FORMATION AND IMPLEMENTATION OF MECHANISMS OF ELECTRONIC MANAGEMENT OF THE REGIONAL EDUCATION SYSTEM

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Abstract: Integration in the field of global education is a trend that at the end of the 20th and beginning of the 21st century is becoming one of the basic categories of modern pedagogy. It is developing both in individual countries and at the regional and global levels. Integration and regionalization in education is part of a complex and comprehensive process of rapprochement, interaction, and interpenetration of national structures. Of course, this introduces into the study of integration problems in global education of all the complexities and contradictions of the analysis of "large systems." At the same time, integration in education has its own distinctive features, dynamics, goals, and methods of forming integration associations at various levels, which need appropriate management. The article analyzes the role of digital technologies in modern conditions of management of regional educational systems, within the concept of electronic management.

Keywords: regional educational system; information technology; internationalization of education; management of educational systems; globalization; digitalization.

1 Introduction

Since the education system represents one of the social institutions, its development is completely determined by the changing needs of society, based on the nature and achievements of scientific, technical, and social progress. The dynamics of modern social development are characterized by rapid and profound changes in all areas of human life and activity - in science and technology, in economics and politics, in education and culture, in the organization of production and in its management. Education, as one of the most important social institutions, is also subject to constant development in accordance with changing goals and needs of society, with the development and implementation of high technologies. At the same time, the response of educational systems to the social challenges of the time does not occur automatically, but indirectly, in the process of development of public opinion and the activity of teachers, public and government figures, being, at the same time, characterized by a certain inertia.

These circumstances determine the need for constant search, research, and monitoring of both general civilizational processes and the processes of functioning of educational systems in order to harmonize their main parameters with social changes, with the leading directions and trends of scientific, technical, and social progress. At the same time, the most radical modernization is usually needed for such an element of education as its content, since namely the content of basic education forms the foundation and opportunities for improving student training programs in high school and vocational schools, and determines the level and quality of higher education. The content of vocational education directly affects the nature of the development and use of the productive forces of society, material and spiritual culture, and the population' well-being.

In the world education system, by the beginning of the 21st century, the following global trends have emerged and are clearly visible [63]:

- The general desire to democratize the education system is intensifying, ensuring access to education for the entire population of the country, primarily for capable talented youth, regardless of their social origin and financial situation, and continuity of stages and levels of education;
- A multi-level education system is developing, which provides greater mobility in the pace of learning and in students' choice of future specialty. It forms in the student the ability and desire to master new specialties and professions on the basis of the university education received;
- The educational process in universities is characterized by a powerful enrichment with modern information technologies, widespread inclusion in the Internet system with its rich information resources and intensive development of distance learning forms for students;
- In the global educational system, the humanitarian component of the content of specialist training in general is significantly increasing, in particular through the human-oriented scientific and educational disciplines: philosophy, psychology, political science, sociology, cultural studies, ecology, ergonomics, economics;
- The 'universitization' of higher education and the processes of integration of all higher educational institutions into the system of leading universities in the country and in the world are intensifying, which leads to the emergence of powerful university complexes, scientific and educational metropolises of national, continental, and interregional significance;
- Universities are also merging with industrial complexes. As a result, a basis is formed for scientific research and targeted training of unique specialists for modern firms and enterprises;
- There is a gradual growth of the market for educational services and an expansion of their range;
- Education is becoming a priority object of financing in all developed countries of the world, and there is an awareness of the prospects of investing in human capital.

In addition, in the field of education management, a reasonable compromise is being sought between strict centralization and standardization of education, on the one hand, and the complete autonomy of educational institutions, on the other. Knowledge about forecasting the development of regional educational spaces has become in demand in modern public practice [45].

Modern pedagogy has significant scientific potential for studying the problem of the development of a regional education system, including research into innovative approaches to the development of regional education systems, research into economic, social, and managerial aspects of the development of regional education systems. However, critically little attention is paid to the formation and implementation of mechanisms of electronic management for the regional education system. This important area of social relations today turned out to be an unexplored "niche", against the backdrop of the rapid pace of digital transformation of education on the one hand and multidirectional, to some extent entropic processes of managing education systems in a globalized world on the other.

2 Materials and Method

The general methodology of the study was determined by heories of the development of modern civilization at the stage of transition to a post-industrial society, the growing role of education in the world, as well as the principle of systematicity and conditionality of economic and social, managerial and pedagogical processes.

The development of methodological tools was carried out based on the provisions of the general theory of systems and the systems approach, the principles and categories of dialectics, modeling as one of the productive methods for studying and

transforming systems, the use of a synergetic approach that identifies and understands general patterns, self-organization processes in complex systems of various natures, in particular in management and educational systems. The method of analogy, analysis, synthesis, induction, and deduction was used.

We used the elements of comparative method when analyzing the regional educational systems of the EU and Asia.

3 Results and Discussion

It should be noted that the term "education without borders" first appeared in official reports (since 2000) in Australia and the UK [36]. Basically, this term is used to characterize the processes of overcoming conceptual, disciplinary, and geographical boundaries traditionally inherent in the system of secondary and higher education. In this aspect, it seems legitimate to compare the term "education without borders" with the term "cross-border education," since namely the relationship between these two terms determines the real boundaries of the regional education systemм [18]. Currently, most publications no longer dispute the actual disappearance of 'hard' boundaries between national education systems, although the term "cross-border education" inevitably emphasizes precisely the fact of their existence.

