THE ROLE OF INNOVATIVE TECHNOLOGIES
IN THE PROCESS OF TRAINING PROJECT MANAGERS

Molokanova V.

The article substantiates that the modern world does not keep up with the changes that are taking place. Because of this, the problems of society become the subject of theoretical research already after they have become quite acute and require immediate solutions. The author researched the concept and necessity of implementing project-based learning under the conditions of the digital transformation of education. The innovative technologies that can be effectively used to spread systemic thinking are presented. The considered methods to form systemic thinking, characteristic features, and stages of problem-solving. It has been proven that the solution to the problem is covered in the most detail through the development of a project plan. Therefore, in order to form systemic thinking, it is necessary to use the project-based learning method in the educational process. Based on the research, directions for improving the educational environment for the formation of integration competence in the digital transformation of society are determined.

Introduction

In the era of global changes, there were many problems of educational processes transformation, and therefore, there is a need to solve a significant number of new tasks for the training of future specialists.Until the middle of the twentieth century, development, as one of the characteristics of system dynamics, considered within the framework of the so-called classical science [1]. The axiomatic provisions of this science included such features as strict determinism and progressiveness of development processes, leveling of the role of the individual and social groups. The environment understand as simple and sustainable systems, and was defined by the acronym SPOD (Steady, Predictable, Ordinary, Definite), was an example of stability and sustainability. Management actions in such systems considered mainly as functions of maintaining thesystem parameters balance, counteracting the stochastic perturbations of the macro-environment, ensuring the optimization of theresources use. However, our SPOD world was quickly replaced by the world of VUCA (Volatile, Unstable, Complex,Ambiguous), which was not going to stabilize its course, but only accelerated the speed of change. Moreover, today modern man has to adapt to the world of BANI (Brittle, Anxious, Nonlinear, Incomprehensible) [2]. The new world generates a bunch of abbreviations of 4 letters. Therefore,Oxford University's Executive Education Program uses TUNA acronym (Turbulent, Uncertain, Novel, Ambiguous) instead of the more familiar VUCA world. Another interesting acronym that describes the modern world

DELA (Dynamic, Emergent, Liminal, Anthropocentric) has an interesting anthropological perspective [3]. The real world is constantly changing, in the process of emergence and formation of intermediate transitional state. In this space of growing chaos, not everyone realizes that our old ideas about building the world and the management tools we use no longer work. Today's daily news feed confirms that most international institutions, country leaders and academics do not understand how to act in this new world. Moreover, it is necessary to act much faster than it was in the last century. Everything leads us to understand that most of the old system models no longer work and questions arise about how and why to train modern specialists.

Analysis of literature and the problem under study

In the second half of the twentieth century, the views of non-classical science became more common, the object of research of which were complex human-dependent systems that have their own subjective judgments about any managerial actions.

The mechanisms of nonlinear development of events are considered in the general theory of self-organization of systems, which is used only for so-called dissipative systems. I. Prigozhin [4] first introduced the concept of dissipation of matter and energy in the system. The existence and dynamics of dissipative systems depends on their constant exchange with the environment. If the exchange stops, such a system collapses. Obviously, any system, constantly exchanging various materials, energy and information with the environment, refers specifically to dissipative systems. Characteristic features of dissipative systems are unbalance and nonlineurability [3].

Unbalance arises precisely due to the presence of processes of exchange of energy, information and substance between the elements of the system itself and characterizes fluctuations in structure, uncertainty of situational interaction between them. Such fluctuations lead to nonlinearity – a violation of the linear nature of the proportionate relationship between external influence on the system and its corresponding reaction [5]. Now, minor influences can lead to a complete change in the structure and complexity of the system, and significant influencescan cause insignificant consequences. Fluctuations in the level of the internal structure of the system described in such categories as «order» and «chaos» [6].

The growth of the structural order degree is due to the system's desire for constant development, while the generators of development are disagreements, contradictions, ambiguity, and not universalism [7].

Ukrainian scientists V. Seminozhenko and V. Geyets emphasize that «...one of the key problems of Ukrainian strategic documents is the lack of understanding of dynamism, variability... Virtually every document does not take into account the changes that are taking place... We are constantly responding to obvious «surprises»... And this is just the beginning...» [8, p. 4]. Itis clearthat our old ideas about economic models and management tools no longer work.

The current state of society demonstrates that the world has not kept pace with the changes taking place, as a result, of which the problems of society become the subject of theoretical research after they have sufficiently aggravated and need immediate solutions. With the old models of thinking, humanity cannot achieve sustainable development that meets the survival needs of future generations. The paradox of the existence of the modern world is that the number of problems that need urgent solutions is not decreasing, but, oddly enough, growing. In these conditions, the importance of the formation of critical system thinking, the ability to creatively solve problems and innovative cooperation is growingfor scientists.

