

# Conceptual Model of Educational Project Management Related to Maritime Transport in Higher Education Institutions

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## Abstract

The subject of the study is the models and mechanisms of project-oriented management of the educational activities of universities. The purpose of the article is to develop a conceptual model for managing the educational activities of universities based on the use of a project management methodology, information technology focused on assessing the demand for educational products of university projects related to maritime transport. The following tasks were set in the study: to outline the market of educational services, to determine their specificity in the implementation of educational projects by universities, to analyze scientific approaches and define the concept of "educational product", to form a conceptual model for the implementation of educational projects at universities, to assess the demand for educational services based on the use of information technology provided by project-oriented institutions of higher education. The following results were obtained: the specifics of educational projects were analyzed, the concepts of an educational service and an educational product were identified; a conceptual model for the implementation of educational projects at universities was formed, and a two-level conceptual model based on the use of information technology for assessing the demand for educational products of university projects was proposed, which can be used in the implementation of projects by enterprises in various fields of activity: the first level assesses demand in general, the second level of demand assessment takes into account the specifics specific project product.

## Keywords 1

Project management, information technology, higher education institution, maritime transport, educational product

## 1. Introduction

Education is an industry that is undergoing significant changes in Ukraine nowadays, the main of which is commercialization. For historical reasons, domestic education was almost completely funded from the budget for a long time, and today only a small proportion of private educational institutions (most of which are preschool) are an alternative to traditional public education [1].

In addition, due to the economic, social and demographic conditions that existed until recently, the demand for educational services of various levels and directions was steadily growing or stable. Thus, higher education was seen as a goal, the achievement of which was mandatory for various segments of the population, and even those who did not intend to work in the acquired specialties considered it necessary to obtain a higher education.

The current situation is such that the long-formed changes in the needs of consumers of educational services of universities have taken concrete forms [2]. The reason for this was the

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changed economic situation. The introduction of independent testing also affected the structure of demand for educational services [3]. Many schoolchildren refuse to graduate from high school and choose secondary specialized education (college, specialized school) in order to acquire a profession as soon as and the possibility of qualified work.

Therefore, obtaining a higher education for a significant category of the population of Ukraine ceases to be a primary goal.

Moreover, future applicants and their parents also treat the choice of a specialty more carefully than it happened before. An attractive name of a specialty or faculty is no longer a priority - the main questions, the answers to which determine the choice of a specialty and a university, are the following: who can a graduate work, what will he be able to do, in what areas and in what enterprises will he be able to find a job. Thus, when choosing a university, the priority is employment opportunities and career prospects with the acquired specialty and acquired knowledge, skills and abilities.

## **2. Analysis of Literature Data and Resolving the Problem**

The main organizational substructure of a project-oriented university that implements a specific project is the project team, which operates within the framework of the charter, mission and strategy of the university, general financial management procedures, but has a high degree of independence in choosing methods for solving the tasks [4-6].

At the same time, a matrix one is added to the traditional functional structure of the university, and the traditional educational activities of the university are supplemented by projects related to the implementation of risky, one-time, "small-scale" orders of the market of educational and scientific services [7, 8].

Modern works devoted to the problem of a project-oriented university are aimed at a wider coverage of the activities of universities by the methodology of project management.

In addition to the project-oriented approach within the framework of the commercialization of scientific activity, in the practice of individual universities, the concept of project management is applied in, in fact, the process of teaching students.

So, in [9] a methodical approach to project-oriented learning in a technical university is revealed, while a project-oriented approach is understood as an approach based on independent project activities of students focused on resolving problem situations. The author believes that a project-oriented approach to learning is associated with the consistent implementation of three stages: the first stage involves the development of mini-projects in core disciplines, the second stage is aimed at the implementation of interdisciplinary projects related to the future profession, the third stage is the implementation of projects in a team, which allows students to acquire skills in task distribution, communication, etc.

The use of this approach ensures the creation of conditions for advanced learning of students, maximizing the creative orientation of the entire learning process and the greatest possible independence of students. Thus, the concept of project management permeates the learning process itself.

