

# ANALYSIS OF THE TRANSFORMATION OF HIGHER EDUCATIONAL INSTITUTIONS THROUGH ENTREPRENEURSHIP IN THE CONDITIONS OF DIGITALIZATION

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## ABSTRACT

*In the context of the formation of a digital economy in Kazakhstan, it becomes relevant to study the realities and prospects for the development of digital entrepreneurship. In the process of improving national education, modern technologies are acquiring an increasing role every year, the introduction of which contributes to the modernization and development of education, as well as to the improvement the entrepreneurship role of the quality of training of future specialists and the convergence of education with science. At the same time, such technologies require a revision of existing approaches to educational activities, as well as an analysis of their impact on society and individual social groups. A carefully thought-out educational policy that takes into account modern trends will help not only to fill the labor market with specialists in a balanced way, but also to prevent social collapse. The active implementation of cluster policy in the modern digital economy is due to the need to eliminate the shortcomings inherent in the market for educational services of higher educational institutions with the aim of coordinated cluster initiatives and the development of a balanced educational policy in the context of digitalization.*

**Keywords:** Transformation, Entrepreneurship, Higher Education, Digitalization, Business Community, Strategy, Education System, Innovation, Educational Process, Management, Quality.

## INTRODUCTION

The rapidly developing digital economy, penetrating all spheres of life in modern society, gives rise to the need for systemic technological breakthroughs and the development of new ways of processing information. The process of total digitalization will inevitably change the structure of employment of the population and the educational environment.

The 21st century is characterized by the transition to a new qualitative state of human activity and society. Humanity has entered a new era - the information era, which is characterized by the development of a market economy, an open and democratic society, the spread of telecommunications, and the Internet and computer technologies.

Globally, digitalization is a concept of economic activity based on digital technologies being introduced in various spheres of life and production. And this concept is widely implemented in all countries without exception.

Digitalization has been declared one of the main trends in the development of modern states, which is associated with the emergence of "smart cities" and "smart objects", etc. The

modern transformation of higher education is due to the transition from an industrial to a post-industrial structure, which has changed the requirements for the main activities, qualifications and competencies, the transition to digital media and the ability to quickly transmit digital media anywhere in the world via the global Internet, which has changed the educational space. It is no coincidence that this was due to a number of global processes, including changes in the structure of processes, forms of organization and the use of pedagogical technologies in the system of higher educational institutions.

The world of education and science has become global, now it is almost impossible to find a student, teacher or scientist who has not visited foreign universities as part of academic mobility programs. In the course of unprecedented changes, many universities are trying to adapt and find their place on the global scientific and educational map, while maintaining their unique qualities and competitive advantages.

Modern digital technologies provide new tools for the development of universities and other educational institutions around the world. Digitalization provides opportunities for the exchange of accumulated experience and knowledge, which allows people to learn more and make better decisions in their daily lives. Carefully thought-out educational policies that take into account modern trends will help not only fill the labor market in a balanced way, but also prevent social collapse.

Educational organizations act as elements of the national and regional innovation system, which are designed to produce new knowledge, its widespread dissemination and use, which contributes to the financial, economic, legal and information support of innovative processes in the regions of the country. To create sustainable innovation systems, it is necessary to have developed research institutions, attract highly qualified personnel, provide conditions for supporting innovation and technology, as well as an active position of the government sector and a stable legislative framework.

Assessment of the level of digitalization of educational organizations allows us to identify the strengths and weaknesses of this process and justify the necessary management decisions that can provide the prerequisites for the innovative development of the national economy on a digital basis.

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## **RESEARCH BACKGROUND**

At the moment, researchers analyzing the digitalization trends in higher education focus on the digital literacy of the population, on the impact of information and communication technologies, on the level of digitalization of education in general, and on legal barriers that prevent transformation.

University digitalization is a complex, continuous process that depends on many factors associated with organizational changes, functioning in strict accordance with the social role of universities in the provision of services (Zajkowski & Stańczak 2015).

