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Ergo Design of Mentoring in the National Ecosystem of Vocational Education in The Period of the 10th Technological Order

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ABSTRACT

The target of this study is to introduce ergo design for mentoring in the ecosystem of vocational education in the period of the 10th technological order. The purpose of the article is to improve the quality of vocational education in the conditions of the 10th technological order. To achieve these goals, the following tasks are solved. The evolution of vocational education technologies in the process of changing technological orders is investigated. The concept and essence of the ergo design of mentoring as an element of the national ecosystem of vocational education are clarified. Mentoring technologies in postgraduate additional vocational education in the conditions of the 10th technological order is investigated. Methodological provisions of mentoring in postgraduate additional vocational education in the conditions of the 10th technological order is developed.

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1. INTRODUCTION

The relevance of this article is related to the need to improve the efficiency of the ecosystem of vocational education. This can be achieved by improving the quality of postgraduate additional education. In turn, the quality of education can be improved by ergo designing the entire ecosystem of vocational education and mentoring. At the same time, it should be borne in mind that in the post-industrial economy, science and education are considered the main factors of its development (Laures *et al*., 2016). They believe that science and education provide up to 80% of economic growth. Therefore, improving the quality of education leads to an increase in the pace of economic development (Mahmood & Alkahtani, 2018; Ozturk, 2008).

Additionally, it should be taken into account that the formation of the 10th technological order generates the need for changes in the activities of universities and organizations in the real sector of the economy. Insufficient development and training of the personnel of the organization of the real sector of the economy are included in the list of the main reasons for the disruption of the process of changes in the organization (company) (. This increases the relevance of the ecgonidine of additional professional education to ensure the competitiveness of organizations of the national economy in a new technological order.

The hypothesis of the article is the assumption that an increase in the efficiency of the ecosystem of vocational education can be provided in postgraduate additional education through the development of the fergo design of post-industrial mentoring. The purpose of the article is to improve the quality of vocational education in the conditions of the 10th technological order.

To achieve these goals, the following tasks are solved in this article:

(i) the evolution of vocational education technologies in the process of changing technological patterns is investigated.
(ii) the concept and essence of ergo design mentoring as an element of the national ecosystem of vocational education are explained.
(iii) mentoring technologies in modern conditions are considered.
(iv) methodological provisions of mentoring in postgraduate additional professional education in the period of the 10th technological order is being developed.

2. METHOD

The object of the article is the ecosystem of vocational education in the conditions of the 10th technological order. The subject of the article is ergo design in mentoring and in the ecosystem of vocational education during the 10th technological order. The research of scientific developments on the topic of this article revealed such scientific and practical results in this area.

3. RESULTS AND DISCUSSION

Mentoring is considered a methodology that allows for improving the quality of higher education (Romanov & Egorova, 2021; Thomas, 2012). In post-industrial conditions, there is the digitalization of mentors' activities (Smyslova *et al*., 2020). The network method and self-management in mentoring are being introduced. Analysts investigate the role of mentoring in modern vocational education. Managers believe that it is important to apply the experience of mentoring in working with employees of the organization. Mentoring includes supporting the activities of university graduates (Pozdeeva, 2017). Mentoring is used not only in

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developing countries but also in developed countries. There is a growing interest in mentoring in various fields of activity (Ilakavicius, 2021). Mentoring is a structural element of practically oriented education (Savchenko, 2021). Researchers draw attention to the fact that mentoring can have the effect of accelerated adaptation of employees (Loseva, 2022). Experts recognize the expediency of introducing mentoring into the municipal management system. Researchers believe that it is necessary to create new mentoring tools.

Analysts believe that mentoring is important in the process of students' research work at the university. Scientists are investigating the patterns of development of the industry mentoring system. To assess the effectiveness of mentoring, a competence model is proposed. One of the directions of professional education development in post-industrial conditions may be the methodology of lean vocational education (Glushchenko & Glushchenko, 2018). Another trend of post-industrial education can be considered as an increase in the level of client-oriented postgraduate education. An important direction for improving the quality of vocational education may be the transition to a product model in this type of education (Glushchenko, 2019).

