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DIGITAL PLATFORM AS A TOOL FOR INTERNATIONALIZATION: MODEL FOR FORMATION OF INTERNATIONAL COMPETENCES' DATABASE APPLYING OF HIERARCHY ANALYSIS METHOD

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ABSTRACT

This research is carried out in the course of the project implementation "Capacity Building for the internationalization of a technical university by means of digital learning technologies".

(1) The article considers the issue of digitalization of the main internationalization processes of a technical university, describes the developed software application aimed at ensuring the implementation of internationalization strategies through digital interaction and the proposed models for assessing key competencies of the educational program in a synchronous and asynchronous way and the use of the hierarchy analysis method to select the optimal analysis procedure within the framework of the section of the information system "Expertise of competencies: an international base by industry", intended for the formation of an international base of competencies in conjunction with international experts.

Keywords: *Information System, Competence Base, Internationalization, Hierarchy Analysis Method, Expertise, Education Program.*

1. INTRODUCTION

The internationalization of education creates new opportunities for higher education institutions, contributes to increasing accessibility and the introduction of innovative methods in higher education systems [1]. In recent years, the topic of the international activities of Kazakhstani universities remains one of the most important for the professional society [2], and the obligatory participation of universities in international rankings has added new accents to the discussion. Internationalization serves the purpose of raising the world ranking of an educational institution and contributes to improving the quality of education as a whole.

The present research is carried out in the course of the project implementation "Capacity Building for the internationalization of a technical university be means of digital learning technologies" on grant funding for young scientists for 2020-2022.The project studies the process of University internationalization, curriculum and learning outcomes affecting the indicators of academic mobility, educational technologies and integration of foreign students, implementation of joint degree programs, possibility to improve the level of English Proficiency and use of digital technologies which activate the international activity at the university.

The objective of the project is to develop and implement a framework of capacity building for internationalization of technical university by means of digital learning technologies to implement sustainable and feasible strategies for internationalizing the educational process of training specialists in technical fields, taking into account the national and international context. There is assessment of internationalization capacity needs, formulating and implementation of capacity building response for internationalization of educational

programs on technical specialties based on the development of specialized competencies that enhance the qualifications and abilities of students and teachers at the international level.

The main directions of the internationalization development within the international experience have been considered, including on the example of operating foreign organizations in Kazakhstan involved in the development of the education sector, in particular the construction of a framework for conceptualizing the internationalization development. A detailed analysis of the learned researches on the internationalization of higher education showed the presence of problems in the results of the international activities of domestic and international science and practice and the lack of work to build the capacity for the internationalization of technical universities. Research on globalization and internationalization of higher education through the prism of digital technologies, which turned out to be a limited number, aroused great interest.

Internationalization is one of the main factors in the competitiveness of a technical university in the modern world. The internationalization of the university consists in teaching foreign citizens, attracting international teachers, in international internships, student exchanges, international research, conferences, grants and representing the university on digital world platforms [3].

The development of an information system clearly shows the capacity for building partnerships based on reciprocity, social responsibility and sustainability of relationships, since internationalization makes it possible to establish joint partnerships, contributing to the mutual improvement of educational research and practices. Internationalization has the capacity to enable participants to understand critically local and global relationships, expanding the frame of reference and providing opportunities for rethinking relationships.

The analysis, emphasizes that leading international universities have tested and are actively using new technologies, forms and teaching methods, which are a combination of various approaches united by a very special paradigm of education. And it should be admitted that in most cases international experience is far superior to domestic practice in the use of digital teaching aids in terms of the internal philosophy of its use. Consequently, the development of a methodology for the application of digital technologies and their introduction into domestic practice can give real results in the internationalization of Kazakhstani universities.

The study was based on the research of foreign practices in the field of university education internationalization. As a result of solving the first task of the research, the research group benchmarked the process of internationalization of a technical university. Interest was aroused by the international experience of benchmarking in higher education, carried out on the basis of three key indicators: human resource management, financial management and information management. A feature of this research is the use of digital technologies in conducting comparative analysis, including the definition of system indicators for IT services, as well as the presentation of new tools for the work of universities: a "dashboard" diagram monitors and summarizes important indicators work immediately; creating relevant, useful data has become an integral part of management decision making and evaluation. Moreover, benchmarking of learning management systems was carried out as part of this study. The objective of the analysis was to identify accessible learning management systems and how the systems work to determine their position and the implementation process of the new system [4].

A distinctive result of the benchmarking analysis according to the international experience on the example of the Stratford University was the developed separate program "IT Benchmarking Certificate" on the basis of this university. IT is an assessment and benchmarking program designed to provide an introduction to benchmarking and to teach how to use benchmarking for IT organizations, as well as how to perform valuation, benchmarking and how to manage a portfolio in an IT organization. The program consists of five modules and a project available online; upon successful completion, the program provides a certificate [5]. This experience can become one of foundational point for the development and application of a specialized IT system to build the internationalization capacity of a technical university.

On the basis of the foregoing, it can be argued that the internationalization of higher education institutions through digital learning is one of the key areas aimed at promoting academic diversity and cultural practices. International practitioners argue that digital technologies in internationalization are able to solve the main problem in the education system, namely, compliance with the quota of serious national shortcomings in the field of people's competence in international relations. A number of studies reveal the views of students on their own

process of change improving language skills, since the concept of global views is based on ideology, it is very difficult to understand and accurately measure change [6].

However, according to some researchers, internationalization is not dependent on the implementation of digital technologies. There is a problem requiring a revision of the approaches to organizing work with the teaching staff. International educational and research activities range from personal and professional experience, participation in international conferences and networks, short- and long-term appointments as visiting scientists or teachers. In research of P. Dewey and S. Duff [7] we observe in practice quite a lot of obstacles to the internationalization of the teaching staff, such as: lack of coordination and information on available international opportunities, limited funding, administrative policies and procedures, difficulties in appointing teachers for temporary replacement, inability to secure employment on return, conflicting academic schedules with the host institution, lack of support staff. Despite the contradiction that has arisen, this study, will attempt to solve some of these problems using digital technologies.

