ПІДПРИЄМНИЦТВО, МЕНЕДЖМЕНТ, МАРКЕТИНГ

ENTREPRENEURSHIP, MANAGEMENT, MARKETING

UDC 338.465.4
DOI: https://doi.org/10.31651/2076-5843-2024-1-2-23-33

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ADAPTIVE MODELS OF MANAGEMENT OF INNOVATIVE PROJECT ACTIVITIES OF EDUCATIONAL INSTITUTIONS ON THE BASIS OF ECONOMIC INTERACTION AND COMPETITIVENESS

In today's world, educational institutions face constant pressure to innovate and effectively manage projects. This requires the development of new management approaches that would take into account changing market conditions and requirements. This article considers the topical issue of the development of adaptive management models of innovative project activities of educational institutions, taking into account the principles of economic interaction and competitiveness.

The authors draw attention to the key aspects of effective management of projects and innovations in the educational sphere, such as strategic planning, resource provision, monitoring and performance evaluation. An analysis of modern trends in the field of education was carried out and the main challenges faced by educational institutions in the process of implementing innovative projects were highlighted. Based on the analysis of scientific research and practical experience, proposals have been developed for the introduction of adaptive management models aimed at increasing the competitiveness of educational institutions and ensuring their effective development in the conditions of the modern market environment.

Specific recommendations for the implementation of adaptive management models aimed at increasing the competitiveness of educational institutions based on developments in the field of project management and innovation are offered. The results of the conducted research can be useful for heads of educational institutions, scientists in the field of management and all those interested in improving the education system and thanks to which they will be able to gain valuable insights on how to effectively implement innovations and manage projects in the conditions of constant changes in the market of education and educational services.

Keywords: *adaptive models, innovative project activity, economic development, economic interaction, competitiveness, educational institutions.*

Introduction. In the modern world, educational institutions play a key role in shaping the future of society, ensuring not only the transfer of knowledge, but also the development of critical thinking, creative abilities and innovative potential of students. However, in order to effectively respond to modern challenges, educational institutions must be ready for constant changes and the introduction of innovations.

Management of innovative project activities in educational institutions becomes a key aspect, as it allows the introduction of new approaches, methods and technologies to ensure quality education and preparation of students for life and work in the modern world. However, in the changing environment of education, where economic and social conditions are constantly changing, traditional management models may not be effective enough.

Therefore, this work examines the possibility of using adaptive management models of innovative project activities of educational institutions based on the principles of economic interaction and competitiveness. This will allow educational institutions to be more flexible and respond to changes in their environment faster and more efficiently to ensure high quality education and meet the needs of modern society.

In this context, the work is aimed at analyzing modern trends in the field of educational innovation management, identifying the main challenges and developing proposals for the implementation of adaptive management models that will contribute to increasing the competitiveness of educational institutions.

In addition, taking into account the rapid development of technologies and changes in the expectations of participants in the educational process, the ability of educational institutions to adapt and innovatively respond to these changes becomes important. Traditional management models may not be sufficiently flexible and inappropriate in the rapidly changing environment. One of the key components of effective management is taking into account economic interaction and competitiveness. Educational institutions must develop as economic entities capable of competing in the market of educational services and ensuring sustainable financial development. Adaptive management models aimed at maximizing efficiency and effective use of resources can become an important tool in achieving these goals.

Based on this context, this work is aimed at developing specific practical recommendations for the implementation of adaptive management models in educational institutions. These recommendations are based on the study of best practices and scientific research in the field of management, and also take into account the unique needs and characteristics of educational institutions.

In general, the implementation of adaptive management models can contribute not only to increasing the efficiency of educational institutions, but also to their ability to actively respond to the challenges of the modern world and provide quality and competitive education.

Analysis of recent research and publications. Such domestic scientists as A. Baranovskyi, I. Dychkivska, O. Kobernyk, V. Lazarev, N. Nechaeva, V. Palamarchuk, and others dealt with issues of innovative readiness of higher education institutions. The issue of management adaptation innovative activities of educational institutions were studied by L. Vozniuk, T. Kovaleva, T. Perekryostova, N.Pogribna, T.Sorochan, and others. However, the issues of developing an adaptive management model for innovative project activities of educational institutions in conditions of increased competitiveness remain open.

The purpose of the paper consists in the researching of adaptive models of management of innovative project activities of educational institutions on the basis of economic interaction and competitiveness and their future development.

