervisory structures that regulate the educational process in higher education institutions, and by state and commercial structures that create information systems that involve cooperation with educational institutions.

References

1. Pashchenko N I 2014 University competitiveness and strategies of their activities in the context of regional competition *Policy Journal* **2** pp 88-92.
2. Saginova O V, Kovaleva E I 2015 Ratings, image of the University and goals of higher education *Education Economics Journal* **1** pp 12-23.
3. Komarov O E 2014 Managing the University's competitiveness in the educational services market *Science and education: current trends* (Cheboksary, Interactiv Plus) pp 81-102 ISSN 2313-6189.
4. Batalova O S 2010 University's Competitiveness in the educational services market *Young scientist Journal* **10** pp 53 – 58.
5. Banslova V B 2017 Russian market of educational services: stages and factors of its development. *Problems of modern economy Journal* **3** (59) pp 201-206.
6. Reznik G A, Ponomarenko YU S, Paramonova L S 2015 Assessment of University competitiveness factors in modern conditions *World of science Journal* Available at: <http://mir-nauki.com/PDF/12PMN115.pdf>.
7. Latypova V A 2010 Design of the University's corporate information system as an organizational and technical system *Young scientist Journal* Available at: <https://moluch.ru/archive/22/2327/>
<https://moluch.ru/archive/22/2327/>.
8. Demchenko S A, Kazarova A V 2016 Enterprise information system of higher education institution: features of creation *Theory and practice of current research Journal* **15** pp 170-174.
9. Grigorjeva A L, Grigorjev Ya Yu, Upskaya O K 2014 Prospects of development and some problems of approaches to designing information systems of higher educational institutions *World of science Journal* Available at: <https://mir-nauki.com/PDF/04KMN314.pdf>
10. Mironova L I 2010 Necessary conditions for the effective functioning of an innovative University *News of the Ural State Economic University Journal* **3**(29) pp 145– 152.
11. Sejdametova Z S, Sejtvelieva S N 2011 Cloud services in education *Information Technologies in Education Journal* **9** pp 105-111.
12. Bilan I 2011 Cloud services for libraries and education *University Book Journal* **10** pp 56-59.
13. Rybanov A 2013 Technology of information support of the process of organization and performance of final qualification work *Modern technic and technologies Journal*. Available at: <http://technology.snauka.ru/2013/10/2518>.
14. Bagaeva A P 2015 Cloud technologies in education *Current state and prospects of engineering education development Journal* pp 459-461.
15. Plotko K O 2016 Application of communication cloud technologies in the educational process *Current*

problems of aviation and cosmonautics Journal **2** pp 759-760.

16. Sirotkin A Yu 2014 Pedagogical potential of cloud technologies in higher education *Psychology and pedagogical Journal Gaudeamus* **2(24)** pp 35-42.

17. Malova E N, Veselovskaya Yu A 2013 Cloud technologies in education: state and prospects of development. Available at: <http://www.elibrary.ru/item.asp?id=27480934>.

18. Kotelnikov V 2018 Business model. The business model and its 1+6 components. Available at: http://www.cecsi.ru/coach/business_model.html.

19. Soolyatte A 2017 Business models of companies: definition, evolution, classification. Available at: http://mkozloff.files.wordpress.com/2010/02/business_models_finexpert_09.pdf.

20. Slywotski A 2002 *Marketing with the speed of thought* (Moscow, Eksmo-Press) p 448

21. Osterwalder A 2017 Business Model Generation. Available at: <http://medium.com/@franticrock/business-model-generation-alexander-osterwalder-yves-pigneur-56ce5614fbef>.

22. Chesbrough H 2006 *Open Business Models: How to Thrive in the New Innovation Landscape*. (Cambridge, Harvard Business School Press) p 272.

23. Levy M 2017 The Principles of Highly Successful Business Models: Using the Value Framework. Available at: <http://www.valueframeworkinstitute.org/ValueFrameworkWorkbookIntro.pdf>.

24. Ryabov V, Nesvizhskij A 2017 Online business: ways to earn money and business models. Available at: <http://www.intuit.ru/department/internet/mwebtech/24/>.

25. Ostervalder A, Pinje I 2016 *Building business models. The strategist and innovator's Handbook* (Moscow, Alpina Publisher) p 288.

26. Isaev R 2017 Integrated business model of a commercial Bank. Available at: <https://pam-online.com/assets/files/lib/books/isaev.pdf>.

27. Strekalova N 2009. Business model as a useful strategic management concept *Problems of Modern Economy Journal* **2 (30)** pp 133-137.

28. Rolstadas A, Andersen B 2000 *Enterprise Modeling: Improving Global Industrial Competitiveness* (Luxemburg, Kluwer academic publishers) p 333.

29. Abovskij N P 1998 *Creativity: a systematic approach-laws of development – decision-making* (Russia, Moscow, Sinteg) p 66.

30. *Philosophical dictionary* 1963 ed. D.E. Rozental (Russia, Moscow, Politizdat) p 544.

31. Sovetov B Ya 2003 *System modeling* (Russia, Moscow, Vysshaya shkola) p 343.

32. Kagan M S 1991 *Systems approach and humanitarian knowledge* (Leningrad, Leningrad state University publishing house) p 384.

33. Bertalanfi L 1969 *General theory of systems, a critical review. Research on General systems theory* (Russia, Moscow, Nauka) pp 23-82.