Both approaches, in our opinion, reflect the realities of today. At the same time, in a period of unprecedented growth in distance and e-learning, simple recognizing or denying geographical boundaries is apparently not enough [2; 3]. In any case, the importance attached to boundaries is growing, especially when the focus is made on regulating the responsibilities of educational institutions (primarily universities), particularly in the areas of quality, financing, and accreditation.

This point is particularly relevant in terms of how definitions can shape educational policy practice, and how practice, in turn, can influence educational policy definition.

Given the changes in the mechanisms for justifying and delivering methods of cross-border general and higher education, it is important to consider the issue of its definition and provide meaning to the current changes and problems it reflects. It is becoming increasingly clear that internationalization must be understood primarily at the national and industry level, as well as at the organizational level [4-7]. Thus, a new definition of the process of internationalization of education is needed so that it can cover both all levels of education (and the dynamics of relations between them) and reflect the realities of today.

The most challenging part of analyzing evolving definitions is considering their application across different countries, cultures, and educational systems. This is not easy task. After all, it is not a universal definition that is being developed, but, first of all, the one that is meaningfully suitable from a wide range of educational contexts in countries around the world [12; 13]. It is therefore important that the definition does not specify the specific benefits and outcomes of activity subjects or internationalization participants, as these elements vary from institution to institution. It is necessary to realize that the international aspect concerns all aspects of education and the role it plays in society. With this in mind, we can propose the following working definition: "internationalization" as a socio-economic phenomenon at the national and institutional levels is defined as the process of integration of international and intercultural socio-economic relations, their forms and institutions (or, in relation to the globalization of the regional education system, - as general goals, functions, and methods of delivery and implementation of various levels of education).

In turn, in the regional aspect, the internationalization process is often considered from the point of view of a tripartite model of education (input, processing, and output of innovative educational knowledge). If the internationalization process determines the materials, outcomes, and benefits of the regional educational process, then there are correspondingly fewer commonalities in the educational process, since it must first of all reflect the specific priorities of the country, institution, or specific group of stakeholders.

The international, intercultural, and intersectoral scales of globalization of national and regional education reflect three conditions that are usually used as a "triad" definition. Indeed, the concept "international" is used to characterize relations between nations, cultures, and countries [14-16]. But internationalization also refers to the diversity of cultures that exist in countries, communities, and institutions, and the concept of "intercultural" is also used to capture this same aspect. Finally, "global" reflects the contradictory perspectives of the global sphere.

These three levels complement each other and together systematically reflect the richness of the entire range of both internationalization and regionalization of education [62]

Like other public institutions, education, under the influence of the comprehensive process of internationalization of life, is becoming increasingly open to international cooperation. Moreover, due to the special role of knowledge in the post-industrial era, education appears to be one of the decisive elements of "high" world politics. And while earlier the process of internationalization of education went as if "following" its development in the economy, today, in our opinion, the need for its rapid development in the field of education is becoming increasingly more obvious [20; 21]. Under the influence of the major political and economic changes taking place in the world, the evolution of the value systems of many countries, as well as in the face of global challenges to humanity, modern education is acquiring an increasingly global, worldwide character.

The internationalization of education is accompanied by strengthening of the international component of the development of its individual elements - national and regional educational systems. This, however, does not mean that they have lost their identity [22; 23]. Rather, the point is that in the process of internationalization, a new international educational environment is being formed, where the national interests of its participants could be implemented in the most effective forms, and a joint search for solutions to problems that are of vital importance for human civilization as a whole could be carried out.

In cases where the developing processes of internationalization are successfully superimposed on the historically long-standing cultural and economic community of a group of states, large fragments are formed in world education, characterized by fairly similar directions of development and the qualitative state of the national educational systems included in them. In our opinion, such trends can be considered as starting points on the path to the gradual formation of regional educational spaces in certain parts of the world, where, if not unified, then largely common educational concepts are implemented (for example, in EU countries).

The internationalization of education is an objective and constantly evolving process that existed in various forms long before the formation of nations and national entities in their present form was completed. It is connected not so much with pedagogical borrowings, which also took place and are in themselves expedient, but rather with general parallel processes and general socio-economic and cultural phenomena that have developed in the world [23; 35]. These include: world economic relations, constantly increasing in volume and increasingly more diverse in content; new technologies with their developed infrastructure, making almost every 'corner' of the globe accessible to information; modern global problems of humanity. The internationalization of education is also facilitated by new trends in world politics, the ideas of the free market that have rooted in most of the world, as well as the universality of humanism and universal human values.

Today, integration trends in global education are being quite actively studied by specialists, and one can talk about different approaches to assessing them [25-27]. Let us note that there are

two main, in our opinion, points of view on the future of interstate cooperation in the field of education.

Supporters of the first of them, relying on the universal property of humanism, on the commonality of a number of the most important problems of modern education, consider it expedient to accelerate the process of its internationalization on the basis of unifying the main directions of the functioning of national educational systems and modern technologies [28]. However, the prevailing view is that universalism in education is possible only if the diversity of social, political systems, cultural and linguistic traditions of different countries is preserved. At the same time, it is not about the unification of national educational systems or their "harmonization", but about the need for their greater orientation towards the needs of a rapidly changing and increasingly interdependent world [52].