Methods. When analyzing the literature, retrospective, sequential research and systematization are stalled; when forming adaptive models, managing the sequence of bookmarks - methods of definition, modeling, formalization, formulating recommendations, solving the role of innovation in systemic events - methods of system analysis, empirical and expert assessments.

Results. Theories, methods, management tools and marketing technologies in education and business management research and use the knowledge presented in the media of different nature, as well as in the intellectual sphere of people who get, apply, retain knowledge in the framework of training and professional activity.

Therefore, knowledge, their essence, methods and management tools are identical in the fields of education and economy, and the subject of knowledge management is the amount of formal information in databases on information media, as well as the experience of listeners (students, pupils) or company staff. Knowledge that belongs to a certain entity (enterprise, institution) is a set of information and methods of logical inference, which also belong to the intellectual agents of two types: people and software systems with the access to technical storage media. Effective interaction between software agents and human agents is paramount to the successful operation of a knowledge management system. The level of education and qualification of staff become important factors in the development of socio-economic system [1].

Today, the idea of a continuing education for an adult is spreading, in other words, «education for life» Among the global trends in the development of society, which cause the spread in the developed countries of this educational concept, the increase in the role of human capital in the growth of national wealth as a factor of innovative development of society is particularly essential to Ukraine.

In the transition to lifelong learning (Smart education), basic education should periodically be supplemented by further additional education programs and organized not only as a final and completed course, but only as a basis for further learning. Lifelong learning provides increased investment in people and knowledge, the acquisition of basic skills, including digital literacy, and the dissemination of innovative, more flexible forms of learning. The aim is to provide people of all ages with equal and open access to qualitative education [2; 3].

Leading countries in the field of lifelong learning have increasingly been using the concept of Smart Education, which is becoming the main feature of the education of the future. The concept of Smart-education refers to the transition from education focused on 3 basic learning activities (reading, arithmetic and writing) to education that develops seven skills of the 21st century: critical thinking and problem solving; creativity and innovation; cooperation and leadership; intercultural understanding, communication, ICT literacy, career and life skills. Due to this, the main function of a tutor and his professional competence in modern conditions is not to show «ready knowledge», but to use the tools of proper quality navigation of world information resources with the help of both ICT and marketing technologies. Smart education enables students to generate new knowledge and to form the personality of a Smart person who has perfect knowledge of computer and information technology for finding and analyzing information, creating innovations. Another task of a teacher and tutor in modern science should be work on the formation of students' logical and critical thinking, skills in analyzing information, development of foundation for lifelong learning, career advancement [4].

Thus, the development of lifelong learning is connected to the development of ICT, and the formation of a conscious, capable and well-motivated person. The implementation of the Smart Concept is becoming a leading trend in the development of lifelong learning. A modern specialist should not only be guided in general and special issues related to his specialty, but be able to use modern Internet technologies, to have access to world scientific databases, to be not only a consumer, but also a "producer" of knowledge.

The Smart-concept refers to transformation of knowledge management models according to the socio-economic system in the context of European integration of processes. Therefore, the educational space should use more flexible approaches, in particular Agile, to organize a training part that primarily involves the development of basic content.

Agile is considered as one of the best methods of project management for building a training course within the concept of Smart Education, by which the course building process is divided into the stages of goal alignment, resource collection, results and objectives, iteration and implementation, and performance evaluation.

There are main problems that arise when the learning process adapts to Agile. It is necessary to monitor the state of the managed object and to form adaptive effects on executive elements. The tutor has to use tools of diagnostics and control of the object, to support the models of a student (for example, indicators of individual characteristics in process of learning) to control the success of learning. It is essential to apply methods of control of success of getting knowledge taking in account training management, information technologies for support and management of students' knowledge [5].

According to this approach the development of an interactive training course for an interactive individualized learning environment, as well as the process of organizing and supporting learning within learning environment, requires a new methodology for creating courses.

The implementation of teaching methodology as an interactive individual environment is the creation of a «product» or technology that will enable to present educational materials as «pure» images, in the form that will be most convenient for human understanding in each individual case. The course itself (system) should be able to «adapt» to the needs of a listener, modeling the most natural images for him in the learning process. In the process of implementation, the system should be able to apply the methodology of self-education (critical thinking).

There are two main participants involved in the learning process: a listener and a system. Before the first session, a student is tested, the results of the test determine a student's basic level and his general characteristics, and then the results are loaded into the system. The system, in its turn, based on student's features, creates a listener's profile which allows to establish a dialogue between the system and a listener, after which actually begins the learning process.