The use of the concept of individualization of scientific and pedagogical activity of universities can contribute to improving the quality of vocational education. In the 21st century, the pace of the emergence of new professions is growing, about 500 professions appear annually. In the period of the 10th technological order, the role of the project approach (project model) in the activities of organizations increased (Glushchenko, 2022a). At the same time, the influence of the mechanism for managing the activities of project teams is increasing (Glushchenko, 2022b).

The complication of the external and internal environment of organizations leads to an increase in the influence of implicit knowledge in vocational education. At the same time, additional vocational education should be considered one of the elements of the service sector. At the same time, mentoring can help students synthesize new ideas in their activities, including the method of joint generation of new ideas (Glushchenko, 2021a). Mentoring is one of the elements of lean manufacturing and, in particular, the production of educational services (Glushchenko *et al*., 2021a). For the transition of an organization to a new technological structure, it is necessary to develop such an enterprise strategy (Glushchenko, 2021b). Mentoring in the field of development can be an element of such a strategic plan for the company's transition to a new technological order. All this suggests that the role of mentoring in vocational education will increase.

As a result of the research of publications on the topic of this article, we can assume that the relevance of the topic of this article is high. Mentoring as a teaching method has a rather long history. Historical analysis shows that before the advent of universities in the 9th century, mentoring was the main form of education. As you know, universities appeared in the period of the 5th technological order (9th century -1770).

The analysis shows that in the period of the 8th technological order (1930-1970) mentoring was used most widely. This is probably due to the intensive development of automated production. In these conditions, mentoring was associated with the need for rapid practical development of new equipment models. In the period 1975-2020, interest in mentoring declined and was low. However, in 2022, experts are talking about a "mentoring renaissance." This is probably due to the increased complexity of production systems. This complication of production systems leads to the need for individualization in innovation, science, and education.

At the same time, the essence and methodology of mentoring can be considered controversial issues in modern additional professional education. Mentoring will be called a

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way of transferring professional knowledge, skills, abilities, and professional culture to a student from a mentor. A mentor is an experienced specialist who, according to the administration of the organization, has sufficient professional competencies and organizational culture. Mentoring methods are training. education. consultations. moral and psychological support in professional socialization and growing up. assistance and much more.

In 2022, the 9th technological order is being formed. In 2022, there is no universally recognized classification of technological orders. Most often, the new technological order is called the sixth. However, this classification covers only the period of capitalist development. Later, an analysis of the period of pre-capitalist development showed that three more pre-capitalist technological orders could be distinguished. The first (1st) technological order is connected with the invention of the sail. Presumably, the sail was invented by the Egyptians. The sail was the first propulsion system using wind power. Therefore, such a technological order can be called a "sail". This lasted from 5500 BC to 2000 BC. The vocational education of children and adults during this period was carried out in the family or by teaching children to a mentor who owns a certain profession.

The next, 2nd technological order was based on the use of horse-drawn traction as an engine. Such a technological order can be called "horse-drawn traction". This technological order existed from 2000 BC to 400 BC. Basic and additional vocational education was provided through mentoring. The third technological order was based on the use of pack transport and the invention of the saddle. This technological order can be called "pack transport". This technological order existed from 400 BC to the 9th century AD. Basic and additional vocational education was provided through mentoring. The fourth technological order is based on the use of water and windmills. That's why it's called a "windmill." This technological structure covers the period from the 9th century to 1770. Universities are developing during this period. The fifth technological order included a period from 1770 to 1830. This technological order is associated with the invention of textile machines and the development of machine weaving production. Universities are developing during this period. The sixth technological order lasted from 1830 to 1880. This is due to the advent of the steam engine. This made it possible to develop mechanized metal processing, to create railway transport. Universities are developing during this period.