With varying intensity, the process of internationalization covered all levels of education, reaching its maximum in higher education. In relation to certain regions of the world (Western Europe), there is reason to assert that the process of internationalization in higher education is acquiring the features of a qualitatively new stage - integration, as evidenced by the emergence of the corresponding political and legal superstructure of the integration complex [30-32]. Of course, international integration in education, as in any other sphere of life, is a complex, contradictory, and lengthy process. Moreover, many problems associated with the need to transfer some functions from the national to the supranational level, with a certain limitation of the sovereign rights of the state, are especially difficult to solve here.

In our opinion, in the development of the processes of internationalization of world education, including their highest form - integration, two main levels of goals can be distinguished: global - promoting, through deepening cooperation in the field of education, general socio-economic progress and sustainable development of the world community, easing pressure of global problems and strengthening mutual understanding between peoples; intra-system (educational) - combining the potential of national educational systems to solve problems that go beyond the capabilities of an individual country and related to the elimination of illiteracy of all types, inequality in access to quality education using the latest technologies, education based on universal human values of an individual who is aware not only of his national and cultural identity, but also perceiving the world in all its integrity and interdependence, understanding his personal responsibility for its fate and ready to act constructively in order to preserve and develop it [37; 38]. One of the main goals that can be achieved on the path of integration and creation of a consolidated world educational space (WES) is a significant increase in the quality of education in the world, improvement of human resources, and in this regard, providing opportunities for the effective transfer of knowledge from one part of the world to another.

States that are characterized by a qualitatively higher degree of cultural dynamics and scientific and technological autonomy also face their own colossal difficulties, which is typical in general for Greater East Asia (North-East and Southeast Asia, Central and South Asia). Of course, these characteristics ensure the ability of these countries to break out of the vicious circle of backwardness, carry out enclave economic modernization and not only master imported high technologies, but also independently develop scientific research, enter a new stage of scientific and technological progress, which provides additional opportunities for expanding the impact on the processes taking place in the Afro-Asian world. On the other hand, the presence of a generally large unskilled, illiterate population did not allow them to apply many of the models of developed countries [40]. Thus, there is little point in introducing new resource-saving technologies (extremely low cost of manual labor, the need to provide work for the population, etc.); it is no coincidence that most technological advances are "export-oriented" in nature. In the countries of Greater East Asia, there was an understanding of the need to make fundamental decisions to correct the situation.

Over the past 25+ years, a radical educational reform has been carried out here, and it followed a coinciding trajectory and had the following common characteristic features:

- Formation of a new image of national concepts of education;
- Restructuring of the education system and its large-scale expansion;
- Ensuring standards and quality of education;
- Extensive use of the non-state sector and finding a balance between equal access to education and promotion of competition;
- Diversification of education;
- Transition to decentralization;
- Emphasis on the use of development planning and strategic management [59];
- The use of information technologies in the teaching and learning process;
- Development of new curricula and teaching and learning methods;
- Changing the practice of examinations and knowledge assessment;
- Searching for opportunities to improve the quality of teachers' work;
- Recognition of the need for continuous professional development of teachers and management of educational institutions [51].

Countries have adopted special programs for the comprehensive development of education. In Japan, the National Council for Educational Reform was created back in 1984, and in 1991 the Standards for the Establishment of Universities were revised. Various new laws and projects were adopted over the next quarter century. In China, in 1995, the strategy "Prosperity of the state through science and education" was put forward. In the same year, South Korea presented an education reform plan; in 1999, the government adopted the "Brains of Korea" program. 21st century", and in 2008 - a special "World Class University Program". In 1996, a new law on education appeared in Malaysia [44].

As a result, in 2015, according to the QS World University Rankings, which are recognized as the most reliable, almost a fifth of the world's elite universities are located in Greater East Asia. The list of 500 best universities includes 31 universities from China (including 6 Hong Kong), 15 from Japan, 13 from South Korea, 11 from Taiwan, 9 from India, 5 from Malaysia, 2 in each Indonesia, Singapore, and Thailand, 1 each from Pakistan and the Philippines. The higher education system of the Asian powers has achieved enormous success in terms of quantitative indicators [51].

At the same time, experts believe that radical education reforms occurred not so much under the influence of exogenous forces (world processes of globalization), but rather at the regional level [41].

Principle scheme of ASEAN regional education cooperation is presented on Figure 1 below.

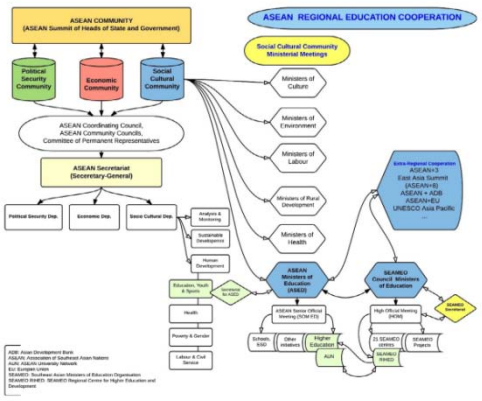

Figure 1. ASEAN regional education cooperation [10]

Although the region underwent processes of decentralization in the field of education, and universities became much more flexible and autonomous (a very high degree of their autonomy is recognized in Singapore and Japan, high in China and Taiwan), the state largely retained its control functions. In particular, in the PRC the state and especially the Ministry of Education remain the main determining factor in the education system. At the same time, at the local level, the autonomy of educational institutions can be very high (for example, Shanghai is the only large city in East Asia where parents have the right to hire and fire teachers) [8; 9].