The implementation of such a system requires a clear organization in the process of development and further support. The feature of this system is the field of its application. Modern distance learning systems offered by various developers only interpret the traditional system of teaching and learning in virtual space. As the new teaching methodology has been presented there is a need for a different form for organizing the development process, which can be a project management system using the process approach. At the present time analyzing the main trends of education, we can distinguish online education, social media, blogs, video blogs, adaptive training, gamification of education, practical knowledge, cumulative effect. It is clear that all the trends presented refer to Smart technologies, and in their essence they are trying to create an interactive individualized learning environment.

The basis of any training is educational material, which can be presented in the traditional form, such as lectures, practical tasks and forms of knowledge assessment. The development model of interactive learning material for Smart Learning is a business process that describes the entire lifecycle of materials from their formation to their immediate submission to an interactive individual environment.

As current practice has shown, one of the best methods of project management is Agile methodology. Using a flexible approach, we can identify the following steps for the development of corporate training, which can be defined as a marketing tool in running an enterprise as a whole entity as well as its business units [5]:

1. Alignment is the first step in an adaptive e-learning design that combines the needs and goals of both students and the organization itself. Alignment may include in-depth analysis of the current online training program, gaps in work, ways of learning process developing that have to satisfy the growing needs of the company and its employees. E-learning developers should also determine the desired outcomes and how the online learning program will serve them. For example, a blended learning strategy might be an ideal approach if the goal is to integrate more technologies into a corporate e-learning strategy and offer employees more interactive activities. It is for this reason that the research to identify the goals and objectives of online learning is being conducted. Such surveys may consist of surveys, observations and focus groups, as well as Big Data analysis.

2. A set of goals, results and objectives is a stage when the resources are gathered. At this time, the ways of solving organization's issues quickly is determined. For analysis, you need to study all the tasks, skills and information that employees need to learn, and then evaluate their current level of knowledge. Selection of tools, software and systems to help employees get from point A to point B most effectively is being conducted. It is also necessary to analyze the assessment of tasks and skills in order to divide each topic into its main components. For example, analyzing a task will help understand the process and identify all stages and skills involved. It will also determine what information employees need to obtain in order to the task.

3. Iteration and implementation. The third step in the Agile approach consists of 2 phases. First, you need to interactively develop solutions to the problem and formulate the main points. The overriding goal is to create an online activity, module, or lesson that offers employees the information they need to

improve their performance. After that, it is necessary to proceed to the implementation of the decision based on the time scale set by the system architects.

To this aim, the ideal online learning activity is determined based on the background, needs, goals and preferences of the employees. At this stage, the eLearning team develops a prototype, performs user testing, and then makes the necessary changes. When the final product is ready, it is open to corporate learners. After this, it is necessary to conduct the research to identify their preferred delivery methods, such as their mobile devices that they typically use to access training materials.

4. Leverage. After the basic online training materials have been developed and deployed, the organization must decide how it intends to offer ongoing support to its employees. This should be done using all the resources at its disposal. The key to success is to create materials that will capitalize on all software and use all available systems. For example, branching or modeling scenarios, using an eLearning authoring tool, allow employees to identify the real application of their knowledge. To take this step in corporate e-learning course design, a continuous online training strategy is created that will allow employees to improve their skills and update knowledge on a regular basis. For this reason, it is essential to determine what performance management resources the organization currently owns and how they can be used to its advantage.

5. Evaluation. The final step in the Agile process is to evaluate the effectiveness of the online training program, which also includes the development of criteria that will measure the effectiveness of the online training and determine whether the desired results are achieved. It is possible to assess the level of knowledge of corporate students to find out whether they have the necessary skills, or to evaluate the effectiveness of a corporate e-learning program to focus on sales figures and customer satisfaction. In some cases, complex tasks will have to be solved to determine the goal. For example, you might need an approach using interactive scenarios or simulation-based exams. To take this flexible approach step, a permanent evaluation plan is created. It reflects all of the goals and outcomes the organization is tracking. If an employee does not meet the requirements and standards, the next steps are clearly defined. For example, you might ask him to take additional online training courses or offer access to training resources to improve his skills.

In this approach, there is an analogy with Agile software development methodology, the main ideas of which are [5]:

– people and interaction are more important than processes and tools;

– working product is more important than comprehensive documentation;

– cooperation with the customer is more important than agreeing the terms of the contract;

– readiness for change is more important than passing the previous plan.