Since a modern university is associated with significant volumes of information flows, the issues of informatization of universities become a separate problem for research. The project approach to the informatization of universities is presented in [10-12].

In [13], methods and tools for implementing the information processing procedures of a project-oriented university were developed.

At the same time, a university project is understood as a unique set of coordinated actions to transform an information resource into an information product of the university management system. Thus, the project-oriented approach is implemented for the university management system, the main task of which, indeed, is the processing of information in order to obtain a "useful result".

In [14], the concept of a design and technological system for managing a university is proposed, aimed at processing an information resource into an information product within the framework of the business processes of a university.

A model of strategic management of a university to achieve development goals and a method for selecting projects for a portfolio of a university were developed in [15-17].

Works [18-20] are devoted to the problem of introducing a project approach into the activities of universities, as well as tracking the levels of achievement of the goals of projects in education. Features of the life cycle of university development projects are presented in [21-23].

### 3. The Purpose and Objectives of the Research

The purpose of the article is to develop a conceptual model for managing the educational activities of universities based on the use of a project management methodology, information technology focused on assessing the demand for educational products of university projects related to maritime transport.

The following tasks were set in the study: to outline the market of educational services, to determine their specificity in the implementation of educational projects by universities, to analyze scientific approaches and define the concept of "educational product", to form a conceptual model for the implementation of educational projects at universities, to assess the demand for educational services based on the use of information technology provided by project-oriented institutions of higher education.

### 4. Materials and Methods of the Research

The implementation of educational services of universities is carried out in the relevant market. Before deciding what the educational services market is and what its specific are, we identify the essence and specifics of the educational service.

In the specialized literature, you can find a significant number of definitions of the concept of "educational service" and, as a rule, they do not contradict each other. Educational services are created in the process of scientific and pedagogical work, which, in turn, is a kind of scientific work [24].

The result of scientific and pedagogical work can be called an educational product. An educational product is a part of an intellectual product adapted to the corresponding segment of educational services. Some authors consider an educational service as a process of transferring certain information for assimilation, in order to obtain a certain result. In turn, the consumer value of educational services lies in the fact that they create human capital, which manifests itself in a more skilled work force.

In [25], an educational service is defined as in tangible actions aimed at the consciousness of an individual, ensuring the realization of a person's need for obtaining a certain type of knowledge, skills, and acquiring a profession or qualification. Thus, the definition adopted in the material sphere of production, according to which raw materials (material) under the influence of technology turns into a certain product, can also be extended to the sphere of educational services (Figure 1).

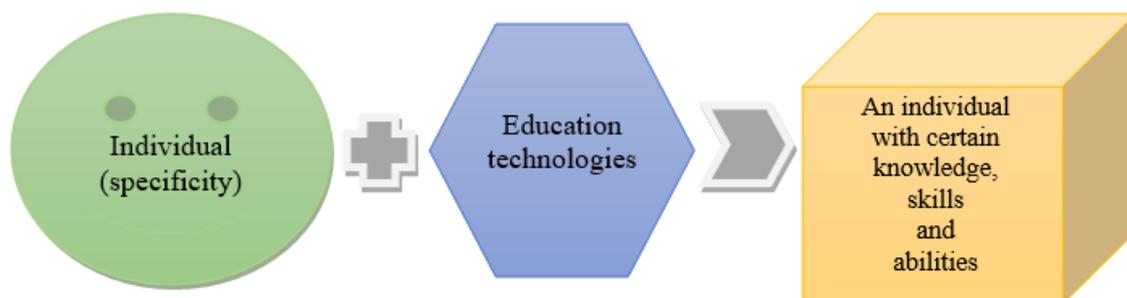


Figure 1: Formation of the educational product

In accordance with this approach, there are two concepts of "educational product" and "product of education". An educational product is an educational program that includes a certain content, organization of the educational process, a system for managing this process and a system for its