International regional cooperation especially contributes to the formation of a cluster of people interested in the development of their own country in the international context. The university in the countries of Greater East Asia is gradually taking on the function of building up human and social capital (human capital implies the training of international-level professionals, and social capital means the creation, with the help of a university center, of such a social organization of society that is capable of "strengthening the effectiveness of coordinated actions carried out by society") [51].

It should be especially noted that in the countries of Greater East Asia, the effectiveness of interaction between higher education and other scientific institutions of a given society is growing, society is increasingly using new scientific knowledge generated in universities, and authorities have the opportunity to rely on universities in the development and implementation of public policy [42; 43]. A developing society is capable of ensuring the stable development of higher education with a clear understanding of national interests and the manifestation of the will of the ruling elite. The example of China, South Korea, India, and other countries of Greater East Asia shows that a developing society is capable of ensuring the stable development of science with a clear understanding of national interests and the will of the ruling elite.

Singapore has been consistently implementing the Intelligent Island program since 1992, accompanied by investments in educational institutions that meet high international standards. In accordance with the recommendations of the World Bank in the field of HE, Singapore is implementing measures to partially privatize universities, attract domestic investment in HE, develop competition and cooperation between the state and the private sector in the field of HE. The government's "Intelligent Nation" strategy involves the implementation of Singapore's competitive advantage, which consists in the presence of a highly educated population in the country (more than 85% of secondary school graduates continue their studies at universities). As part of this strategy, based on the system of mass education, the "smart city" program, programs for teaching new skills and promoting innovation in creative industries are being implemented with the goal of creating a "national innovation system".

In addition, the city-state is planned to be turned into an educational hub - the so-called "Boston of the East". Students from all over the EA and SEA regions enroll in Singapore universities. Leading universities in the region organize joint educational and research programs with Singapore universities, and also open branches of their campuses. The Singapore government pays foreign specialists working in the Singapore HE system a guaranteed honorarium [19].

Hong Kong is betting on creating an educational hub of regional significance with the prospect of turning it over time into an international hub. Hong Kong attracts students from Southern China, Singapore, and Japan. The strategy to expand the presence of Hong Kong educational institutions in the region is being implemented through the opening of research centers and branches of Hong Kong universities in mainland China, in particular in Shenzhen, an industrial center located near the border with Hong Kong.

Recently, authorities in mainland China and Hong Kong have been taking steps to integrate the Pearl River Delta manufacturing hub and Hong Kong, as well as to liberalize trade in the integrated region. These processes open up broad opportunities for the development of HE in Hong Kong, namely: for the development of applied research based on industrial enterprises in China; access to new sources of financing; creating educational and advanced training programs for citizens of mainland China; organizing internships in China for Hong Kong students; development of joint academic programs with Chinese universities. The Pearl River Delta Business Council's 2010 report provided recommendations for transforming the hub into a model area for integrated education reform, using Hong Kong specialists' expertise in institutional development, education workforce development, and formation of standards of educational disciplines. This regional initiative will allow Hong Kong, on the one hand, to "export" its educational services, and on the other, to influence the socio-economic development of Southern China [29, p. 84].

Malaysia is implementing HE policies with the aim of transitioning from an economy driven by commodity exports, low labor costs and labor-intensive industries to a knowledge economy. First, the Malaysian government increased the level of investment in mass education, vocational training and workforce retraining. Recently, measures have been taken to improve the skills of workers, promote and popularize HE and develop innovation. Back in 2007, the Ministry of Higher Education was established, whose main task was to develop and implement a long-term plan to strengthen the link between HE and economic development, as well as measures to liberalize, privatize, and develop private educational institutions in order to improve the effectiveness of HE. In addition, the most important task of the Ministry of Higher Education was the expansion of the higher education system. As a result of the policy, from 2005 to 2012 the number of Malaysian students increased by 54%. The share of secondary school graduates who continued their education was 44.12% in 2016 [50, p. 21].

The Ministry of Higher Education back in 2011 formulated a number of development priorities at the regional level: the construction of regional research centers, the creation of regional research programs, cooperation with regional associations in the field of education. Malaysia actively attracts students and holds educational fairs in poor countries in the region - Cambodia, Laos, Myanmar, and Vietnam.

In addition, since 2009, the country has been participating in the implementation of a student mobility program together with Indonesia and Thailand, one of the goals of which is the harmonization of HE in Southeast Asia [29, p. 73].

Research also shows a clear regional trend of expanding and deepening cooperation between business and universities, which contributes to the development of innovative and new creative industries, especially in South Korea and Singapore [9, p. 19].