In connection with the accelerated rate of development of information and communication technologies, digital society and the digital economy give rise to certain skills and competencies that are essential for achieving professional success or personal development of a person (Bejinaru, 2019).

Innovation, as a result of interconnected processes of learning and knowledge creation, is a special way with which economic agents "adapt" to constantly changing conditions. These new economic demands are putting increasing pressure on universities and generating major changes in their governance. In this sense, Lupan & Bejinaru. (2019) believes that academic management

should be directed in such a way as to improve the relationship between intellectual capital and performance management. Universities focused on entrepreneurship, technological development and scientific research have a strong impact on the economic environment.

Due to the study of the entrepreneurial model in the context of the transformation of universities, policies and governance mechanisms in the field of higher education, according to Toan Van Dinh (2020), should be improved in such a way as to create an ecological environment conducive to innovation in the digital economy, and to form an advanced university management.

According to Dunaeva (2016), information technologies in education are radically changing the traditional system of higher education, since they are focused on the effective integrated use of virtual resources, are designed for an online audience, video broadcasts and an individually oriented approach, as the main principle of organizing education instead of a group approach.

In his research, Feng Gao (2020) argues that in the era of big data, the development of information management in the higher education system has led to some changes, as a result of which a new concept of building an educational information management model has been proposed, including strengthening the building of a system of information management standards in education management, promoting effective integration of the education management system, improvement of education administrators, believing that general information literacy contributes to the creation of information in the field of education management and the creation on its basis of a new learning model.

Starting in the spring of 2020, the outbreak of COVID-19 has forced all universities in the world to close campuses (dormitories) and start online learning. Due to these circumstances, the main focus in all universities is on online education, which, according to Wei Bao (2020), is represented by specific teaching strategies to summarize the current online learning experience for university teachers who could conduct online education:

1. high relevance between online instructional design and student learning;
2. efficient delivery of online training information;
3. adequate support provided by teachers and teaching assistants to students;
4. high quality participation to enhance the breadth and depth of student learning;
5. a contingency plan for online education platforms.

Considering foreign experience, despite the fact that before the outbreak of Covid-19, the level of adoption of e-learning aids decreased slightly, it can be assumed that the demand for digital offers will rather increase. Therefore, it can be assumed that the current situation will have a positive impact on digital innovation in teaching in higher education due to the pressure of the crisis, the great dedication of many teachers and heightened expectations.

According to research by Olaf Zawacki-Richter (2020) in Germany, during all three years of the survey (2012, 2015, 2018), more than 99% of students stated that they have access to the Internet at home. If in 2012 only slightly more than half had a smart phone with mobile Internet access, then in 2018 this figure was 98%. Students estimate that they use the Internet for an average of four hours a day. Overall, students are very well equipped with digital devices. On average, they have five different endpoints. While stationary devices (desktops, printers, scanners) have become less and less important over the years, mobile devices have become more and more popular (smart phones + 42% or tablet computers + 34%) (Table 1).

<b>Table 1</b>				
<b>INDICATORS OF THE USE OF INTERNET TECHNOLOGIES ABROAD</b>				
Usage mode	2012	2015	2018	$\Delta$ (2018–2012)
Library service	28%	45%	53%	25%
Collecting data for exam papers	24%	35%	48%	24%
Research for exam papers and presentations	45%	55%	69%	23%
Sending emails to teachers	51%	65%	74%	23%
Classes on courses	39%	46%	57%	18%
Review scores	55%	66%	69%	14%
Take pictures	66%	70%	78%	12%
Writing texts for exam papers	6%	11%	18%	12%
Buying books	24%	30%	35%	11%
Access to Learning Management Systems	68%	75%	78%	10%
internet research during lesson	71%	71%	74%	4%
Sending texts or photos	41%	41%	45%	4%
Sending letters to fellow students	70%	72%	73%	3%
LMS communication	36%	41%	38%	3%
Sending SMS messages to fellow students	84%	61%	36%	–48%
Instant messaging (e.g. WhatsApp).	-	-	88%	
Source: compiled by authors according to Olaf Zawacki-Richter (2020)				

According to research by Minina (2020) on the topic of digitalization of higher education identified four trends associated with the introduction of digital technologies and tools into the educational process:

1. formation of a blended learning model;
2. transition to online learning;
3. creation of a virtual (digital) educational environment;
4. changing the approach to the management of educational organizations.