The 7th technological order occurred in the period from 1880 to 1930. This technological order characterizes the creation of two types of engines: an internal combustion engine. an electric motor. Such engines made it possible to create automobile and aviation transport. In the period from the third to the seventh (7th) technological order, vocational education was carried out at universities, engineering, and vocational schools. At this time, technical institutes are developing most intensively. The system of vocational education has three hierarchical levels: higher. secondary. proper vocational education (working professions). The subject form of vocational education was the main one at all hierarchical levels.

The eighth technological order lasted from 1930 to 1970. During this period, the following was created: a nuclear reactor. electronic computers. automation tools. The main forms of vocational education have become branch technical institutes and institutions of secondary vocational education. vocational schools for obtaining working professions. During this period, the level of automation of means of production is growing. Therefore, there is a growing interest in mentoring as a method of personnel adaptation in the organization, and a method of professional additional education. This is the period of the widest development of mentoring in the real sector of the economy.

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The ninth technological order included a time interval from 1970 to 2010. This period is characterized by the development of microelectronics and microprocessors. During this period appeared: cell phones. bank cards. ATMs and much more. In the period of such a technological structure, distance education is developing. The role of mentoring is declining.

The 10th technological order, according to forecasts, will remain from 2010 to 2040. This technological lifestyle will be characterized by the development and implementation in the practice of neurotechnologies, nanotechnologies, and information technologies. digitalization technologies. resource-saving technologies. environmentally friendly technologies. Vocational education in the period of this technological structure is characterized by the introduction of distance education (Berezovska *et al*., 2020). project form of vocational education (Glushchenko, 2022a). Methodology of lean production in education (Glushchenko *et al*., 2021b). Customization of scientific and educational activities of organizations. increasing customer orientation in education and others. During this period, vocational education becomes continuous. During the transition to a new technological order, not only production technologies change, but also other elements of the external and internal environment of the organization. In the process of forming a new technological order, the following are changing: the world order. forms of public administration. forms of doing business. methods of professional education. methods of scientific research. methods of personnel management (Glushchenko, 2021c). Studies of the shape of the future of the 10th technological order in the field of science and education allow us to talk about the following.

The new technological order will be characterized by: innovations that will become almost permanent. innovations will be post-industrial. acceleration of the process of formation of new professions. individualization of scientific and educational activities. development of the project form of activity of real organizations and in higher education. increasing the importance of implicit knowledge.

It is not just knowledge that will play an increasingly important role in achieving professional success and synergy in activities. The post-industrial nature of innovations means that the starting point of such innovations is: the use of scientific and technological achievements as the basis of innovation. the creation of new needs of people. the active use of methods of influencing human consciousness (neurotechnology, etc.) and much more. Increasing the role of mentoring in the 10th technological order may be influenced by the fact that personnel development management systems will be implemented in organizations. Part of such a system of social development of personnel is the construction of an individual professional career for employees. To carry out such an individual career, an employee may need mentoring in various fields of activity.

It is predicted that an increase in the pace of scientific and technological progress will lead to the fact that to maintain the competitiveness of organizations, it is necessary to constantly introduce innovations. The main organizational form of innovation will be innovative projects. This will increase the role of the project approach in the activities of organizations. The acceleration of scientific and technological progress leads to the intensification of the process of formation of new professions. At the same time, the importance of additional education and mentoring is increasing. The essence of any scientific category is revealed through its functions and roles. Let's describe the functions and roles of mentoring in the period after a person receives a university education. Mentoring functions in additional professional education can be recognized as:

(i) customization in the professional activities of campaign employees.
(ii) adaptation of the labour force to changes in the structure of the labour market.

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(iii) professional elevator for specialists as a result of increasing the competence of the employee.
(iv) transfer of practical skills and implicit knowledge in personal communications of the mentor and the trainee.
(v) creating conditions for the introduction of lean production methodology into the organization's activities.
(vi) adaptation of the general competence of the organization's employees to changes in the requirements of the competition and the market.
(vii) formation of professional values and organizational culture of the company.