In terms of information security, this could mean the following:

–safety is provided by ordinary people. Top management supports and trusts the employees and the effectiveness of the end result and the whole process depend on this factor;

–it is not «paper» compliance that is important, but a real protection system aimed at business needs;

– cooperation with people (employees, customers, different divisions, partners) is more important than formal fulfillment of requirements, policies and concepts;

–in a dynamic environment for protection, constant change of landscape, threats and legislation it is necessary to be ready for such changes and to implement them as needed, without waiting for the end of the next stage of the life cycle.

Monitoring the educational process includes monitoring the context of the content of learning in the educational process, monitoring the resources of the educational process, monitoring the progress and results of the educational process. Among the functions of monitoring knowledge management processes we can point out the analysis of the status of knowledge and their availability, knowledge evaluation, identifying relevant knowledge resources and production business processes. The ways of knowledge level monitoring include information about agents' mental models, business process quality models, tutor and listener knowledge models. They influence the knowledge lifecycle management processes and the processes of adapting knowledge representation to the features of agents and their requirements.

This adaptation implies a change in the process of educational activity of the parameters of the transmitted information, depending on the individual characteristics and the current psychophysiological state of a user. On this basis, an important aspect of monitoring the educational process is the analysis of the mental models of agents. The characteristics that allow us to classify agents of the knowledge management system (KMS) by mental level include the form of information presentation, the rate of submission and complexity of information messages, the level of knowledge or competence, psychophysiological state and problem-oriented profile of an agent. It is proposed to carry out the mental state of the user in the KMS by means of diagnostic procedures that enable to define agents according to the form of information presentation, the pace and level of complexity of information messages, as well as the level of knowledge at the beginning of training [1; 6;13;14].

A business model for the design and implementation of an adaptive training course using modeling methodology and functional business processes in IDEF0 notation is proposed. The peculiarity of this methodology is its emphasis on the subordination of objects. IDEF0 standard considers the logical relationships between works, not their time sequence, and represents the organization in the form of a set of modules connected by activity arrows (ICOM). The description of the base model is detailed to the required level using decomposition diagrams made in notations IDEF0, IDEF3 or DFD [7;9;11;12].

ICOM arrows indicate inputs, outputs, controls, and mechanisms. Inputs are materials and information used or converted by an organization's function block to produce a result. Management is a set of rules, strategies, procedures, or standards according to that an organization's functional unit works. Mechanisms are labor or material resources engaged in the execution of work, and outputs mean all the data obtained as a result of the function. The outputs can be material or information produced within the functional block [7]. A detailed explanation of each of the ICOM elements of the business model is presented in tabular form (Table 1).

Table 1 – ICOM arrows of the business model «Training course development and implementation» (fragment)

Arrow Name	Arrow Definition	Arrow Type
Listeners of a course (learning community)	Persons enrolled in the course and certification.	Input
Listeners' Goals	The personal goals of each of the course listeners are analyzed during a preliminary survey. They will be used to form their mental profile.	Input
Experience of other organizations	Analysis of training and certification courses that other educational institutions have carried out.	Input
Control Regulations	Document defining the procedure for evaluating the results of the course and the quality of knowledge acquisition	Input
Curricula	Curricula and working curricula of the educational institution for each specialty	Input
Distribution of specialty courses	Identification of courses for each specialty and group, as well as their distribution among tutors.	Input
Sources of knowledge	Information resources on the Internet, books, manuals, audio and video.	Input
Certified students	Persons who have successfully passed the final course test and are eligible for the certificate.	Output
Informational and educational system	An informational system used to present learning materials to students and to diagnose the process of their learning.	Output
Course schedule	The schedule of work for the institution and the schedule of teaching and learning process	Output
Analytical report of the KMS (Knowledge Management System)	A report formed by the knowledge management system according to the results of the course	Output
Student Performance Report	Information about the level of knowledge of each of students and their points in test or practical tasks	Output
Test results	Analytical information to control students' knowledge taking into account their results of the tests.	Output

Source: author's own development

Peculiarities of the training course development model are reflected in the functions of planning by the results of control, development of the training course, adaptive learning process, process diagnostics and success control, as well as adjustment of the training course (Fig. 1).