The countries of East Asia and Southeast Asia are making serious attempts to increase their competitiveness by strengthening regional cooperation, in particular, by creating regional educational hubs and using education as a new industry driver of economic growth. It is important to note the decisive role of consistent government policy in the implementation of educational hub projects in Singapore, Malaysia, and Hong Kong. The governments of Singapore and Hong Kong initially saw the creation of the hub as a means of "soft power" to promote their regional leadership. Subsequently, educational hubs allowed them to capitalize on their achievements in the field of HE and their favorable geographical location [39, p. 9].

Most countries in the region will achieve middle-income status in the near future and will face new challenges. Focus on the development of knowledge-intensive industries and, accordingly, national education systems helps create conditions for sustainable and long-term economic growth [47-49]. The development of educational hubs, as a result of which the infrastructure of the territories involved in the relevant projects is created and improved, knowledge transfer networks are formed and cluster effects arise, helps strengthen the competitive advantages of the region and its position as a new world economic center.

Regarding European regional educational systems, it should be noted that education is one of those areas of life in the countries of the European Union that are not subject to complete unification. No one is imposing a certain model of education on anyone, and each member country of the European Community is given the right to form its own educational and examination systems in accordance with national needs and historical educational traditions. At the same time, the openness of the EU countries provides young Europeans with the opportunity to obtain higher education in any country of the European community [53; 54]. The unified requirements imposed by universities on applicants from any country have led to the fact that each state itself strives to bring its education system in line with common European requirements and take its rightful place in the integrating European educational space.

Among the organizers of European education, there is an understanding of the many problems and difficulties that accompany the convergence of education in individual European countries, which differ both in the level of socio-economic development and pedagogical traditions [55]. Experts are aware of the fact that the formation of the main directions of educational policy in the EU countries is carried out in conditions of the predominance of global processes that generate persistent contradictions between the global and local, universal and individual, traditions and modernity, long-term and immediate tasks, competition and equality of opportunity, unlimited expansion of knowledge and limited person's ability to assimilate them, as well as between spiritual and material [45].

Education in the EU is perceived as a key element influencing the success of genuine European integration. The approval by the EU countries of uniform rules required the updating and unification of a number of legal acts regulating the education process in European countries, in particular, laws on education systems, laws on higher vocational schools, laws on the principles of recognition of professional qualifications acquired in EU countries, etc. Reforms of education systems in European countries have become an important aspect of the social policy of these states, manifested in the formation of a single European identity [56-58]. A key function in this process, in the absence of social cohesion in European societies, is to be performed by the integration of educational systems, based on educational dialogue and international mobility, implementing open education strategies based on multilingualism and multiculturalism.

The observed development of integration processes in European education gives grounds to judge the trend towards its complete Europeanization. In the absence of direct influence of the EU leadership on the formation of the educational systems of the Commonwealth countries, the European Union, through regulations, indirectly influences the formation of a unified educational policy of states, regulated by the relevant articles of the constituent documents of the EU.

Currently, the educational systems of the European countries of the Union are being restructured on the basis of the European model of education, which aims to prepare young people for the effective implementation of the ideals and objectives of integration [61; 62]. This model is based on four fundamental principles formulated in the report prepared for UNESCO by the independent International Commission on Education for the 21st Century, headed by former President of the European Commission J. Delors, "Education: The Treasure Within": learning to know; learn to do; learn to coexist and learn to live.

European education, implemented on the basis of these principles, is considered from the position of equipping the younger generation with knowledge about Europe, taking into account global and local politics; training in Europe, which involves the formation of attitudes and skills necessary for young Europeans, familiarization with European reality, ensuring the acquisition of international experience, and training for Europe, including preparing young people for constant contacts and joint work with representatives of other European countries. According to the Commission, the implementation of the stated principles will contribute to the demand for all individual's talents [46].

At the same time, the EU policy within the framework of European educational integration does not find full support in the scientific and public environment of Western European countries. Despite the positive attitude of the majority of European politicians and researchers towards the idea of creating integrated educational systems, an interconnected and open European educational space that determines the future of Europe and its citizens, opponents of this process believe that it leads to a decrease in the level of education and its subordination to market priorities [33].

Meanwhile, international integration in education is the result of the development and deepening of the process of internationalization and bringing it to the level of integration of national educational systems. Integration is characterized by increasing mutual convergence, complementarity and interdependence of national education systems due to a coordinated international educational policy, a growing degree of their "cohesion", synchronization of actions through their regulation by relevant supranational institutions, the gradual outgrowing of national educational systems of their state framework and the emergence of tendencies towards the formation of a single educational space as the most effective form of implementing tasks.

Of course, any definitions of integration are not universal, since they do not take into account the entire complex of elements involved in it. However, integration itself is also relative, because it is a process of unification, but not yet unification itself [64; 65]. And nowhere in the world has complete unification occurred in any area yet. At the same time, a certain degree of development and constant improvement of integration processes is a necessary condition for social progress.

Integration processes in the field of education begin to develop if at least three necessary conditions are present: a solid economic foundation in a certain group of countries, an established rule of law that guarantees the binding nature of relevant international treaties, and democratic decision-making based on the principles of compromise and consensus.