The role of mentoring in additional professional education can be called: improving the efficiency of using the organization's human resources. accelerating the adaptation of the organization's personnel. increasing the competitiveness of the organization. At the same time, mentoring can be considered an important element of the professional education ecosystem. The ecosystem in higher professional education will be a comprehensive system of meeting the educational needs of the economy and society by forming the necessary variety of educational products that meet the needs of stakeholders in this system. Stakeholders of the professional education ecosystem can be considered: government agencies, business circles, mentors themselves, and trainees.

The professional education ecosystem must meet the following requirements: sufficient diversity of professional education segments, safety, the convenience of participants in the educational process, provision of comprehensive services to members of society and economic entities, integration of science-practice-education, improving the efficiency of the use of assets of universities and educational organizations, as well as minimizing damage to students' health and the environment. A harmonious system of relations between stakeholders, taking into account possible inconsistencies of these requirements, and much more. The national ecosystem of vocational education can be characterized by: orientation to the life cycle of certain types of technologies. close connection with the life cycle of representatives of certain professional groups. synthesis of complex educational products. integration of education, upbringing, science and practice, and many others. The ecosystem of vocational education belongs to the category of complex systems. As a complex system, the ecosystem of vocational education is characterized by the following properties: a large number of heterogeneous elements, hierarchy - the presence of several levels of hierarchy, emergence - the irreducibility of the properties of the whole to the properties of individual elements. Multifunctionality, reliability, as well as adaptation and much more. The ecosystem of vocational education has several hierarchical levels and is characterized by a complex structure.

For a better understanding of the properties of the ecosystem approach in the national system of vocational education, we conduct a comparative analysis of the subject, ecosystem and project approach in such education in **Table 1**. At the same time, additional education itself (in its subject, ecosystem, or project form) can be considered a way to increase the universality of the national education system. In addition, additional education can be considered as a mechanism for adapting the national system of higher professional education in the process of changing the external environment during the formation of the 9th technological order. It is known that the theory of lean production asserts that to implement the philosophy of lean production, an organization must become a training organization (Glushchenko & Glushchenko, 2018).

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Table 1. Comparative analysis of the subject approach, ecosystem approach, and project method in higher professional education.

No	Methodological approaches in education/Names approach factors	Subject professional education	Ecosystem approach in education	Project approach in education
1.	The basis of the methodology of education	Allocation of individual subject areas of knowledge	Analysis of lifestyle and production activities of social groups	Segmentation of project types
2.	The object of satisfaction of educational needs	Obtaining knowledge and skills in a separate subject area	The quality of the workforce of a professional or social group	A set of competencies required for the implementation of the project
3.	Educational product	A course of lectures and tasks for practical training	The paradigm of maintaining the professional competence of a social group	Implemented educational project
4.	The time horizon of the effectiveness of the educational product	It is connected with the division of knowledge into fundamental and applied	The strategic nature of the ecosystem approach	Is equal to the period of the relevance of projects of this type
5.	The object of the innovation project	Improving methods and techniques in a specific subject area	Creating a comprehensive educational product	Methodology for the implementation of a certain type of projects
6.	Attitude to competition	Competition at the level of knowledge and skills in a certain subject area	The desire to avoid competition by creating comprehensive pioneer educational products	Competition at the level of ongoing educational projects
7.	The decisive factors of the competition of educational concepts	Knowledge and skills of graduates in a specific subject area	Organizational culture and methodology of educational activity	Competence and organizational culture of the project team
8.	Impact on the educational services market	Local influence in a given subject area	The impact of the ecosystem on the educational services market and the economy as a whole	The impact of an educational product on a market segment
9.	Criteria for evaluating the effectiveness of the quality of education	Results of students' testing on the subject, the satisfaction of employers	Competitiveness of the national innovation system and the education system	Economic efficiency of ongoing innovative projects

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The ergonomic design of the ecosystem of professional higher education will be called a set of measures aimed at harmonizing the relations of the elements of this system in the interest of ensuring that this ecosystem is perceived by its stakeholders as a whole. Under the ergo design of mentoring, we will mean a system of pedagogical measures aimed at the perception of mentoring as an organic element of the system of higher professional education, harmonization of the systemic interaction of mentoring elements, harmonization of the mentor and student relationships, and harmonization of the mentoring process following the specifics of the form of education.