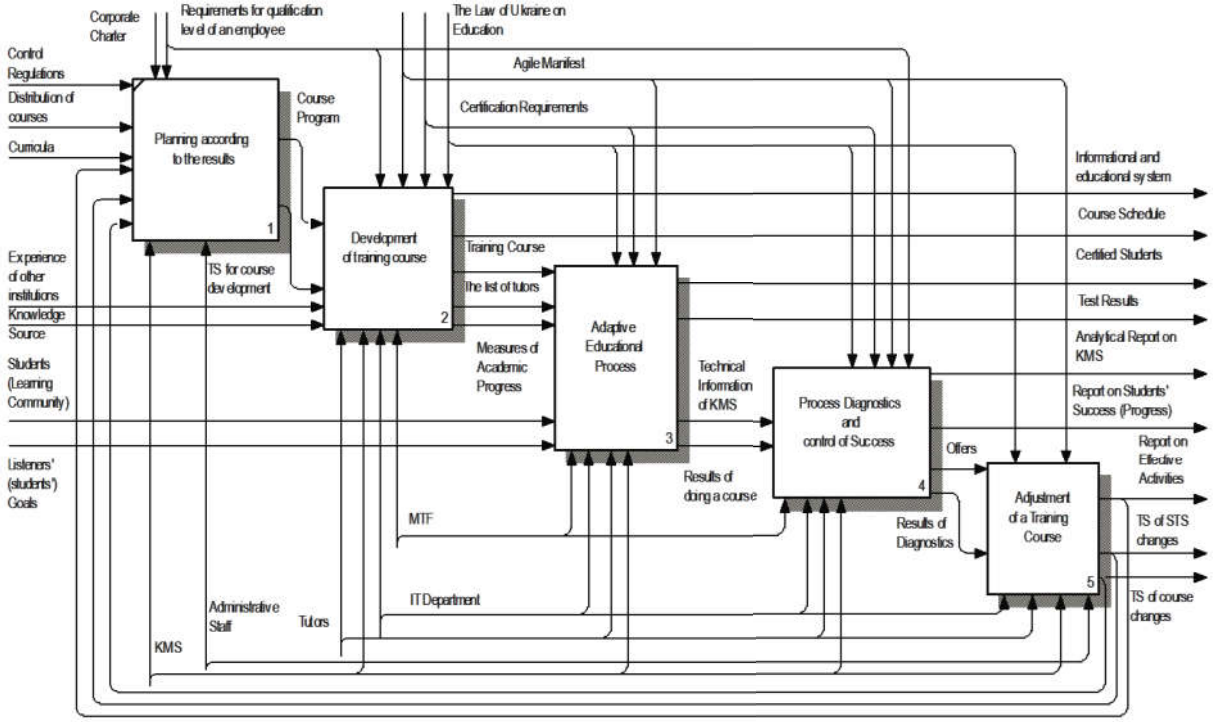

Figure 1. Decomposition diagram of the business model «Training course development and implementation» in IDEF0 notation

Source: author's own development

The process of «Development of a training course» is described by the functions of development of a training platform, preparation of a course structure, creation of training materials and testing of course effectiveness.

At the stage of inputs, the model receives information about the course syllabus, sources of knowledge, experience of other organizations and the technical specifications (TS) to develop the course. At the stage of outputs the model forms a training course, its schedule, a list of tutors and a prepared information and training system.

The Adaptive Learning Process function can be divided into the following components: analysis of the mental profile of a listener, adaptive study of educational materials, completion of current test tasks and final testing for certification.

At the stage of inputs, this model receives a list of course listeners (learning community), information on the listeners' (students') goals, a list of tutors, a training course, and criteria for evaluating the success of its acquisition. At the stage of outputs technical information of the KMS, course results, test results, and a list of certified listeners (students) are provided.

The function of diagnostics and control of success can be divided into the following components, which are the work of the diagram of decomposition «Process diagnostics and control of success». They are analysis of efficiency of mastering of knowledge, analysis of system adequacy to the peculiarities of students and development of suggestions for course correction. The inputs of this model are the technical information of the KMS, and the results of the course. At the stage of the outputs the analytical report of the KMS, the results of diagnostics and suggestions for improving the course are formed.

The process of correction of the training course consists of the following functions: analysis of the effectiveness of the proposed measures implementation, determining the ways of implementation and formation of technical tasks for completion. The inputs of this model are the results of diagnostics and

suggestions for improvement. The outputs of this model are TS for completion of the course and TS for completion of the SLS.

When performing adaptive processes of an educational episode, the functions of the tutor include correction of the listener's (student's) mistakes, updating his knowledge, strategic functions that calculate the need to change the tutor's strategy, functions of diagnostics, i.e. accurately determining the student's level of knowledge, prediction functions, or determining the student's probable response, as well as the student's assessment and smart learning system. The process of knowledge acquisition begins when the tutor defines the level of knowledge of the student as incomplete. It consists of four stages: determining what kind of knowledge the student lacks, choosing the time to enrich knowledge, choosing the means of knowledge enrichment (learning influence) and the implementation of the chosen learning influence.