methodological, material and personnel support, educational and methodological complexes, information technologies, etc. (i.e. "technologies of education"). Also, in the author's opinion, educational products include: university inventions, patents, programs and research results based on the use of information technology. The product of education is an individual with characteristic features and certain competencies. Thus, the process of applying educational technologies including information technology to an individual in order to acquire certain competencies is an educational service. Educational services can be classified as follows: by duration of provision: short-term - from one day to a month; medium-term - from a month to a year; long-term with different levels - incomplete secondary, secondary, specialized secondary, higher, advanced training courses, postgraduate studies, doctoral studies; on ascertaining the achievement by the student of the educational levels established by the state (educational qualifications): with the receipt of documents confirming the achievement of the educational level; without receiving; by the method of reimbursement of funds for education: educational services provided free of charge (at the expense of budgetary funds); paid; with partial reimbursement of costs [26-28].

As you know, any service has a certain specificity. So, for example, the common properties of all types of services are: intangibility, inseparability from the source, variability of quality, perishability, etc. The general properties of services in the field of education are as follows [29-31].

**Intangibility:** the consumer of an educational service cannot know the result of his training in advance, but can only assume the quality of the service based on his own past experience, guided by the opinions of other consumers, with the help of an advertising message, information technologies;

**Inseparability of educational services from the source:** an educational service does not exist separately from the university and its faculty. The quality of the educational service changes under the influence of changes in the qualifications of personnel, the material and technical base, information technologies and other elements integral to the educational process;

**Quality volatility:** any replacement of a teacher can change the outcome of the educational service. The same teacher can conduct classes in different ways, depending on his mental and physical condition. The perishability of educational services is interpreted as follows: a person, consuming educational services, accumulates knowledge, skills, but this is the result of the work of the human brain and intellect, and not these actions themselves [32]. For example, by consuming services in the field of vocational education, a person can accumulate certain knowledge, skills, abilities, develop their intellectual capabilities. But in this case, it is not the services themselves that accumulate, not the actions to form vocational education, but the results of these actions.

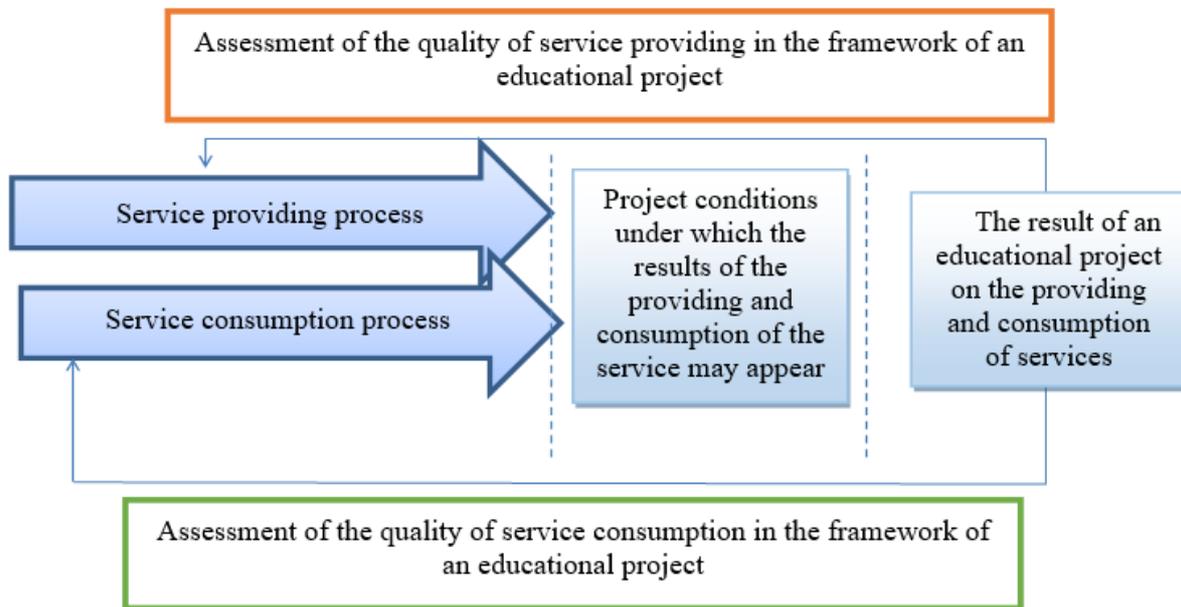
In addition to the above properties of services, there is also an additional specificity inherent only in educational services. Thus, the consumption and provision of services are two parallel processes, which is common to all types of services.