Therefore, there is agreement with foreign colleagues in the statement that the educational institution is gaining an international scale due to digital technologies and an integrated global economy that promote internationalization [8].

As part of the study, a hypothesis was put forward - digitalization of key internationalization processes will maximize the existing potential of a technical university internationalization and will provide a solution to a number of problems existing in Kazakhstan in this area.

Here are the examples of some of them. The use of digital technologies as a component of a framework for the capacity building for internationalization of a technical university and the development of a philosophy of their use will contribute to the practice of internationalization of education by creating an opportunity for the joint production of knowledge and the impact of different contexts and worldviews, conducting more complex and detailed analyzes, as well as increasing the ability to respond to changes and variety. The methodology of language training for university staff and students as a condition for the development of key methodological competencies for teaching and learning in English will build the capacity for integrating learning into all curricula of a technical university, since a deeper understanding and improved pedagogy will help to improve the quality of national curricula in an international context [9]. In order to identify the most effective way to form the competence base, together with international experts, the research group considered two methods and evaluated them.

Modeling an e-learning space within the information system for the formation of professional foreign language competence of future engineers will contribute to the expansion of intercultural understanding and dialogue through the implementation of the preservation and support of intercultural contacts, which will create opportunities for individual and collective thinking, creative cooperation.

Taken together, such events will contribute to a deeper understanding of the local-global connection and improve the quality of educational services provided.

2. CHARACTERISTICS OF THE INFORMATION SYSTEM

Due to the introduction of educational process automation at universities the functionality of information systems which allows to develop curricula, disciplines work programs, and methodical documentation [10]. The information system being developed is aimed at ensuring the implementation of internationalization strategies via digital interaction. According to the results of SWOT and benchmarking analyses, the information system covers the following categories of internationalization: Research; Student; Faculty; Curriculum; Management; Partnership. The functioning of the information system "Karaganda technical university" is aimed at ensuring the following processes:

- the process of all subjects' interaction of academic and research complexes;

- the process of internationalization via an integrated training information system.

- the process of creating and launching an open dialogue digital platform for finding potential sponsors / partners for scientific research, commercializing the results obtained and participating in key foreign educational events and projects;

- the process of communication and interaction with graduates, including those living abroad.

The positive dynamics of the internationalization process is achieved due to the multi-role user policy in full operation [11], which is implemented when switching to 5 main sections: «About the project», «Partnership in Education», «Partnership in Science», «Academic services», «Alumni Network Environment». The section "About the project" contains general information about the project, including the purpose of creating an information system, a manual for use, a site map of the task, methods and means, expected results.

The «Partnership in Education» section contains five large blocks covering international academic relationships and university processes.

The module of «Top programs" by educational level is intended to familiarize with the promising programs of the university. The double degree and joint educational programs are separately highlighted. A general list of programs by educational level is also available for viewing. At the same time, users have the opportunity to familiarize themselves with the passport of the educational program and the key professional competencies formed within the frame of each program.

The module "Mobility": designed to collect data, receive applications and proposals for organizing the mobility of students and teachers. This block provides Karaganda technical university students with the opportunity to choose existing programs of external academic mobility, taking into account the country, educational program and method of funding. All applications are received and processed at the international department of the Karaganda technical university. For international students, there is also the possibility of applying for incoming mobility by filling out the appropriate electronic form in the IS.

The formation of a bank of "global" competencies of students is implemented in the module "Expertise of competencies: an international base by industry". This block is available to registered international experts and information systems administrators.

To obtain general information and fill out invitations to participate in IS, there is a module "Partnership in educational projects", which includes the Register of international educational projects of the university, including a list of current projects and a short description, as well as an application form for cooperation in the field of new projects. Within the frame of the module, the task of forming the readiness of the teaching staff for the processes of globalization through the international environment is solved via the profiles of the teaching staff of Karaganda technical university, containing information about their interests and scientific achievements, as well as basic information and a list of lectures, video materials (with the permission of the authors) of invited visiting professors, related with their international profiles. In addition, the module presents soft & business skills trainings for the development of language, cross-cultural and entrepreneurial competencies of teaching staff.

The "Partnership in Science" section is designed to support the university's research processes and the process of commercializing the results obtained. The subsection presents the module "Scientific directions", containing a list of directions of the university, in which scientific research is carried out; a register of active research projects in areas, a list of international partners in the field of research. The list of scientific directions is closely interconnected with the base of scientific papers in the "Annotations" module and the "Technology Transfer and Patent Cooperation (PCT)" module.

The "Annotations" module contains the base of scientific works of the teaching staff of the university in English in scientific areas, which is replenished in the mode of the corresponding administrator, published in international rating journals with reference to the corresponding journal and profile of the teaching staff. Annotations are displayed in English and Russian. At the same time, for the teaching staff through the profile, the opportunity to apply for the selection of scientific journals in the scientific direction of interest is implemented.

The module "Technology Transfer and PCT" includes the Business Skills Park site with a list of active start-up and spin-out projects and a register of patents and Intellectual Property Certificate associated with the list of active scientific projects.

The modules of Material and Mechanical Engineering Technology journal «International Journal of Karaganda technical university» and «Conference» provide access to scientific events of KTU, publications, list of international conferences. The possibility of submitting an electronic request for publications has been realized.

Section "Academic services" is intended to familiarize with the learning environment of the university in the context of the national identity and cultural characteristics of Kazakhstan. For this purpose, blocks "Study at Karaganda technical university" have been developed, containing representative academic information about the

infrastructure of the university; block "English language learning", base "MOOCs" with the function of searching and submitting online applications for training.

The module «Alumni Network Environment» is intended for the development of the association of graduates and the support of the process of interaction on issues of international exchange, attraction of sponsors, realization of post-diploma programs.