These trends are interrelated, but each has a specific impact on higher education institutions. On the one hand, digitization increases the openness and flexibility of education, increases student involvement in the educational process and develops a network model of university interaction. On the other hand, this leads to the emergence of new educational situations and changes the composition of relations between the main participants by introducing new factors into the education system.

Digitization leads to significant changes in the role of teachers and students in the learning process, which require appropriate adaptation.

According to scientists such as Echenique et al. (2015), the transition to online education and the creation of a virtual educational environment create the need for a change in the management of educational organizations. And if these changes do not occur, digitalization can have negative consequences.

So, characterizing the experience of digitalization of education, J. Cross (2018) noted: “We thought that we could take teachers out of the educational process and let students act independently. We were wrong. The first generation of e-learning systems ended in failure”. Determining the positive potential of digitalization, we note that digital technologies offer many options in the design of educational processes. At the same time, the educational space formed by digitalization has the features of universality.

According to the researcher, the creation of a virtual learning environment radically changes the role of the teacher in higher education. He or she becomes a kind of teaching technician who develops an effective and engaging learning environment that shapes learners' lifelong learning abilities (Saykili, 2019).

For example, Tulinayo et al. (2018) used an internet technology called TAM (Technology Adoption Model) at the College of Computing and Information. Blended learning model in science (Uganda).

Modern digital technologies, according to research, have made it possible to create a personalized learning environment that combines formal and non-formal learning. Social networks play a central role in the formation of a personalized learning environment as a set of various network tools and technologies that serve as channels of communication, cooperation and creative expression (Dabbagh & Kitsantas 2012).

Experts view the following media as social networks that are actively used in education:

1. weblogs, or easily created blogs, and updated sites that allow authors to publish immediately on the Internet (they facilitate communication between teachers and students);
2. wikis, where members can use their web browsers to modify any page or create a new one - a web browser on which users can create new pages or add and edit already published ones;
3. websites on which users can create new pages or add and edit already published;
4. bookmarking sites that allow users to bookmark and exchange links to sites (users can create personalized websites, examples: Reddit, StumbleUpon, Digg);
5. social networking sites (Youtube, Facebook, LinkedIn, VKontakte, etc.) is a publicly available web service that allows users to create a personal profile, identify other users with whom they are associated, read and respond to messages from other users on the site, and also send and receive private and public messages.

According to Peshkova & Samarina (2018), the rapidly developing digital economy, penetrating into all spheres of life in modern society, gives rise to the need for systemic technological breakthroughs and the development of new methods of information processing.

Universities around the world are increasingly digitizing all of their operations, with the current COVID-19 pandemic accelerating other sustainable change (Laksov & McGrath, 2020).

Universities are faced with management problems associated with the ability to research and use their activities to achieve social, innovative and economic results, as evidenced by the results of foreign researchers Cruz-Amarán et al. (2020).

Research by Lattu & Cai (2020) provides insight into the analytical framework developed by Hann et al. (2015) for understanding the corporate sustainability controversy in the context of the university system in order to identify areas related to stability of universities.