Taking into account business processes of the model, a project for creation and implementation of an adaptive PMBoK 6 standard was developed into a certified training center (CTC). It consists of the stages of initiation, development planning, development itself, control of implementation and completion of the project (training course launch). A team consisting of a project manager, coordinator, methodologist, authors, editors, developers, designers and tutors of the course perform this project.

The main product of the project implementation is the developed and effective adaptive training course, which can be used as a basic tool in the activities of the CTC in carrying out training and certification in the specialty «Project Management» according to the PMBoK 6 standard [7; 8;10].

A visual representation of the progress of the project is illustrated in the Gantt chart. This chart is a standard tool for illustrating project work plans. It is represented in the form of a bar chart where we can see sequential individual project steps or tasks, represented by timeline-oriented horizontal bars. The length of each bar reflects the length of the stage, and the start and end points correspond to the start and end of the project.

The main objective of the project is to develop and implement an adaptive training course.

Strategic goals of the project:

- improvement of methodological and informational support of CTC, transition to more advanced methods of conducting activities;

– improvement of the educational process quality and the level of students' knowledge;

– implementation of modern information technologies, increase of information component in the educational process of CTC.

Tactical goals of the project:

– improvement of resource availability of the educational process by specific specialization (project management);

– education promotion among population, raising the level of students' knowledge and providing additional opportunities for self-education;

– improvement of tutoring quality in CTC;

– promotion of CTC.

Conclusions. The process of designing and implementing an adaptive training course can be divided into 5 stages: initiation, development planning, development, monitoring of project completion (training course launch). An adaptive development approach, in turn, involves splitting the whole process into short sub-stages – sprints that have a structure that is consistent with the basic structure of the whole project (defining goals, developing, testing, correcting disadvantages). Sprints are performed by a team of developers, which usually includes a subject matter expert, an instructional designer, a software developer, and a project manager. To create quality training courses, developers, designers and project managers need to use a variety of sophisticated information technologies at a sufficiently high level.

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АДАПТИВНІ МОДЕЛІ УПРАВЛІННЯ ІННОВАЦІЙНОЮ ПРОЄКТНОЮ ДІЯЛЬНІСТЮ НАВЧАЛЬНИХ ЗАКЛАДІВ НА ЗАСАДАХ ЕКОНОМІЧНОЇ ВЗАЄМОДІЇ ТА КОНКУРЕНТОСПРОМОЖНОСТІ

У сучасному світі навчальні заклади стикаються з постійним тиском щодо впровадження інновацій та ефективного управління проектами. Це потребує розробки нових підходів до управління, які б враховували мінливі ринкові умови та вимоги. У статті розглядається актуальне питання розробки адаптивних моделей управління інноваційною проектною діяльністю закладів освіти з урахуванням принципів економічної взаємодії та конкурентоспроможності.

Автори звертають увагу на такі ключові аспекти ефективного управління проектами та інноваціями в освітній сфері, як стратегічне планування, ресурсне забезпечення, моніторинг та оцінка ефективності. Проведено аналіз сучасних тенденцій у сфері освіти та висвітлено основні виклики, з якими стикаються навчальні заклади в процесі реалізації інноваційних проектів. На основі аналізу наукових досліджень та практичного досвіду розроблено пропозиції щодо впровадження адаптивних моделей управління, спрямованих на підвищення конкурентоспроможності закладів освіти та забезпечення їх ефективного розвитку в умовах сучасного ринкового середовища.

Запропоновано конкретні рекомендації щодо впровадження адаптивних моделей управління, спрямованих на підвищення конкурентоспроможності навчальних закладів на основі розробок у сфері проектного менеджменту та інновацій. Результати проведеного дослідження можуть бути

корисними для керівників навчальних закладів, науковців у сфері менеджменту та всіх, хто зацікавлений у вдосконаленні системи освіти та завдяки яким вони зможуть отримати цінні ідеї щодо ефективного впровадження інновацій та управління проекти в умовах постійних змін на ринку освіти та освітніх послуг.

Ключові слова: *адаптивні моделі, інноваційна проектна діяльність, економічний розвиток, економічна взаємодія, конкурентоспроможність, навчальні заклади.*

Одержано редакцією: 03.03.2024
Прийнято до публікації: 15.04.2024