A distinctive feature of the information system is the Partners Point functionality, designed for communication on cooperation issues in the categories "student", "foreign professor", "foreign administrative worker". This option allows you to quickly receive information about persons and organizations interested in cooperation and provide them with relevant services and information.

3. IMPLEMENTATION OF THE PERFORMANCE ALGORITHMS OF THE METHODS FOR ASSESSING KEY COMPETENCIES

In Kazakhstan, attempts have already been made to fully or partially digitize the process of developing professional competences. So, in 2017, at the republican conference, Karaganda Technical University presented to the academic community a construction set of educational programs, including a module for determining professional competencies in conjunction with employers. Syllabus analysis and automatic semantics-based competences were carried out. So, the authors have developed models, methods and algorithms of an intelligent system for the formation of educational programs, taking into account the mutual influence of the studied disciplines and formed competencies, based on the analysis and processing of texts in natural language to improve the quality of the educational programs content. 10,11]. The researcher [12] developed an information model of the distributed knowledge base of the university's educational programs oriented to the professional knowledge and competencies required in the labour market, using the example of the ICT sphere.

A distinctive feature of this study is the involvement of international experts in the design of competencies for the educational program and the determination of the most effective methodology for coordinating the proposed competencies.

Subsection "Expertise of competencies: international base by industry": designed to form an international base of competencies in conjunction with international experts. There are many works to solve such problems, in particular to improve the quality of the educational process, where various methods and algorithms for automation are applied [13-16]. The purpose of the experiment was to select the most effective method for assessing and modifying the existing key competencies of the university's educational programs in accordance with international requirements and the content of educational programs in this area of training. The bachelor degree program "Mechanical Engineering" was chosen as a pilot program for testing the proposed assessment methods.

For the analysis of competencies at the pilot stage, we used a synchronous and asynchronous approach in approbation of the business process, within which the assessment is carried out according to two principles: sequentially and in parallel. At this stage, 2 experts are involved in the assessment.

1. Sequential assessment (Figure 1):

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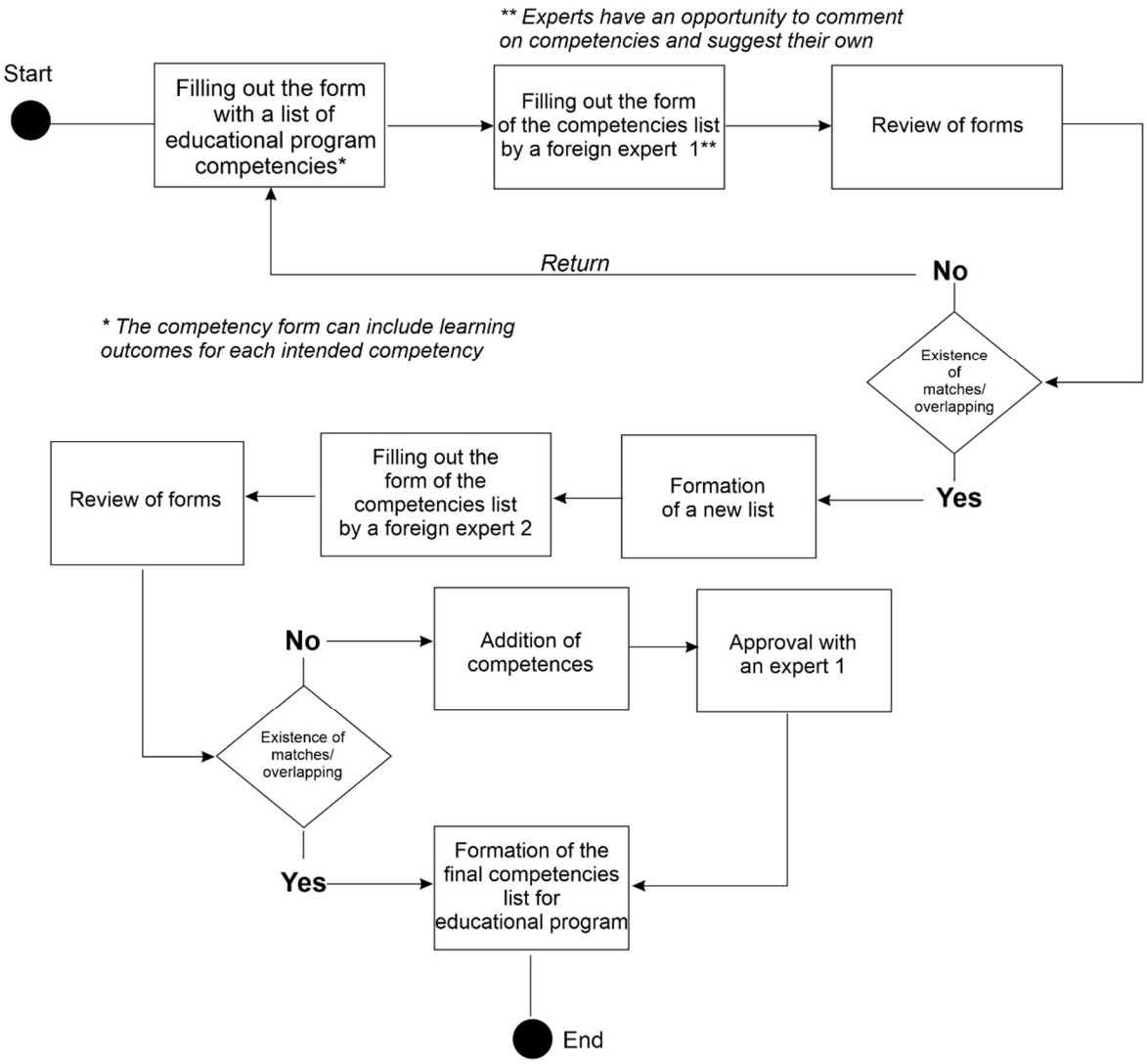

Figure 1: Sequential Assessment

Business process for a precedent: sequential formation of competencies:

1.1 At a first stage, the list of competences for the educational program is filled in.

1.2 At the second stage, an analysis of the competencies is carried out by an international expert 1, who notes the competencies that, in his opinion, are necessary, comments on refusals or proposes his own. If there are no matches, it returns to the first stage. Then re-assessment is carried out.