In general, integration processes lead to a shift in emphasis towards non-traditional actors, who are increasingly shaping international educational policy, without, however, displacing the state as the main participant in the international communication. In education, which is part of the global socio-economic complex, these general trends of qualitative transformations in the internationalization process are, of course, in full effect [66]. Regionalization of education, simultaneously

with the inclusion of the educational system in existing and developing innovation clusters, leads to very positive results. Lysenko et al. (2020) [34], researching higher education space in EU, studied the relationship between the cluster development and the higher education development. They identified indicators of the effectiveness of regional innovation clusters and evaluated the impact of these indicators on the higher education system. Data analysis shows that, generally, with the increasing indicators of the cluster development, the value of the higher education development demonstrates similar dynamics (see Figure 2 below).

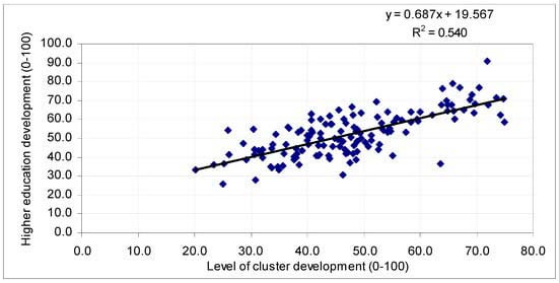

Figure 2. The relationship between the cluster development and the higher education development [34]

In our opinion, at present, in global education it is possible to distinguish integration associations of several types and levels of maturity:

1) Integration associations of educational systems of various groups of countries (some Arab states, European Mediterranean countries, etc.), aimed at harmonizing individual elements of educational policy, in particular mutual adjustment and recognition of training courses, recognition of diplomas from educational institutions of various levels and scientists degrees, expanding academic mobility. As a rule, such measures are regulated by relevant conventions and are a certain stage on the path to closer regional or subregional integration in education;

2) Integration associations based on the historical and cultural commonality of individual countries, on the similarity of the goals and objectives of educational policy at certain stages of development. The main forms of activity of such associations are the development of general standards for the quality of training of specialists, measures to prevent their mass outflow outside the regions. At their core, these measures are protectionist in nature and are aimed at protecting national educational systems from powerful external pressure. Typical representatives are associations of Latin American countries: “Andean Group”, “Contadora Group”, etc.;

3) Integration associations of the new industrial states of Southeast Asia, which aim to radically improve the quality of education through the fullest use of the internal potential of national educational systems, the latest technologies, and the experience of other countries, including by massively sending young people to study abroad. A typical feature of such associations is the desire to develop interstate cooperation primarily on the “upper floors” of education and science, where the main resource of the post-industrial era – knowledge - is most efficiently and efficiently produced;

4) Integration associations of the highest type, which set as their goal the formation and implementation of a unified educational policy at all levels of education, regulation of this process with the help of relevant supranational bodies. In associations of this type, education (as well as culture) is assigned the role of a central (cementing) link in the entire integration chain. Some of the operational functions for managing education in the states that form such associations are transferred from the national to the supranational level. The state, to a greater extent, assumes the functions of a guarantor of social justice in the sense of access to education and its appropriate quality. The only example so far of such a level of integration associations is the European Union. Both in terms of the economic and social spheres, the European Union is a project that does not yet have analogues in other parts of the world. It can be considered as a model of international integration, “...the distinctive feature of which is the conscious refusal of the participating countries from part of national sovereignty in favor of supranational regulation” [1, p. 74]. In almost each of the listed types of integration associations, the determining role of the “motor” of globalization - transnational corporations - is increasingly visible.

Like in other areas, integration in education is developing in two main and, at first glance, contradictory directions - regional and global. Regional integration in education grows out of the general process of its internationalization. This is happening under the influence of two trends: on the one hand, the continuously growing need for the convergence of educational systems of different levels of development in different parts of the world, on the other, clearly expressed narrow regional needs associated with increased competition in the global market of educational services. However, in our opinion, this contradiction is objective in nature and is a necessary stage of integration, the further development of which, most likely, will take place under the increasingly decisive influence of the line on the globalization of education.

Unlike the previous period of internationalization of education, where the predominant forms of cooperation were unilateral agreements, the stage of integration is characterized by multilateral interstate agreements, large targeted and comprehensive international educational projects and programs implemented under the auspices of the UN, well-known international foundations created with the participation of transnational corporations, and non-governmental organizations, as well as legislative acts of relevant supranational institutions (for example, regulations and directives of the Council of Ministers of the European Union), that are binding for all countries participating in the integration process.

Integration in education, in contrast to internationalization, is characterized by the stability of connections between national educational systems, certain possibilities for planning and regulating these connections with the help of a specially created institutional and legal environment. At the same time, the inextricability of connections is guaranteed by the fact that emerging phenomena of disintegration in the emerging educational space encounter created political, sociocultural, legal and economic barriers that prevent movement back.