The individualization of scientific and educational activities during the ninth technological order finds its expression in the growth of the level of specialization of scientific and educational activities in the interests of in-depth study of the material world and/or brain activity. In the period of the 10th technological order, the main efforts will be directed to the creation and practical implementation of such types of technologies: neurotechnologies. nanotechnologies. information technologies. digitalization technologies. resource-saving technologies. environmentally friendly technologies. The high level of complexity of these technologies increases the need for mentoring as a form of additional professional education.

The development of the project approach in the activities of real organizations and higher education, as already noted, is associated with the activation of innovative activities. At the same time, innovative scientific and educational projects should be post-industrial. At the same time, the implementation of the project approach in additional professional education requires comprehensive knowledge of the field of activity from the participants of the project innovation activity. The analysis shows that the project participant must know 7 or more fields of knowledge (directly in the field of technology, investment, marketing, management, etc.). Such a comprehensive education can be carried out through additional adult education.

Sociological studies show that at the beginning of the 21st century, a person during his professional activity, due to the structural restructuring of the economy, is forced to change the scope of his activity 2-3 times. With such a change in the sphere of professional activity, additional professional education for adults is necessary.

Due to the increasing complexity of the external and internal environment of innovative projects, there is an increase in the importance of implicit knowledge in achieving professional success and synergy in activities, Implicit knowledge includes such knowledge that cannot be transmitted by verbal methods. This kind of knowledge is transmitted in the process of personal communication with the help of intonations of voice, gestures, positions, and movements of the body and others [16, p. 800]. Implicit knowledge arises, in particular, at the junctions of several subject areas and another. Implicit knowledge cannot be "digitalized". At the same time, implicit knowledge serves as a source of synergy in the project and management decisions made.

In the period of the 10th technological order, it is expected that competition between firms will move from the sphere of products to the sphere of organizational cultures. Therefore, the timely development of the organizational culture of the company becomes the most important factor in the competitiveness of the organization. New directions of development of the technological basis of organizations in the period of the 10th technological order can be called: neurotechnology's. nanotechnologies. information technologies. digitalization technologies. resource-saving technologies. environmentally friendly technologies and more.

The development of one part of these technologies will be associated with deeper penetration. Firstly, it is into the nature of the material world in the development of nanotechnology, resource-saving technologies, and environmentally friendly technologies.

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Secondly, it is into the mechanism of functioning of the human brain in the development and implementation of neurotechnology's.

This determines the specifics of the development team of such technologies from such points of view: 1) the collective competence of the project team. 2) the culture of relationships in the team of its members and between the team and the external environment of this team. In the process of development of the 10th technological order, not only teams of developers of new technologies should be formed, but also implementation teams. The implementation teams will be engaged in the introduction of new technologies into the existing technological basis of the organization, which is made up of technologies of previous technological structures. For the development of these new technologies and the process of their implementation (commercialization), certain sets of knowledge and skills (competencies), and new research techniques will be formed.

A new form of mentoring form of additional professional education can be called the network method in mentoring. Network mentoring is characterized by the following: one mentor may have several trainees. One trainee may have several mentors. mentoring programs are formed based on the complex educational needs of the trainee.

This approach in network mentoring allows you to integrate knowledge from different fields, meet the complex educational needs of trainees, and form an individual professional profile of the trained specialist. In addition, new social professional systems of relations (institutions) should be formed for the development of these technologies. Each of these institutions will be characterized by its professional and social organizational culture.

This professional and social culture in each of the specific organizations should have its specifics (Posey *et al*., 2010). This specificity is reflected in the features of professional and social values necessary for successful collaboration in a particular profession, in the features of professional behavioural stereotypes that ensure the coordinated work of project teams, and in typical ways of responding to opportunities and threats of the external environment.