1.3 If there are matches, a new list is formed, which is sent to expert 2. Next, the forms are analyzed, if there are no matches, the Card adds or edits competencies in accordance with the comments and agrees with them with expert 1. After that, the final list of competencies is formed. If there are coincidences, the final list of competencies is formed immediately, in which the competencies are ranked according to the expert rating (estimates).

1.4. The Karaganda technical university administrator analyzes the received list, after which he forms the final list of competencies.

2. Parallel assessment is shown in Figure 2.

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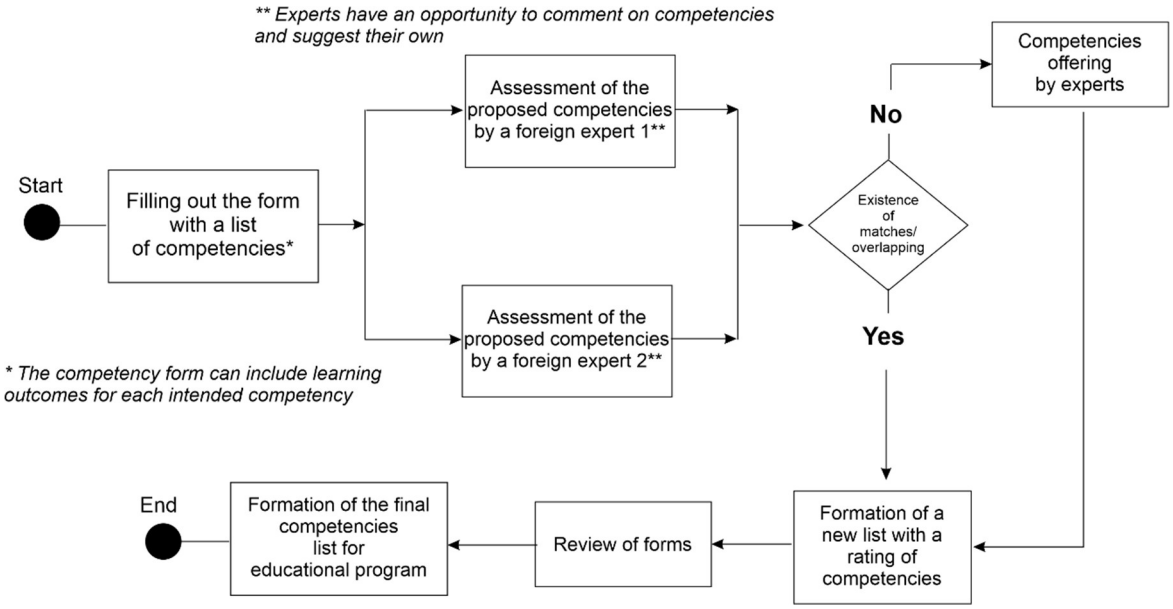

Figure 2: Parallel assessment

Business Process for Precedent: concurrent competences building:

1.1 In the first step, the list of competences for KTU EP is completed

1.2 At the second stage, a parallel analysis of competencies is carried out by international experts 1, 2 who mark the competencies they think are necessary, comment on refusals and / or offer their own. In the absence of the selected competencies, the form cannot be sent without the competencies proposed by the experts.

1.3 If there are coincidences, a ranked list of competencies is formed according to the sum of expert points (1 point from each expert for the selected competence).

1.4. The Karaganda technical university administrator analyzes the received list, after that he forms the final list of competencies.

To select the most optimal of the proposed approaches, namely the synchronous and asynchronous methods, in the final version of the information system, a procedure is provided for the examination of the final list of competencies using the hierarchy analysis method of each of the methods. The hierarchy analysis method was carried out by decomposing the problem into simple components and processing expert judgments [17]. As a result, the relative importance of the competence approaches under study was obtained for all criteria of their hierarchy. This importance is expressed in the form of priority vectors. The obtained values of the vectors are estimates on the scale of ratios and correspond to the so-called hard estimates.

The order of application of hierarchy analysis method [17]:

1. Building a qualitative model of the problem in the form of a hierarchy, including a goal, alternative options for achieving the goal and criteria for assessing the quality of alternatives;

2. Determination of priorities of all elements of the hierarchy using the method of paired comparisons;

3. Checking judgments for consistency;

4. Making a decision based on the results obtained.

The tree of criteria and alternatives looks like this (Figure 1).

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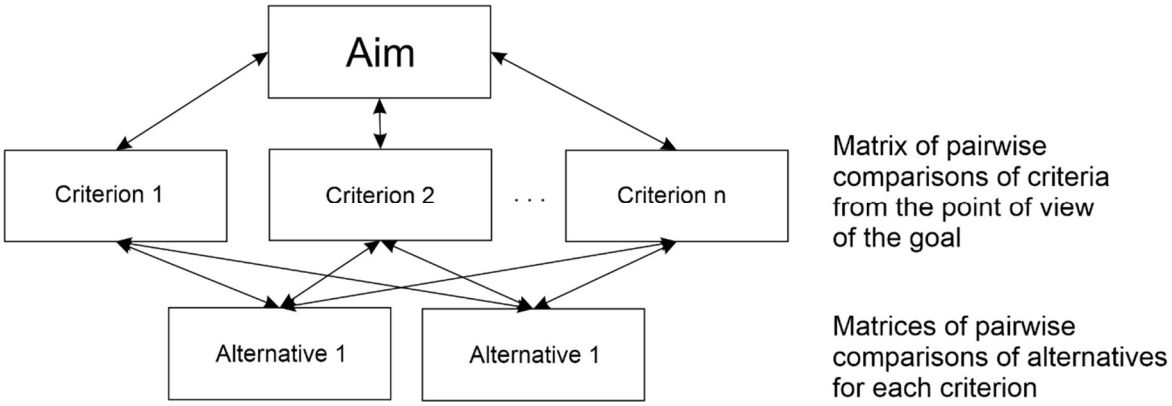

Figure 3: Tree of criteria and alternatives

Hierarchy building begins with delineating the research problem. Further, the hierarchy itself is built, including the goal located at its top, intermediate levels (for example, criteria) and scenarios that form the lowest hierarchical level [18].