The purpose and objectives of the study

The purpose of the studyis to substantiate the role of project competencies as a specific managerial component of the integral competence of a modern manager capable to make responsible decisions in the face of growing environmental uncertainty and nonlineurability.

Methodical research materials

Ukraine obtained the status of a candidate for EU membership on June 24, 2022, that causes large-scale reforms in the seventh direction. The methodology of project management allows many developed countries to solve the problems of reforming the state in conditions of strict resource and time constraints. The constant growth of data volumes for analysis and the rapid development of information technology, it could argued that this task is constantly complicated.

The importance of systematic learning for both business and the academic world has led to the emergence of research related to measuring people's ability to innovate. In particular, some researchers propose to consider innovative competence as a set of 5 main components and evaluate a person on each of these properties: initiative, creativity, critical thinking, cooperation and teamwork [9].

The integral competence of all levels managers is «a systematic and natural process of progressive changes in the information and research competence of the individual in accordance with the needs of a digital society, which implies the ability to master new knowledge, improve skills and abilities, gain new experience in the use of information and digital technologies» [10]. The development of Ukraine requires highly qualifiedmanagement personnel, which are necessary for the successful systematic management of innovative projects.

Paragraph 3 of the National Qualifications Framework states that competence is «the ability of a person to perform a certain type of activity, expressed through knowledge, understanding, skills, values, other personal qualities». It also defines integral competence as universal competencies that do not depend on the subject area, but are important for the successful further professional and social activities of the applicant in various fields and for his personal development [11].

Integrated project competence should combine professional managerial, legal, economic, analytical, other special knowledge and skills that are expressed through the ability to quickly respond to problems and changes and the ability to work in a team within the relevant strategies and programs.

To combine theoretical knowledge and practical skills, pedagogical science offers several interesting teaching methods. Therefore, Problem Based Learning (PBL) is a method in which students are offered to solve complex problems, which allows them to master the system principles and decision-making.

The case-study approach (learning through parsing real cases) originated at Harvard Business School in the early 1920s. It was then that the first collection of cases was published at the Harvard Business School, since the teachers of the program realized that there are no textbooks that prepare students for real working situations. Unlike the exact sciences, there is no single correct answer in the cases, since the number of components of the problem is always very large [12]. Therefore, in cases it is impossible to know one solution, you have to choose the most effective, and then look at what other participants offered. The value of case technology lies in the fact that it helps to activate a certain baggage of knowledge that must be learned when solving this problem, that is, thanks to cases, students learn to use the knowledge gained in practice. Therefore, cases can be considered as a kind of laboratory for brain training in search of solutions to various situations.

The project activity of students carried out in the application of the Project Based Learning method requires not only the study of the object and subject of research of a particular scientific field, but also requires the study of related branches of science, which will lead to the results of metacognition and integrated learning

activities. The peculiarity of project education is that it combines both practical work (manual labor), but also has a creative component and scientific research. Integration of disciplines (natural sciences, general technical and technological, teaching art and socially significant disciplines) is based on project activities and can become the basis for innovation in the future. One of the most effective methods of forming integral project competencies is project activities aimed at solving complex interdisciplinary problems. The method of project-oriented learning is similar to problem learning, but requires bringing the problem solution to the particular project development. Work on own project can become an important component of the educational process aimed at forming the ability to work in the information space, professional development focused on the systematization of professional competencies [13]. Table 1 shows a comparison of the methods of integral system competenceformation.

Table 1

Comparison of methods for the integral competence formation

Method	Advantages	Disadvantages
Problem learning	Associated with one of the subject branches. The product may simply be a proposed solution expressed in writing or in an oral presentation.	Associated with one of the subject branches. Tries to structure the problem with the help of thematic examples and fictitious scenarios for the development of the problem.
Case-study method	It contains real, very real tasks. The professor presents a specific complex problem and students are looking for and developing proposals for solving it. The task has clear stages. It helps to activate a certain baggage of knowledge that must be learned when solving this problem.	It is impossible to know one solution, you have to choose the most effective, and then see what other participants offered. It does not come to a clear development of the final product.
Project based learning	It involves alkalization to «real» tasks and structured activities of students (often questions or group), which is advisable to evaluate on individual tasks. Includes detailed development of project product creation processes using decomposition and synthesis methods.	It can be long (weeks or months) of open projects, which requires the ability to change the management model depending on the phase of the project.