In direct connection with this feature is another distinctive feature of integration in education - the need for its proactive nature. Different spheres of social reproduction have different “propensities” for integration and dissimilar dynamics of these processes. Let us assume that the monetary sphere is superior in this regard to commodity trade, and that, in turn, is more prone to integration than the production sphere. It seems to us that, in contrast to the previous period of international cooperation, characterized by the fact that the internationalization of education followed the internationalization of the economy, in modern conditions, when knowledge acts as a decisive resource, when the process of its accumulation becomes continuous, cooperation in the field of education in its pace should be ahead of the development of this process. Interstate cooperation in education should precede subsequent effective mobility and the necessary quality of professional services and specialists both at the regional and global levels. In a certain sense, integration processes in global education should acquire a pioneering character, and their results should act as a kind of common “substrate” for international cooperation in other areas. Ensuring the advanced nature of integration processes in world education is facilitated by the rapid development of modern means of telecommunications and the latest technologies based on them, which make it possible to a certain extent to “level out” the existing sharp differences in the qualitative state of individual parts of the world educational space and, as it were, to “step over” the accumulated in some of them material and personnel problems.

The formation of an education integration strategy should be based on the principles of humanism, democracy, regionalization, variability and freedom, and not a technocratic interpretation of the interests of the state, a pragmatic attitude towards education and people as a means of solving some political, economic, state and similar problems. Regional integration of education is an effective mechanism for the implementation of these principles, the transition from their declaration to practical implementation.

The real integration of education and the preservation of a single educational space are largely ensured by electronic governance mechanisms.

In this context, the following areas of digital transformation of the education sector can be identified, which are emphasized by public administration [59]:

- Development of material infrastructure. This includes the use of data centers, as well as the emergence of new communication channels for the use of digital educational materials
- Development of online learning and teaching
- Improving the professional skills of teachers in the field of digital technologies
- Development of a student identification system. At this point in time, all information about the student is stored in specialized databases.

The implementation of an electronic (digital) mechanism for managing the education system at the national and regional levels based on improving the sources of information in demand in the management process involves the introduction of a unified national and regional database of open sources of information in demand in the management of the education system, which allows making informed and thoughtful decisions.

At the same time, the essence of the principle of integration mobility is to deepen the relationships between all elements of the management process to increase the sustainability and efficiency of the educational program (in a broader sense, the quality of education) in various situations, regimes, conditions, which allows taking into account the unevenness of the social, economic, and political landscape in the countries participating in the regional educational system.

The next important thing for designing the concept of digital quality management of higher education is compliance with the principle of variability in management strategies and technologies. Variability is one of the main ways to humanize not only the content, but also the learning process itself; it manifests itself in various methods and forms of education, types of educational institutions, and varieties of training courses. The principle ensures the interconnected activities of participants in the management process, carried out in conditions of choice of content, means and methods of activity and communication, value-semantic communication. The core of the implementation of the principle is the free establishment of the main positions and requirements for an educational program or process, which makes it possible to determine the strategy and technology for the implementation of these requirements by all participants in the management process. The selected principle provides [11]:

- Assessment and accounting of the state in which the control system is located, and determination of the influence of environmental factors and their changes on it;
- Timely determination of the need to make changes to the current strategy, taking into account the analysis of changes in the external environment and the capabilities of the educational institution;
- Identification of the strengths and weaknesses of an educational institution in each specific case (material and technical equipment, human resources, etc.), which are necessary to achieve high quality education.
- One of the directions of the participatory-synergetic approach is compliance with the principle of instrumental flexibility. The prerequisites for this principle are the features of the organization's flexible management system, among which experts note [24]:
- Interdependence of the management process at all stages of achieving both strategic and operational goals. At the same time, the management process cannot be a broken process;
- Parallelism of various stages of management, their merging into a single system.

Valuable for our research is that the content of the concept of "organizational flexibility" is associated with changes in management functions that ensure synchronization of relations between elements of the internal and external environment. Managerial flexibility in this context is presented in the form of an integrated system of motives for an innovative management model, ensuring a rapid change of action strategies, as well as the constant search, restructuring, and implementation of new management technologies. The principle ensures a quick response of the management system to changes occurring in the internal "production" and "institutional" external environment within the capabilities of the subjects of management. This principle reflects the objective processes of integration of education, production, science, as well as trends towards diversity in all social spheres.

Today, the principle of openness is traditional for any development in the field of education. This is a view and a type of reasoning in which not only social institutions (kindergarten, school, university, etc.) have educational functions, but also each element of the social and cultural environment can have a certain educational effect [46]. The implementation of the principle of openness is considered in two aspects that are significant for our research. The first is embodied in granting independence to educational institutions, the ability for them to determine the main characteristics of the educational process, in particular methods and technologies, the structure of human resources, sources of funding, student populations, and more. The second aspect is related to the changing role of participants in the management process in an open environment. The principle of openness ensures [59]:

- Significant increase in awareness of representatives of management subjects;
- Understanding the quality of education as a result orientation;
- Changing the composition of actors in the development of the educational program and implementation of the educational process;
- Recognition of self-realization as the driving force of effective education;
- Providing choice to participants in the educational process and creating a "culture" of choice and co-organization of various educational offers into own educational program;
- A high level of transparency of control, monitoring and rating of all types of "products" of the educational process.