Purpose: to determine the best approach for analyzing the competencies of educational programs.

Main criteria:

- processing time;
-number of returns;
-consistency of the result with the purpose of the EP.

Main alternatives:
-sequential assessment;
-parallel assessment.

Next, we construct a tree of alternatives. (Figure 4)

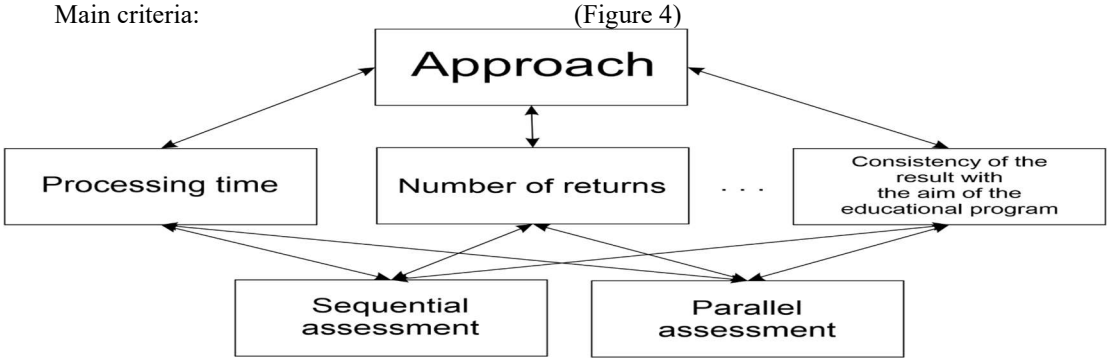

Figure 4: Constructed tree of criteria and alternatives

The next step is to build a pairwise comparison matrix:

1. Comparison of criteria.

Initially pairwise comparison on a qualitative scale, with subsequent conversion to points:

equal, indifferent	= 1
slightly better (worse)	= 3 (1/3)
better (worse)	= 5 (1/5)
much better (worse)	= 7 (1/7)
fundamentally better (worse)	= 9 (1/9)
in case of intermediate opinion, intermediate points are used	2,4,6,8

1. Next, we proceed to constructing the matrix of pairwise comparisons

The number of experts' answers for constructing a matrix of pairwise comparisons for n compared elements is n * (n-1) / 2 or n2 / 2 - n / 2. When filling out the matrix of pairwise comparisons, it is enough to determine the elements located above the main diagonal of the matrix.

Filling in matrices of pairwise comparisons by involved experts.

Paired comparisons are made in terms of the dominance of one element over another. For example, "Evaluate the importance of processing time in relation to the number of returns." The judgments obtained are expressed in whole numbers from a nine-point scale of relations.

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Consider an example of paired comparison matrix formation in general form. Let A1,A2,... An is a set of n of elements (variants) and α_1,α_2,...α_n - respectively their weight or significance. It is necessary to compare the value of each element in pairs with the significance of any other element of the set in relation to their common property or purpose (in relation "parent element"). In this case, A matrix of pairwise comparisons has the following form (formula 1):

$$[A]=\begin{array}{c|ccccc} & A_1 & \dots & A_2 & \dots & A_n \\ A_1 & \alpha_1/\alpha_1 & \dots & \alpha_1/\alpha_2 & \dots & \alpha_1/\alpha_{1n} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ A_2 & \alpha_2/\alpha_1 & \dots & \alpha_2/\alpha_2 & \dots & \alpha_2/\alpha_n \\ \dots & \dots & \dots & \dots & \dots & \dots \\ A_n & \alpha_n/\alpha_1 & \dots & \alpha_n/\alpha_2 & \dots & \alpha_n/\alpha_n \end{array}$$

We compose a matrix that has the property of inverse symmetry:

$$\alpha_{ji} = 1/\alpha_{ij} \qquad \alpha_{ii} = 1,$$

where α_ij is the ratio of criterion i to criterion j.

Table 1: matrix of pairwise comparisons

	processing time	number of returns	consistency of the result with the aim of the educational program
processing time	1	5	1/9
number of returns	3	1	1/7
consistency of the result with the aim of the EP	7	9	1

Similarly, we compose a matrix for comparing options (alternatives) for each criterion.

Table 2 - Processing time comparison matrix

processing time	sequential assessment	parallel assessment
sequential assessment	1	1/9
parallel assessment	9	1

Table 3 – Comparison matrix by the number of returns

number of returns	sequential assessment	parallel assessment
sequential assessment	1	1/3
parallel assessment	3	1

Table 4 – Comparison matrix by the consistency of the result with the aim of the EP

consistency of the result with the purpose of the EP	sequential assessment	parallel assessment
sequential assessment	1	1/3
parallel assessment	3	1

According to the matrix analysis technique, first of all, we find the sum of the elements of each column [19, 20]:

$$S_j = \alpha_{1j} + \alpha_{2j} + \dots + \alpha_{nj}$$

Divide all matrix elements by the sum of the elements of the corresponding column (normalization of the matrix):

$$A_{ij} = \frac{\alpha_{ij}}{S_j}$$

Table 5: normalization of the matrix

α_{ij}	processing time	number of returns	consistency of the result with the aim of the educational program
processing time	1	5	1/9=0,111
number of returns	3	1	1/7=0,143
consistency of the result with the aim of the EP	7	9	1
TOTAL	11	15	1,254

Also, in parallel, we find the average value for each line:

Table 6: average value

A_{ij}	processing time	number of returns	consistency of the result with the aim of the educational program	average value
processing time	1/11=0,09	5/15=0,333	0,111/1,254=0,089	0,171
number of returns	3/11=0,273	1/15=0,067	0,143/1,254=0,114	0,151
consistency of the result with the aim of the EP	7/11=0,636	9/15=0,6	1/1,254=0,797	0,677

The resulting column sets the "weights" of the criteria in terms of the goal. This column is called the criterion weighting column. Thus, the intermediate conclusion by the criteria can be displayed as:

Table 7: weight percentage

	weight in shares	weight percentage
processing time	0,171	17,1
number of returns	0,151	15,1
consistency of the result with the aim of the EP	0,677	67,7

On the basis of the obtained table, we can conclude that from the point of view of satisfying our goal, the most significant is the consistency of the result with the goal of the educational program and is 67.7%, the processing time and the number of returns have lower weight coefficients and in total are about 32%.

Similar calculations for matrices of pairwise comparison by criteria were performed. As a result, columns (vectors) of the weight coefficients of the objects of comparison from the point of view of compliance with individual criteria were obtained.

Criterion: processing time.

Table 8: processing time

processing time	weight in shares	weight percentage
sequential assessment	0,1	10
parallel assessment	0,9	90

The vector of weights of objects according to the criterion "processing time" was obtained.

According to the criterion "processing time", the most significant is parallel assessment (90%).

Criterion: number of returns.

Table 9: number of returns

number of returns	weight in shares	weight percentage
sequential assessment	0,25	25
parallel assessment	0,75	75

Criterion: consistency of the result with the goal of the EP.

Table 10: weight percentage

consistency of the result with the aim of the EP	weight in shares	weight percentage
sequential assessment	0,25	25
parallel assessment	0,75	75

Similarly, with two other vectors of object weights according to the criterion «number of returns», «consistency of the result with the aim of the EP».

According to the criteria "number of returns" and "consistency of the result with the goal of the EP", the most significant is the parallel assessment (75%).

An equally important aspect of the study is the consideration of the final part, namely, the determination of the weights of the alternatives.

As a result of calculations, vectors of criteria weights are obtained, as well as a matrix of weights

of alternatives for each criterion, which consists of the obtained columns.

Table 11: weights of the alternatives

	processing time	number of returns	consistency of the result with the aim of the educational program
sequential assessment	0,1	0,25	0,25
parallel assessment	0,9	0,75	0,75

Table 12: vectors of criteria

	weight in shares
processing time	0,171
number of returns	0,151
consistency of the result with the aim of the EP	0,677

Multiplying the resulting matrix by a column according to the row by column rule (matrix), we obtain the weights of the alternatives in terms of achieving the goal:

$$\begin{pmatrix} 0,1 & 0,25 & 0,25 \\ 0,9 & 0,75 & 0,75 \end{pmatrix} \times \begin{pmatrix} 0,171 \\ 0,151 \\ 0,677 \end{pmatrix} = \begin{pmatrix} 0,2241 \\ 0,7749 \end{pmatrix}$$

As a result, we obtain the weights of the alternatives in terms of achieving the set aim:

Table 13: weights of the alternatives

	weight in shares	weight in %
sequential assessment	0,2241	22,41
parallel assessment	0,7749	77,49

Thus, parallel assessment is the most attractive method for this aim.

4. DEVELOPMENT OF DATABASE AND APPLICATIONS MODELS

At this stage, the elements of the previously obtained class models are mapped to the elements of the database and application models:

- classes are displayed in tables;

- attributes - into columns;

- types - into the data types of the used DBMS;

- associations - in relationships between tables (many-to-many associations are converted to one-to-many associations by creating additional relationship tables);

- applications - into separate classes with finally defined methods and attributes associated with the data in the database [21, 22].

Since the database and application models are constructed on the basis of a single logical model, the connectivity of these projects is ensured automatically (Figure 5) [23].

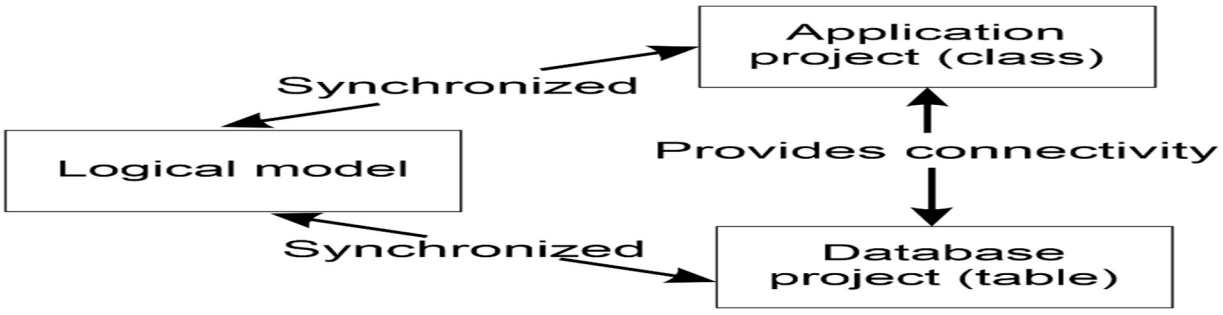

Figure 5: Connection between database and application projects

Client-server architecture with an application server. Figure 6 shows the Application server model.