The dynamism of the professional environment in the conditions of the 10th technological order requires the behavioural readiness of specialists to respond on time (in real-time processes) to the manifestations of the external and/or internal environment of professional activity. As already noted, in 2022, about 500 new professions appear annually. Universities are not keeping up with such a rapid change in the professional structure of society. Universities can conduct their educational activities only concerning large professional groups.

Therefore, the rapid growth in the number of professions leads to an increased need for the development of additional professional education for adults in general and mentoring as a method of additional professional education in particular.

The methodology of ergo design in mentoring should take into account the specifics of the form of an educational activity (Chow, 2013) (subject form, ecosystem approach, project approach) in which mentoring is used. The paradigm of ergo design in mentoring will be called the systematic unification of philosophy, ideology, culture, and politics of such an ergo design. The philosophy of ergo design in mentoring is a wise and most general view of the need to harmonize the elements of mentoring and/or types of mentoring in the system of higher professional education.

The ideology of ergo design in mentoring can be called. Firstly, the main idea of ergo design in mentoring (increasing the level of harmony of the elements of mentoring (the level of professionalism of the mentor. elements of the mentoring program. the goals of adaptation of the intern in the workplace, etc.). Secondly, the optimal distribution of powers in the process of such mentoring between the administration, mentor, and intern.

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The ergo design policy in mentoring will be called a set of mutually agreed measures that are implemented in mentoring to achieve an organic perception of mentoring by all stakeholders in this process. Such events may include a selection of a mentor with certain qualities for a particular intern, an acquaintance of a mentor with a student, mutual diagnosis of a mentor and a student, determination of mentoring goals, identification of the most relevant areas of mentoring, determination of the principles of mentor-student relationships, and much more.

The concept of ergo design in mentoring will be called a systematic view of ergo design in mentoring within a certain form of higher professional education. The ergo design of mentoring is designed to harmonize the mentoring process, taking into account the specifics of the form of higher professional education. Mentoring should harmoniously fit into the work of the ecosystem of higher professional education.

The process of increasing the level of competence of a student in the process of mentoring in additional professional education is best described by the well-known model "Leader (mentor)- follower (student)". It can be assumed that the student can reach the professional level of a mentor depending on: the level of his abilities. The degree of motivation of the student in such training. At the same time, if there is a synergy in the process of interaction between the mentor and the student, the professional level (competence) of the student being trained may exceed the professional level of his mentor.

To assess the quality of mentoring, a four-level model for evaluating the quality of mentoring services in adult supplementary education can be used. At the same time, the methodology of modelling and evaluating the quality of services will be used. A four-level mentoring quality assessment model may include the following elements. The first level of such a model for evaluating the effectiveness of mentoring reflects the main goal of mentoring: the formation of a comprehensive educational product that ensures the student's ability to carry out safe and effective professional activities in a certain field (profession) after studying with a certain mentor.

The second level of the model is mentoring in its real execution: assessment of the sufficiency of the transfer of a certain amount of professional knowledge. assessment of the sufficiency of the transfer of certain skills to the trainee. assessment of the degree of assimilation of values and elements of professional organizational culture by the trainee. assessment of the sufficiency of research skills transferred to the trainee. assessment of the effectiveness of the studied communication methods. assessment of the trainee's ability to self-realization and much more.

The third level of the model is mentoring with reinforcement: the possibility of paying for mentoring services on credit. the possibility of receiving advice on professional orientation from a mentor. the possibility for a student to receive consultations after the end of the training period in the form of mentoring, etc.

The fourth level is an assessment of the quality of mentoring (the impact of mentoring on human ecology and the development strategy of a person - a particular trainee). Human ecology here can be understood as the influence of mentoring on the professional activity, health, and mood of a person (intern). The intern's professional development strategy can be understood as the influence of a particular mentor on the vertical and/or horizontal career of a person and other people. The analysis shows that mentoring has its specifics concerning the subject of higher or additional education. Let's perform a comparative study of this specificity of subject and education and mentoring in **Table 2**.

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Table 2. Comparative analysis of the properties of mentoring in the subject, project education, and ecosystem approach in professional higher education.