## METHODOLOGY

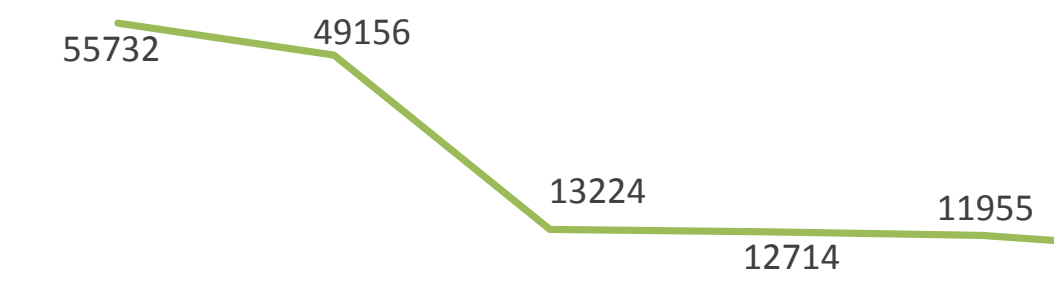
The study was carried out using methods such as: abstract - logical and comparative analysis, also used a descriptive method and generalization, as well as methods of system analysis, economic comparison, expert assessments. In the course of the research, the author analyzed the classification of the universities in Kazakhstan using cluster analysis, which allows the division of objects into homogeneous groups or clusters according to a number of features in the regional aspect. To solve the problem, the usual Euclidean metric was used, and the distance between the clusters was determined by the Ward's method. Due to the fact that the indicators are

presented in different units of measurement, the initial data were previously normalized. As a result, a sequence diagram was obtained for the unification of clusters in the regional aspect of universities in Kazakhstan.

## Analysis and Results

The role of innovative higher education in the context of digitalization and its contribution to the country's economy is the main lever of economic growth and is critically important in the context of digitalization and innovation policy of the state.

But still, comparing the indicators of foreign countries in relation to the share of government spending on education in total GDP, Kazakhstan has the least value in this comparison ((Figure 1 (Source: compiled by authors according to <https://www.statista.com>)).



**Figure 1**  
**AMOUNT OF PUBLIC FUNDS PER STUDENT, IN USD DOLLARS IN 2019**

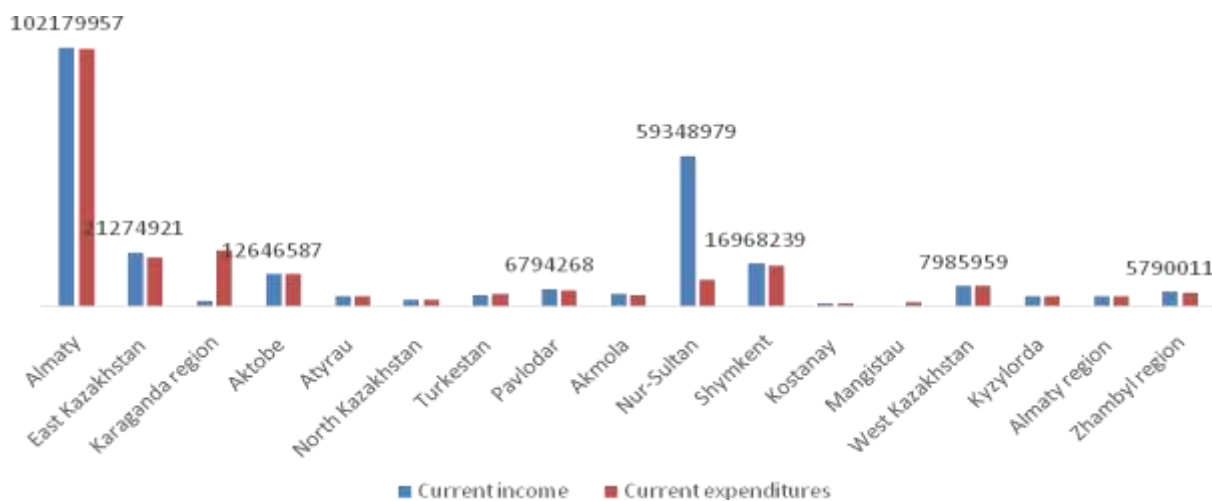
To divide objects into homogeneous groups according to the indicators under consideration (current income and expenses of universities, informatization of universities and the use of interactive equipment), we will conduct a cluster analysis, which allows this analysis to be carried out (Table 2).