However, in some areas, the results of the provision and consumption of services are observed immediately after the end of the processes (transport, hairdressing, tailoring services), the result of the provision of educational services can appear only after some time (for example, a young specialist comes to production, where it becomes possible to evaluate the level and quality of educational services provided to him).

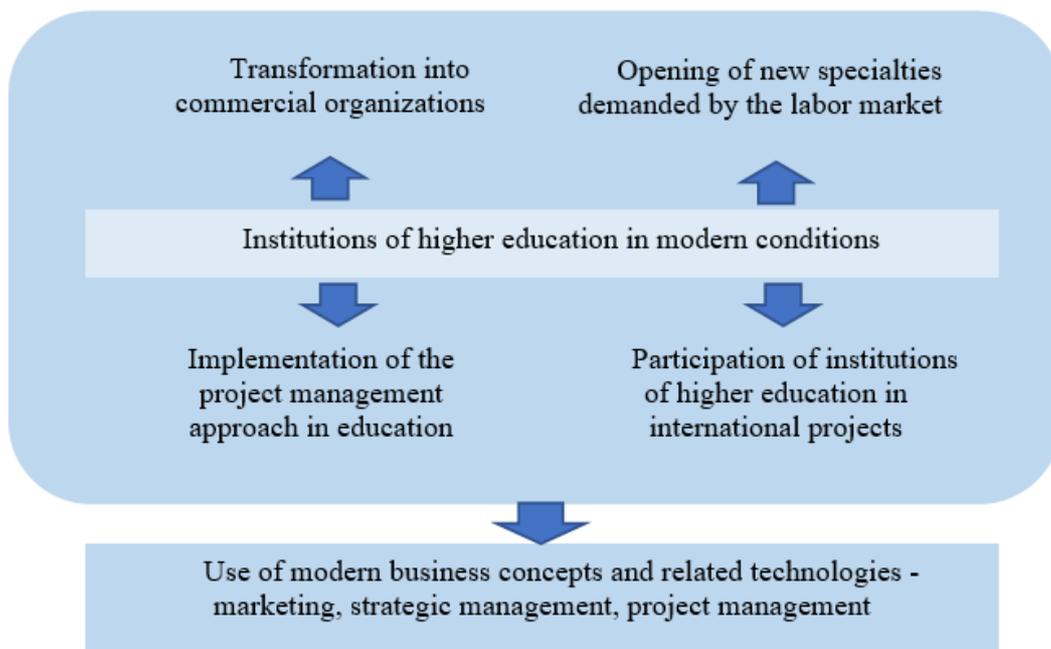
At the same time, the unsatisfactory quality of the education received can be caused not only by the low quality of the process of providing the service, but also by poor-quality consumption of the service (the student did not make efforts to acquire knowledge, develop skills or did not use information technology in education).

Thus, unlike many other service industries, in education the final outcome depends both on the party that provides the services and the party that consumes those services; and the result itself appears after a certain time after the provision of the service (Figure 2).

Also, the specificity of education services is the impossibility of their direct monetary measurement. The price mechanism is often unable to reflect all the costs of producing educational services. If in the material sphere services are relatively easy to quantify (in pieces or kilograms, for example) per unit of output, then in relation to educational services this is difficult to implement. The useful result of such a service can manifest itself only after a long time, and it can practically be measured only with the help of indirect indicators. The main activities carried out by modern Ukrainian higher education institutions, taking into account the requirements of the external environment, information technology, are presented in Figure 3.