No	The method of educational activity / The properties of entrepreneurship	Subject Education	Ecosystem approach in education	Project Education
1.	the composition of the competencies received from the mentor	a set of competencies within a single subject	The multifunctional complex of competencies	A set of competencies required for the implementation of the project
2.	transfer of organizational culture	assimilation of organizational culture in a specific subject area	Organizational culture of the educational ecosystem	Organizational culture of a specific educational project
3.	transfer of implicit knowledge	transfer of implicit knowledge on a specific subject	Transfer of implicit knowledge within the professional education ecosystem	Transfer of implicit knowledge within a specific project
4.	the nature of communication in mentoring	personality-oriented communication in a specific subject area	Integrated communications on the problems of the educational ecosystem	Communications within the framework of this project
5.	implementation of diagnostics of a specific trainee	Diagnostics of knowledge in this subject area	Diagnostics in many areas of the professional education ecosystem	Diagnostics of competence in solving project tasks
6.	motivation of students	individual motivation system within a specific subject	Group and individual motivation within the professional education ecosystem	Group and individual motivation within a specific project
7.	Method of quality control of education	Testing on this subject	Assessment of the competitiveness of the eco-education system	Evaluation of the effectiveness of the project
8.	model of the learning process	Model "Leader (mentor) - follower (student)"	Network mentoring: many mentors for a large number of trainees	The "Leader (mentor)- follower (student)" model in the project
9.	educating trainees by a mentor	education following the requirements of the subject area	Education within the framework of an ecosystem approach in vocational education	perception of the project values and by the mentor's example
10.	The nature of the interaction between the teacher and the student	vertical interaction	Interaction taking into account the principles of the ecosystem approach	Interaction of process subjects vertically and horizontally
11	ergo design's mission in mentoring	Harmonization of mentoring elements in subject learning	Harmonization of parts of the professional education ecosystem	Harmonization of mentoring elements in one project

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The analysis of the materials of this article shows that the mentor produces a comprehensive educational product. This product in a systematic unity includes the following elements: professional competencies (knowledge and skills). values and professional culture. research knowledge and skills. methods and tools of professional communication and more.

The presented model for evaluating the quality of mentoring can be used in such cases: assessment of the quality of mentoring. Improvement of the quality of mentoring in its elements. implementation of the ergo design of mentoring as a whole. positioning of the mentor. formation of a personal brand and image of the mentor. synthesis of the intern's brand and more. The four-level model of education quality creates an opportunity for effective application of ergo design methodology in mentoring.

At the same time, the most common integral assessment of the quality of mentoring remains the degree of satisfaction with the process and results of mentoring of all stakeholders (mentors. interns. employees. government agencies, and others).

The economic effect of improving the quality of vocational education can be assessed by assessing the change in the gross domestic product when the quality of vocational education changes (Apriana *et al*., 2019). The influence of the quality of vocational education on the economic efficiency of the organization is described in (Glushchenko, 2019).

4. CONCLUSION

The article discusses the ergo design of mentoring in the ecosystem of professional higher education in the conditions of the 10th technological order. The image of the future of science and education in the conditions of transition to a new technological order is described. The process of development of the ecosystem of professional higher education in a new technological order is considered. The main directions of ergo design in mentoring in various forms of education (subject, ecosystem approach. project approach) are defined. In the work, the factors determining the increasing role of mentoring in the ecosystem of additional professional education during the 10th technological order were studied. The article proposes a four-level model for assessing the quality of mentoring as one of the types of educational services. It is proved that this four-level model of mentoring quality can be used for the ergo design of mentoring in the 10th technological order.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

6. REFERENCES

Apriana, D., Kristiawan, M., and Wardiah, D. (2019). Headmaster's competency in preparing vocational school students for entrepreneurship. *International Journal of Scientific and Technology Research*, *8*(8), 1316-1330.

Berezovska, L. I., Kondratska, G. D., Zarytska, A. A., Volkova, K. S., and Matsevko, T. M. (2020). Introduction of new forms of education in modern higher and vocational education and training. *International Journal of Higher Education*, *9*(7), 107-118.