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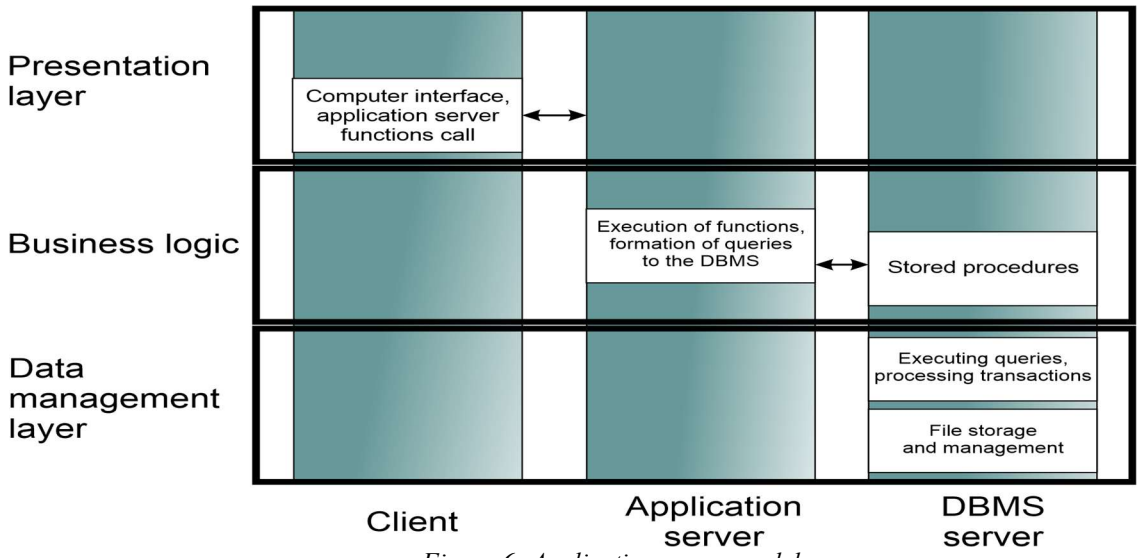

Figure 6: Application server model

The database schema and the list of the information system tables are shown in Figures 7 and 8.

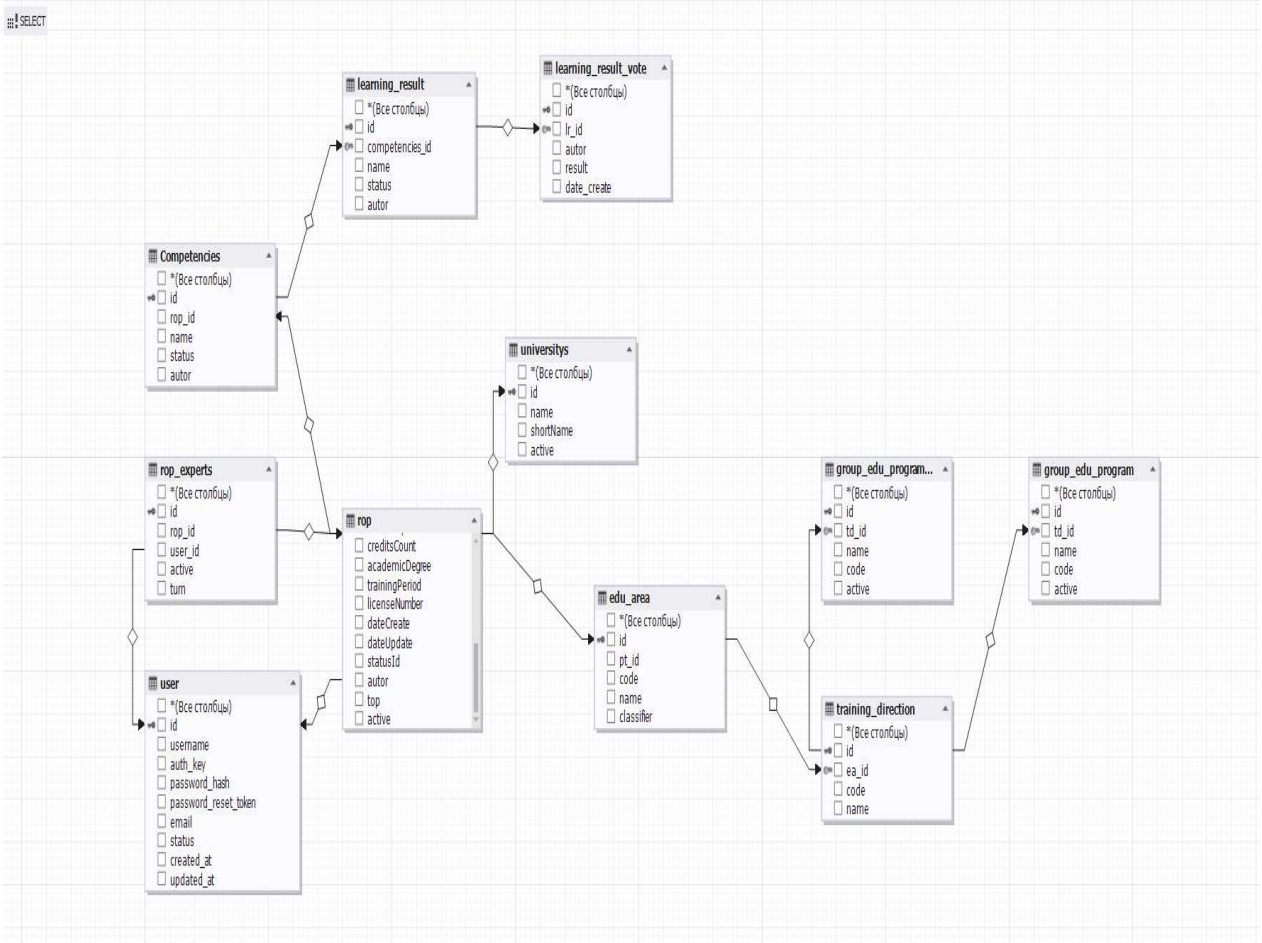

Figure 7: DB schema

Table	Strings	Type	Memory
auth_assignment	3	InnoDB	32 kB
auth_item	14	InnoDB	48 kB
auth_item_child	13	InnoDB	32 kB
auth_rule	0	InnoDB	16 kB
Competencies	12	InnoDB	32 kB
competencies_vote	0	InnoDB	32 kB
edu_area	37	InnoDB	32 kB
group_edu_program	2	InnoDB	32 kB
learning_result	14	InnoDB	32 kB
learning_result_vote	11	InnoDB	32 kB
menu	0	InnoDB	32 kB
migration	7	InnoDB	16 kB
rop	2	InnoDB	48 kB
rop_experts	6	InnoDB	32 kB
training_direction	124	InnoDB	32 kB
universities	1	InnoDB	16 kB
User	3	InnoDB	16 kB
17	249	--	512 kB

Figure 8 - List of tables

4. RESULTS OF THE PILOT WORK

In order to assess the competences of the educational program "Mechanical Engineering" the table with the formed competences is filled in (Table 14).