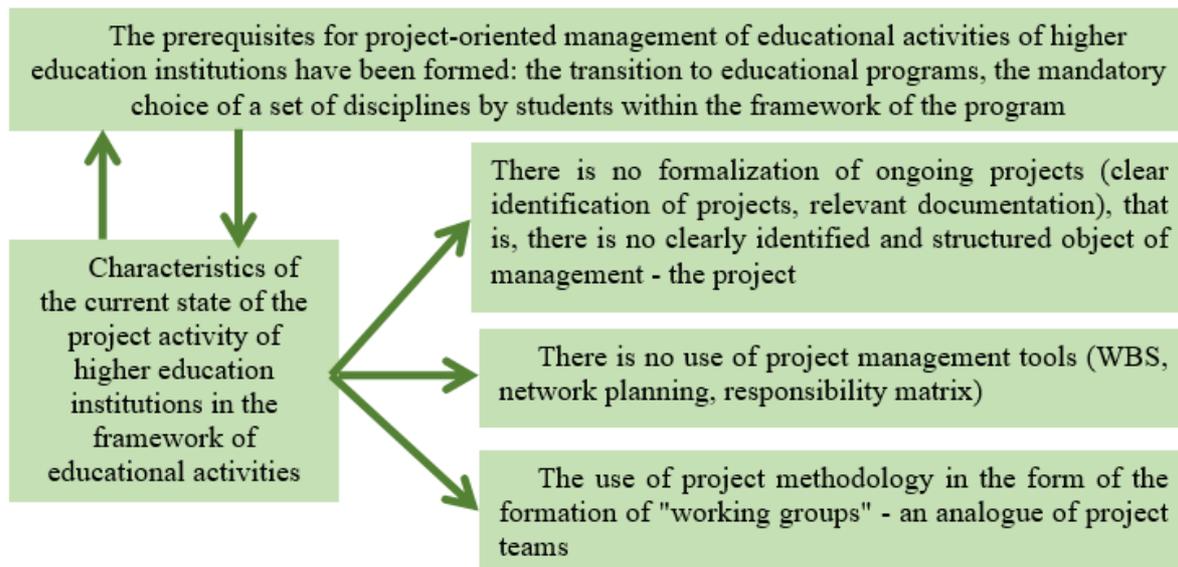


**Figure 2:** Specificity of the educational information technology project



**Figure 3:** Model for using the project approach in higher education institutions

The project activity of domestic universities within the framework of the main - educational - activity based on the use of information technology is characterized in Figure 4.



**Figure 4:** The concept of the project approach in higher education institutions based on the use of information technology

Thus, it can be argued that the transformations and reforms in higher education are reflected in the practical use by universities of specific approaches that have not been adopted before, which also served as the driving force behind the processes of forming the theoretical basis of the organization and ensuring the management processes of project-oriented universities.

The analysis of statistical information made it possible to establish the fact that a significant change over the past few years has been observed in the dynamics of the share of the population of Ukraine enrolled in domestic universities.

This confirms the fact that not only natural demographic causes affect the number of university students.

The following statement was put forward as a hypothesis: at the state level, the demand for educational services of universities is generally determined by the main macroeconomic parameters. The following can be considered as the main macroeconomic parameters:

An example of bulleted list is as following.

- X1 – GDP at current prices, billion dollars
- X2 – GDP per capita, USD
- X3 - Export of Ukraine, billion dollars
- X4 – Import of Ukraine, billion dollars
- X5 – Population of Ukraine, thousand people

The predicted parameter is the number of university students (Y).

It should be noted that the demand for educational services of universities and the number of students enrolled in universities are not identical concepts, since the demand may be higher than the capabilities of universities. In addition, some school graduates may not be able to enter universities based on the results of external independent testing (EIT).

Also, foreign citizens enter Ukrainian universities. However, the last two categories are not very significant at the national level, so they can be neglected at this stage of the study (and taken into account in the process of adjusting the obtained forecasts).

In conditions when the capacity of universities in terms of the number of students (that is, supply) exceeds the real demand, it can be assumed that the demand for educational services of universities is fully satisfied, and, therefore, the number of students enrolled in universities can be considered almost equal to the volume of the considered demand.

The results of the correlation analysis are presented in Table 1.