From a structuralpoint of view, a complex scientific process divides into smaller, logically related units that draw students' attention to important features of scientific thinking. These individual units call stages of research, and their interrelated set forms a certain life cycle of solution development. The model of the research learning cycle proposed by the authors M. Pedaste, K. Manoli, consistsofthe following stages: orientation, conceptualization, investigation, discussion, and conclusions [14]. There is no one best way to determine the ideal life cycle of a project. Within the framework of the Project Management Institute methodology, the classic life cycle of the project has 5 phases: initiating, planning, executing, monitoring, and closing [15]. The integration competence of the project manager allows showing special qualities at each stage of the project life cycle. Stages of the creative process of solving the problem through the project development as indicated on the table 2.

Table 2

Stages of solving the problem through the project

Project Management Methodology and Logical-Structural Analysis	Stage 1. Preparation	Intellectual-creative preparation
		The manifestation of social needs
		Choose an area of interest
	Stage 2. Formation of the concept	Collection and analysis of information
		Define the purpose of the project
		Directed search of means
	Stage 3. Search phase	Free generation of ideas
		Formation of alternatives to achieve the goal
		Selection the optimal strategy for achieving the goal
	Stage 4. Detailed Planning	Description of the general concept of the project
		Structuring the project's works
		Detailed project planning
	Stage 5. Implementation and evaluation	Checking the execution of work according to the plan Management of critical processes at the stage of project implementation Development of solutions and measures to get out of crisis situations Assessment of the achievement of planned project results

On the basis of the system analyststraining, a description of digital tools for the formation of the main activities during the main stages of the project life cycle for solving complex problems has been presented (see table 3).

Table 3

Digital tools for the development of integrated system competence

Digital tools that provide a certain educational activity	Examples of digital tools to support this learning activity
Tools for finding information	
Search tools	Google, Google Trends, Google Public Data Explorer, Bing, Baidu, BibMe, EasyBib,
Tools for working with cloud storage	GoogleDrive, 4Shared Free File Sharing, Dropbox
Tools for online translation	Translate. Google, PROMT, Context, Lingualeo English Translator, DeepL Translator
Tools for conducting a survey via the Internet	Kahoot, Socrative, Mentimeter, Google Forms
Tools for working with online documents	GoogleDocs, MS Office 365, ThinkFree
Manage teams and communities	Jira, Trello, GitHub, Meetup, Google Drive, Google Analytics
Data visualizationtools	
Tools for creating conceptual maps	Miro, Mindmeister, Mindomo, Seeing Reason, Showing Evidence, Webspiration
Creation ofthe graphics	Corel Draw, Paint, Aviary, NGA, Twirler,SwatchBox
Editingpictures	Fotoshop, FotoFlexer, Picnik, Pixlr, Pixlr Express
Tools for project management	
Calendars	MS Project, Sure Track, Famundo, Google Calendar, HiTask, Spider
Tasks and tracking of the main stages	MyNoteit, Teamwork Project, Jira, Trello,
To-do lists	MyNoteit, Remember the Milk, To Do List, Google Keep
Tools for communication and exchange of views	
Tools for online chatting	Zoom, Teams, WhatsApp, Google Talk, Skype Chat
Tools for communicating with mobile devices	Teams, Viber, Telegram, WhatsApp, Messenger
Video and audio conferencing	Zoom, Teams, Google Video, WhatsApp, Skype, Tokbox

The dynamic development of new information technologies and professionally oriented software necessitates to provide the future project manager not only with high-quality professional education, but also to develop the ability to quickly update and complement the acquired knowledge and skills, to form a desire for constant self-development and self-improvement. The widespread use of information and communication technologies capabilities in the educational environment has led to the emergence of new components in the education system that open up wide opportunities for improving the educational process.

Thus, project management teachers should significantly expand their arsenal of interactive methodical tools. The gradual integration of new technologies into the processes of higher education opens up for teachers simply unlimited opportunities for experimentation. Conducting interactive training activities requires the use of a wide range of technical means of training, such as video and media tools, interactive tables, illustrations, etc. Although, in order to avoid annoying surprises, the teacher needs to prepare much more for interactive classes than for a lecture session.

Conclusion

Project management is a powerful means of rebuilding the world aimed at solving complex problems by creating a project product. The integration of digital education into project management is very important for the development of project education in Ukraine. Educational environment has to attract students in the project management study, to create positive motivation in them, to stimulate them to find new methods for solving problematic situations.

The modern educational environment creates favorable conditions for training a very largenumber of participants in the educational process at the same time. This is especially important, since modern electronic systems attract students to scientific education by interesting means for them and make educational processes independent of the material and technical base of the educational institution. All this increases the competition in the market for the provision of educational services and demands from scientists not only high professional skills, but innovation and creativity.

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