DOI: https://doi.org/10.17509/ijert.v2i3.50378
p- ISSN 2775-8419 e- ISSN 2775-8427

Chow, J. Y. (2013). Nonlinear learning underpinning pedagogy: Evidence, challenges, and implications. *Quest*, *65*(4), 469-484.

Glushchenko V.V. (2019). Product model of functioning of universities in higher machine-building industry education. *Kazakhstan Science Journal*, *10*(11), 37-56.

Glushchenko V.V. (2022a). Formation of a mechanism for managing the work of project teams in the conditions of the 9th technological order. *The Scientific Heritage*, *5*(84), 10- 17.

Glushchenko V.V. (2022b). The concept of project activity of organizations in the period of the 9th technological order. *The Scientific Heritage*, *4*(83), 24- 34.

Glushchenko V.V., Glushchenko I.I. (2018). Improving the quality of education based on the application of the principles of lean higher education. *Competence*, *2*(153), 24-26.

Glushchenko, V. V. (2021a). Strategic planning of organizations 'transition to the sixth technological order in the national economy. *International Journal of Engineering Science Technologies*, *5*(1), 30-46.

Glushchenko, V. V. (2021b). Synthesis of effective ideas of innovative projects during the development of the eighth technological order. *International Journal of Engineering Science Technologies*, *5*(5), 99-118.

Glushchenko, V. V., Presnuhina, I. A., and Samodelova, E. V. (2021c). Improvement of service quality in higher professional education by application of lean manufacturing theory in universities. *International Journal of Engineering Science Technologies*, *5*(1), 18-29.

Ilakavicius M.R. (2021). Mentoring in the ministry of internal affairs of Russia: Reboot. *Questions of Pedagogy*, *11*(2), 208-211.

Loseva A.L. (2022). Mentoring as a tool for accelerated adaptation of new teachers. *Siberian Teacher*, *1*(140), 45-51.

Loures, L., Panagopoulos, T., and Burley, J. B. (2016). Assessing user preferences on post-industrial redevelopment. *Environment and Planning B: Planning and Design*, *43*(5), 871-892.

Mahmood, H., and Alkahtani, N. S. (2018). Human resource, financial market development and economic growth in Saudi Arabia: A role of human capital. *Economic Annals-XXI*, *169*, 31-34.

Ozturk, I. (2008). The role of education in economic development: a theoretical perspective. *Journal of Rural Development and Administration*, *33*(1), 39-47.

Posey, C., Lowry, P. B., Roberts, T. L., and Ellis, T. S. (2010). Proposing the online community self-disclosure model: the case of working professionals in France and the UK who use online communities. *European Journal of Information Systems*, *19*(2), 181-195.

Pozdeeva S.I. (2017). Mentoring as an activity support of a young specialist: models and types of mentoring. *Scientific and Pedagogical Review*,*2*(16), 87-91.

Romanov, V. A., and Egorova, Y. A. (2021). Mentoring as a condition for training a competent teacher. *Представительная Власть-XXI Век: Законодательство, Комментарии, Проблемы*, *3*, 44-47.

DOI: https://doi.org/10.17509/ijert.v2i3.50378
p- ISSN 2775-8419 e- ISSN 2775-8427

Savchenko I.V. (2021). Mentoring as the basis of practice-oriented professional education bulletin of Donetsk national university. *Bachelor of Economics and Bachelor of Laws*, *2*, 159-169.

Smyslova O.Yu., Osipova I.V., Filonenko N.Yu., Lakomova D.V. (2020). Digital transformation of mentoring institution in the public service. *Modern Economics: Problems and Solutions*, *7*(127), 107-117.

Thomas, L. (2012). Building student engagement and belonging in Higher Education at a time of change. *Paul Hamlyn Foundation*, *100*, 1-99.

DOI: https://doi.org/10.17509/ijert.v2i3.50378
p- ISSN 2775-8419 e- ISSN 2775-8427