**Table 1**  
Correlation matrix

	GDP	GDP per capita	Export	Import	Population	Number of university students admitted
GDP	1					
GDP per capita	0.9981119	1				
Export	0.8967027	0.913597	1			
Import	0.9151534	0.930129	0.993014	1		
Population	-0.6232082	-0.66697	-0.82008	-0.78772	1	
Number of university students admitted	0.036069094	0.06934624	0.36185384	0.29831813	-0.625436	1

Given the high level of correlation (which is logical) between GDP and GDP per capita, GDP and exports, GDP and imports, after analyzing the correlation matrix, the following factors were selected to build the regression model: GDP per capita; Population.

Actually, these two parameters will make it possible to estimate the number of students enrolled in universities at the national level.

For the considered factors, a regression model was built:

$$Y=2777-0.06042 \cdot X_1-0.04453 \cdot X_2 \quad (1)$$

It is easy to see that the two factors taken as a basis, on the whole, describe quite satisfactorily the sought-for dynamics of students entering universities based on the use of information technology.

Naturally, in the presence of a statistical base, the model can be supplemented with other factors, but the main conclusion that the conducted studies allow us to draw is that not only demographic factors cause a decrease or increase in demand for educational services of universities.

Economic factors also largely determine the choice of the population in favor of higher education.

To predict the demand for educational services of universities at the national level, it is proposed to use regression models of the form:

$$Q = k_1 \cdot k_2 \cdot S'(f_1, f_2, \dots, f_n), \quad (2)$$

where  $Q$  – demand for educational services of universities;

$k_1$  – coefficient taking into account the change in interest in higher education (under the influence of factors not taken into account in  $f_1, f_2, \dots, f_n$ );

$k_2$  – coefficient taking into account the influence of the results of external independent testing (EIT);

$S'$  – assessment of demand based on demographic and economic factors;

$f_1, f_2, \dots, f_n$  – a complex of demographic and economic factors (population, GDP and others that can complement the factors considered above).

Correction factors  $k_1$  and  $k_2$  can be established either statistically or on the basis of expert opinion.

Possible terminological inconsistencies should be noted here: the concept of “entrants to universities” and “entrants to universities”.

“Entrants” is a term that is usually applied to the category of citizens who are going to receive higher education. “Entrants” – to the category that, according to the results of the selection, is enrolled in the composition of the students of the university.

But, today, “applicants” have the opportunity to enter several universities and be selected in several universities, which naturally increases the number of applicants for each university. But within the framework of this study, we will traditionally understand the term “entrants” as the number of citizens who are willing to receive (and have the opportunity) higher education and, as was previously accepted, who form the demand for university services.

So, we have considered a methodological approach to forecasting the demand for educational services of universities in general at the country level based on the use of information technology, which can be applied in cases where there is forecast information on the main macroeconomic parameters.

The second level of forecasting is an assessment of the demand for educational services of a particular university (a specific educational product) based on the use of information technology. As a tool, it is proposed to use the following formula, which is based on the classical approach to determining market capacity in marketing research:

$$S = Q \cdot I_1 \cdot I_2 \cdot I_3 \cdot I_4 \cdot I_5 \cdot I_6 \quad (3)$$

where  $Q$  – the total predicted volume of applicants to domestic universities;

$I_1$  – the share of school graduates who prefer universities of a certain orientation (classical universities, humanitarian, technical, etc.);

$I_2$  – the share of school graduates who are going to receive higher education in Ukraine;

$I_3$  – the share of school graduates who do not plan to receive education outside the region (the coefficient takes into account the proportion of those who prefer to receive education, for example, in metropolitan universities);

$I_4$  – the share of school graduates who, based on the experience of past admissions campaigns, prefer a particular university within the framework of specialties of a certain orientation;

$I_5$  – coefficient taking into account a positive ( $I_5 \geq 1$ ) change in the competitive status of a university (thanks, for example, to a planned large-scale PR campaign), or a negative ( $I_5 \leq 1$ ) change in the university's reputation and image;

$I_6$  – coefficient taking into account the share of applicants - graduates of schools of previous years.

Note that the values of the coefficients  $I_1, I_2, I_3$  are established as a result of sociological surveys;  $I_4, I_5, I_6$  are determined by the experience of a particular university or by an expert.