In particular, in the EU, public consultations have identified the need for more targeted EU action to support the introduction of innovative approaches and digital technologies in education, including management in educational systems. The action plan focuses on implementation and the need to stimulate, support, and expand the purposeful use of digital and innovative educational practices [52]. It is intended that the plan will draw on a wide range of education and training stakeholders, including business, research, NGOs, and non-formal education where appropriate. For each priority, the action plan includes measures to help EU Member States address these challenges. This is also an important element in the creation and implementation of electronic governance mechanisms for the regional educational system. New expert- and practitioner-led training workshops for both policymakers and educators, including the European Associations platform, can further strengthen connectivity by developing specific content in multiple languages and using key EU platforms such as the School Education Gateway and Teacher Academy. Blended mobility will be further promoted with new opportunities in

Erasmus+ to support both online and face-to-face learning and increase the mobility of students from different countries [52].

User-centered innovation is a key factor for early adoption of innovative solutions in education. Materials in the field of education are generally collected from the top down under the guidance of international organizations and governments. The user's point of view is often not sufficiently taken into account, which can limit or distort possible solutions. In this context, the commission will explore ways to promote citizen engagement and user-centered innovation through the annual EU-wide Education Hackathon to develop innovative solutions to key challenges in education and training. Among the most interesting initiatives, there are the following [46]:

- Eurydice - a network for technical support and promotion of European cooperation in the field of education. All countries participating in the Erasmus+ program can receive information from the network on how to improve the quality of the education system in Europe. Educators, schools, and institutions have the opportunity to obtain descriptions of national education systems, comparative studies, indicators and statistics, as well as detailed information on practical working conditions, such as school calendars and even salary comparisons;
- eTwinning - a platform for school staff to find potential partners in other schools throughout the EU. Partnerships can consist of simple communication or joint creation and launch of educational projects. The eTwinning initiative is a real learning community created through the Erasmus+ program, which provides direct contact between European teachers to develop potential projects in their educational institutions.

Moreover, a strategic tool is the creation and launch of pilot projects on artificial intelligence and learning analytics in education. The basis for these projects is the optimal use of the vast amount of available data. These data actualize specific problems of digitalization of education based on the implementation and monitoring of educational policy and contribute to the development of appropriate tools [52].

Modern data mining technologies make it possible to create new knowledge by identifying hidden patterns, predicting the future state of systems, and therefore allowing predicting the effectiveness of making a particular management decision. Impacts on educational systems are subject to various types of uncertainties. The main reason for this is the fundamental delay in the information collected in the field of education management during monitoring, errors in statistical reviews, inaccurate answers from consumers of educational information during expert surveys, etc. The introduction of artificial intelligence and machine learning technologies can solve the above problems, as well as optimize the balance of interests of all stakeholders, particularly within the Triple Helix.

When describing the activities of the state as an "electronic" object of management, the so-called "models of activity" are considered as the basis, displayed in the form of "architectures of activity", and the management of activity itself is considered as the implementation of certain development strategies (reflecting management tasks - Why and With What Aim should we manage?), carried out through the establishment of organizational management structures (Who manages?), management objects (What does it manage?) and targeted influence on them with the definition of directions (Where to manage?), management methods (How to manage?) and within a given time frame (When to manage ?) [17].

On the other hand, when analyzing educational activities as a controlled process, significant analogies can be established. They most clearly follow from the consideration of the problems of modern education [59]. Thus, when managing territorial educational systems, it is also necessary to create models for the development of relevant processes, determine an effective organizational management structure, develop rational ways to manage various aspects of educational activities, etc. Essentially, in the base of the concepts of designing information analytical systems that provide organizational support and information support for the management of educational processes, lie the organizational-managerial management mechanisms that are materially implemented at the objects of management of educational activities. The essence of the functioning of such mechanisms consists in targeted actions to manage various aspects of educational activities according to given regulations (cyclograms). Thus, the development of a scientific and methodological approach to describing the processes of managing educational activities can and should be carried out using the methodology for constructing the architecture of the electronic state.

In accordance with theoretical recommendations for the development of the main elements of "electronic governments" and the problems of education management, the resulting needs for education management and the capabilities of the educational system in terms of using education management methods can be systematized in the form of a matrix, which should reflect the following aspects [59]:

- Reasons for the relevance of education management, where it is necessary to formulate goals, results, and criteria for assessing management work in the field of education.
- Management objects, where elements of education system should be described as management objects and their relationships, including the external environment.
- The subject of management activity, which considers the content of educational processes in the education system as a subject of management, classification of educational processes, description of flows of educational information, data on educational processes and their effectiveness.
- Methodology for constructing a system for managing educational processes, which examines the requirements for the elements and subsystems of the educational management system and its infrastructure.
- Methods for implementing management of educational systems, which highlight methods for issuing control actions, establishing feedback, making decisions to adjust management, etc.
- Temporary factors for the implementation of management activities, where plans for the implementation of all processes over time are justified.

Consideration of activities in the context of these issues allows to generally cover the main issues on which the preparation of conscious positions is required in the interests of identifying the essence of activities in managing educational processes. This involves the construction of multidimensional dynamic matrices of needs - they can be easily constructed for each of the four levels of education management (regional, national, municipal, and educational institution level).

It is obvious that in real educational environments there is a convergence of linear and nonlinear control processes. Therefore, it is important to highlight four main properties that characterize the management functions of information environments in the electronic management of regional educational systems: stability, controllability, individuality, and self-organization.

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Primary Paper Section: A

Secondary Paper Section: AE, AM