<b>Table 2</b> <b>INDICATORS CHARACTERIZING THE LEVEL OF DIGITALIZATION OF HIGHER EDUCATIONAL INSTITUTIONS IN THE REGIONAL BRANCH IN 2019</b>					
Region	Current income of universities, thousand tenge	Operating expenses of universities, thousand tenge	Informatization of universities (number of computers in the educational process),	Number of sets of interactive equipment, units	Number of higher educational institutions, units
			units		
Akmola	4991612	4188123	1254	106	4
Atuibinsk	12646587	12691431	3479	396	6
Almaty	3720247	3688648	1736	98	3
Atyrau	4111522	3766161	723	88	3
West Kazakhstan	7985959	7733956	2398	121	4
Zhambyl	5790011	5189904	1249	94	3
Karaganda	22066404	22015733	8402	449	9
Kostanay	1143753	1143753	4209	300	7
Kyzylorda	3740170	3652757	1459	116	3

Mangistau	1511593	1432108	792	125	2
Pavlodar	6794268	6157978	1479	110	4
North Kazakhstan	2307940	2298076	1896	141	2
Turkestan	4320323	4663082	1819	122	2
East Kazakhstan	21274921	19305304	5416	643	7
Nur-Sultan city	59348979	100931875	12063	1090	15
Almaty city	102179957	101831140	23768	1690	41
Shymkent city	16968239	15767028	6081	380	10
<b>Total:</b>	<b>285192910</b>	<b>320683745</b>	<b>78223</b>	<b>6069</b>	<b>125</b>

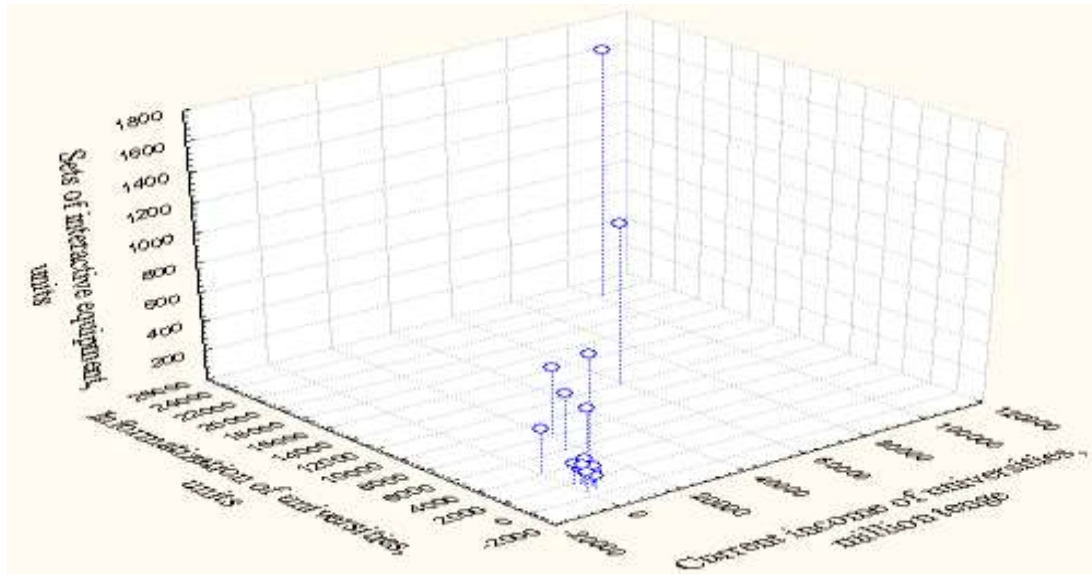
Source: compiled by authors according to the source Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan

According to the data presented in Table 2, in 2019 we can observe a pronounced trend in the development of income and expenditure current indicators of universities in Kazakhstan in Aktobe, Karaganda regions, Nur-Sultan, Almaty, Shymkent (Figure 2 (Source: compiled by authors according to the source Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan)).