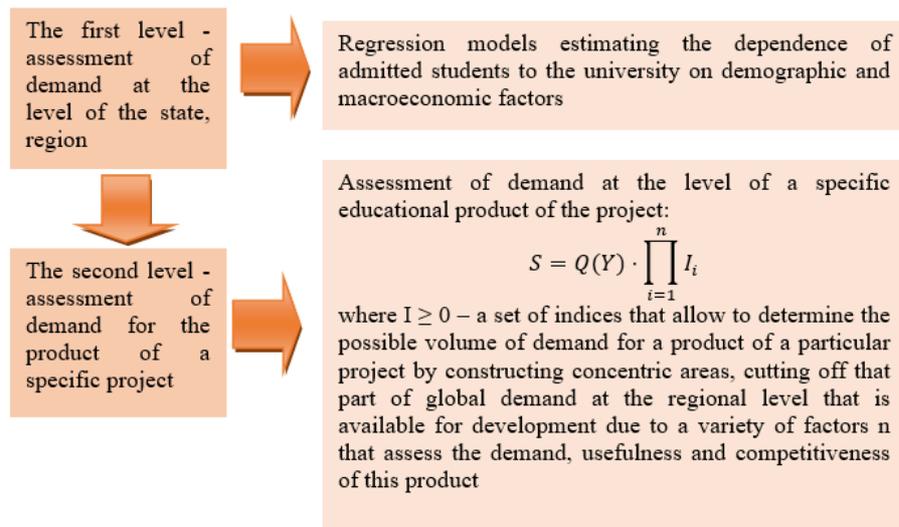
This list of coefficients can be supplemented with coefficients that take into account the competitiveness and demand for specific educational products of the university, the specifics and attractiveness of the region.

Thus, as a result, as a tool for assessing the demand for a specific educational product of a particular university, it is proposed to use the following formula:

$$S = Q(Y) \cdot \prod_{i=1}^n I_i \quad (4)$$

where  $I \geq 0$  – a set of indices that allow, by constructing concentric areas, to determine the possible volume of demand for the product of a particular project, cutting off (or capturing) that part of the global demand  $Q(Y)$  at the regional level that is available for development due to a variety of factors  $n$  that assess the demand, usefulness and competitiveness of the educational product.

Summing up the above, the concept of the proposed methodological approach to forecasting the demand for educational services of universities in general for the country and a particular university (educational product) in particular based on the use of information technology is shown in Figure 5.



**Figure 5:** Model of a two-tier approach to assessing the demand for educational products

Note that this two-level approach to demand assessment can be extended to the activities of enterprises in various fields of activity: the first level assesses demand in general, the second level of demand assessment takes into account the specifics of a particular product.

## 5. Conclusions

The paper found that the theoretical basis of the project-oriented approach to the activities of universities is at the initial stage of its formation. There is no concept, theoretical base and appropriate tools for organizing a project-oriented university, taking into account the systematic coverage of various types of its activities. To date, the methodological foundations and methodological tools for the implementation of university development strategies through projects are presented at a fairly high level. It was found that the project-oriented approach to the educational activities of universities is considered fragmentarily, while the conceptual approaches to building a project-oriented management of the educational activities of universities are not sufficiently developed.

Within the framework of the study, the specifics of educational projects were analyzed, the concepts of an educational service and an educational product were identified.

The study formed a conceptual model for the implementation of educational projects related to maritime transport at universities, and also proposed a conceptual model for assessing the demand for educational products of university projects based on the use of information technology. This two-level approach to demand assessment based on the use of information technology can be extended to the implementation of projects of various enterprises: the first level assesses demand in general, the second level of demand assessment takes into account the specifics of a particular product.

The implementation of the proposed conceptual model for assessing the demand for educational services in project-oriented institutions of higher education is supposed to be carried out on the basis of the use of an information system, which will greatly simplify the procedure for achieving the goal. The use of the information system in the implementation of the proposed conceptual model in project-oriented institutions of higher education will make it possible to take into account a larger number of indicators and more accurately assess and predict the demand for educational products of project-oriented universities.

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