Table 14: formed competencies

№	Sequential assessment	Parallel assessment
C1	**Apply the main provisions of the Constitution of the Republic of Kazakhstan, the provisions of current legislation, the mechanism of interaction of substantive and procedural law**	**Apply the main provisions of the Constitution of the Republic of Kazakhstan, the provisions of current legislation, the mechanism of interaction of substantive and procedural law**
C2	**To possess a cognitively linguistic-cultural methodology for solving professional problems**	**To possess a cognitive-linguistic-cultural methodology for solving professional problems**
C3	**To carry out entrepreneurship of economic entities within the framework of the profession, using knowledge and skills in the field of marketing, business planning and project management**	**To carry out entrepreneurship of economic entities within the profession, using knowledge and skills in the field of marketing, business planning and project management**
C4	Count on the strength, stability, reliability of mechanisms and machines, equipment and structures in the design and operation	To conduct analysis, design of production facilities and processes based on general professional and specialized knowledge
C5	**To use IT-technologies for the implementation of the functioning of the processes of machine-building production**	**To use IT-technologies for the implementation of the functioning of the processes of machine-building production**
C6	To develop design documentation for existing and new facilities	Develop technical facilities and new products, design, technical and operational documentation
C7	**Develop technological processes of**	**Develop technological processes of**

	production/receipt of products.	**production/receipt of products.**
C8	**To ensure the organization and functioning of the technological/industrial processes**	**To ensure the organization and operation of technological / production processes**
C9		To uses various construction and tool materials in the design and production of machines
C10		To performs the assignment, modernization and design of tools, devices and process equipment
reachability ratio	**73,44%**	**89.97%**

In order to assess the conformity of the formed list of competences, we used two approaches to construct the competences assessment diagrams for the "Mechanical Engineering" educational program, presented in Figure 9, and to determine the experts' achievement rate.

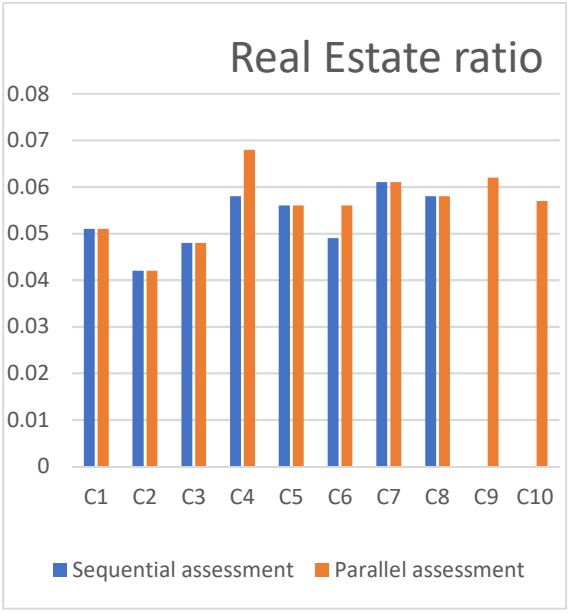

Figure 9: Real Estate ratio

As can be seen from the diagram, the highest priority for the educational program "Mechanical Engineering" has the competences C4, C7, C9, which were obtained by parallel evaluation.

It should be noted that C2 and C3 have the lowest priority, according to the experts, as these competences fall within the general education disciplines. Based on the results of the computation of the resulting priority vector, parallel estimation has a higher priority than consecutive estimation, which is also supported by the results.

5. CONCLUSION

In order to confirm the hypothesis put forward a study of the world experience of internationalization was carried out, including on the example of operating foreign organizations in Kazakhstan, involved in the development of the education sector. Revealed the need to build a distributed information system for the development of internationalization, with the aim of establishing a joint international partnership, contributing to the mutual improvement of educational research and practices.

The Kazakhstani experience in digitalization the process of forming professional competencies has served as a starting point for the development of a unique system that allows not only to form a competence base together with international experts, but also to ensure that it meets world standards. In order to compare competences, the educational program carried out expert analysis of the proposed

methods for evaluating the list of competences by means of the hierarchical analysis method. The method of analysis of hierarchies for educational program "Mechanical Engineering" has been tested. Priority competences of the "Mechanical Engineering" degree program have been identified as a result. To compare the competencies of the educational program, an examination of the proposed methods for assessing the list of competencies was performed using the hierarchy analysis method. The method of analysis of hierarchies for the educational program "Mechanical Engineering" has been tested. The priority competences of the educational program "Mechanical Engineering" have been identified as a result of the use of synchronous and asynchronous approaches. This approach will allow the university to respond flexibly to changing environmental conditions and develop educational programs, increasing their quality and demand on the educational services market. The presented architecture of the distributed information system module "Expertise of competencies: international base by industry" can be scaled both vertically and horizontally and allows you to form a base of updated key competencies for educational programs of the university. Thus, modeling a specialized space for interaction with foreign experts within the information system will contribute to the expansion of intercultural understanding and dialogue, the formation of a positive image of the university in the global educational space, and an increase in the demand for university graduates not only in Kazakhstan, but also abroad.

The results of this study will serve as a basis for continuing the design of a digital ecosystem that will effectively target the processes of creation, accumulation, processing, use and transfer of knowledge to improve competitiveness in the education market.

Taken together, measures to internationalize a technical university will contribute to a deeper understanding of the local-global connection and improve the quality of educational services provided.

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