**Figure 2**  
**DYNAMICS OF INDICATORS OF CURRENT INCOME AND EXPENSES OF UNIVERSITIES OF KAZAKHSTAN IN THE REGIONAL ASPECT FOR 2019, IN THOUSAND TENGE**

Based on the data on the income of universities and the degree of their informatization, we will classify the regions of the Republic of Kazakhstan. Let us graphically represent the relationship between the indicators under consideration using a scatter plot (Figure 3 (Source: compiled by authors)).



**Figure 3**  
**SCATTER GRAPH**

Current income of universities, million tengevs. The number of sets of interactive equipment, unitsvs. Informatization of universities (number of computers in the educational process), units.

To classify the regions, cluster analysis was used, which allows the division of objects into homogeneous groups according to the indicators under consideration. Objects are considered homogeneous if the observed features are in close proximity to each other. The proximity metric is the distance metric. To solve this problem, the usual Euclidean metric was used, and the distance between the clusters was determined by the Ward's method.

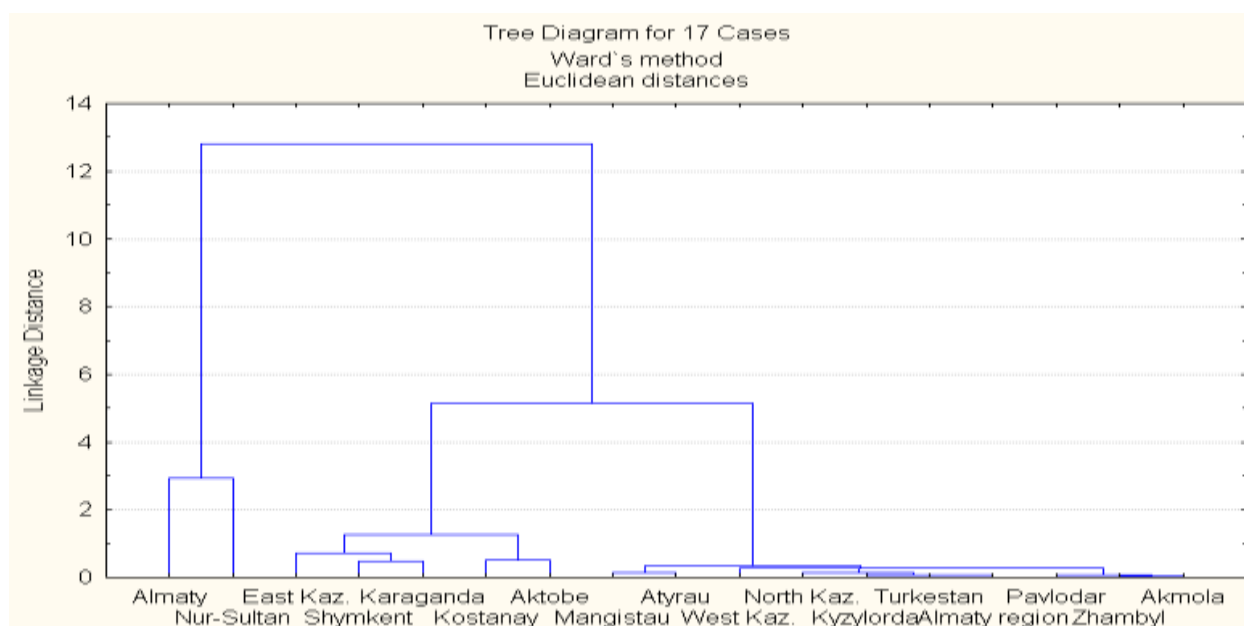
Due to the fact that the indicators are presented in different units of measurement, the initial data were previously normalized. As a result, a diagram of the sequence of combining clusters was obtained (Figure 4 (Source: compiled by authors)).

Amalgamation Schedule																	
Ward's method																	
Euclidean distances																	
linkage distance	Obj. No. 1	Obj. No. 2	Obj. No. 3	Obj. No. 4	Obj. No. 5	Obj. No. 6	Obj. No. 7	Obj. No. 8	Obj. No. 9	Obj. No. 10	Obj. No. 11	Obj. No. 12	Obj. No. 13	Obj. No. 14	Obj. No. 15	Obj. No. 16	Obj. No. 17
.0411968	Akmola	Zhamb															
.0615602	Almaty	Turkes															
.0663688	Almaty	Turkes	Kyzylor														
.0835109	Akmola	Zhamb	Pavlod														
.1255312	Almaty	Turkes	Kyzylor	North K													
.1314943	Atyrau	Mangis															
.2628329	Akmola	Zhamb	Pavlod	Almaty	Turkes	Kyzylor	North K										
.2660968	Akmola	Zhamb	Pavlod	Almaty	Turkes	Kyzylor	North K	West K									
.3484645	Akmola	Zhamb	Pavlod	Almaty	Turkes	Kyzylor	North K	West K	Atyrau	Mangis							
.4716436	Karagai	Shymk															
.5079854	Aktobe	Kostan															
.7226869	Karagai	Shymk	East K														
1.259718	Aktobe	Kostan	Karagai	Shymk	East K												
2.939619	Nur-Sult	Almaty															
5.145224	Akmola	Zhamb	Pavlod	Almaty	Turkes	Kyzylor	North K	West K	Atyrau	Mangis	Aktobe	Kostan	Karagai	Shymk	East K		
12.79990	Akmola	Zhamb	Pavlod	Almaty	Turkes	Kyzylor	North K	West K	Atyrau	Mangis	Aktobe	Kostan	Karagai	Shymk	East K	Nur-Sul	Almaty

**Figure 4**  
**DIAGRAM OF THE SEQUENCE OF COMBINING THE REGIONS OF THE REPUBLIC OF KAZAKHSTAN INTO CLUSTERS**

The results of the cluster analysis can be presented in the form of a dendrogram (Figure 5 (Source: compiled by authors)).





**Figure 5**

### **DENDROGRAM OF CLUSTER ANALYSIS OF THE DIVISION OF THE REGIONS OF THE REPUBLIC OF KAZAKHSTAN**

Thus, the regions of Kazakhstan in terms of the profitability of universities and the degree of their informatization can be divided into the following clusters:

Cluster 1 - Almaty, Nur-Sultan.

Cluster 2 - East Kazakhstan region, Shymkent, Karaganda, Kostanay, Aktobe.

Cluster 3 - Mangistau, Atyrau, WKO, NKO, Kyzylorda, Turkestan, Almaty, Pavlodar, Zhambyl, Akmola.

### **CONCLUSIONS**

To classify the regions, the author used cluster analysis, which allows dividing objects into homogeneous groups according to the indicators under consideration (current income and expenses of universities, informatization of universities and the use of interactive equipment). As a result of the cluster analysis, the author identified clusters in terms of profitability indicators of universities and the degree of their informatization:

1. Cluster 1 - Almaty, Nur-Sultan.
2. Cluster 2 - East Kazakhstan region, Shymkent, Karaganda, Kostanay, Aktobe.
3. Cluster 3 - Mangistau, Atyrau, WKO, NKO, Kyzylorda, Turkestan, Almaty, Pavlodar, Zhambyl, Akmola.

As a result of the study, the author made conclusions about the need for more intensive work of higher educational institutions:

1. to develop and strengthen the philosophy and values of the educational activities of the university;
2. to improve the system of promoting the image at the regional and international level;
3. to unite the efforts of the structural services of the university to create a positive image of the university and find the most effective ways to promote it using modern information technologies;
4. to improve the corporate culture of the university and consolidating the team;
5. to use of the information potential (resources) of the university using modern means of communication.

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