

The Role of the Project Management Information System in Developing Students' Project Culture at University

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Abstract—This article examines the development of students' project culture in higher education as an integrated system of professional competencies, values, and norms. The relevance of this research stems from the labor market's need for specialists prepared for effective teamwork in the cross-functional project environments characteristic of modern industry, science, and public administration. The aim of the study is to provide a theoretical justification and analyze practical experience with a specially developed project management module within a digital educational system (PMIS) as a key tool for fostering students' project culture. This type of module generates its effect through the synergy of two system types: project management information systems and educational information systems (EIS). An overview of PMIS functionality and the specifics of its application within an EIS is provided. Particular attention is paid to the integration of the system into the educational process and the impact of its use on the quality of specialist training.

The methodological framework was constituted by the cultural and setting-incremental approaches, integrated into the digital educational environment on the Digital Resource platform within the framework of the RANEPA Project School. It has been demonstrated that EPMIS promotes the development of skills in teamwork, strategic planning, documentation, coordination, and analytics, thereby creating conditions for cultivating project culture. The results of the pilot implementation indicate an increase in the transparency, manageability, and conscious engagement of students in project activities. It is concluded that EPMIS acts not merely as an automation tool, but as a cultural artifact that mediates the transition from a learning task to professional practice.

I. INTRODUCTION

The transformation of the economy and social sphere towards project-oriented activity models places new demands on university graduates. The demand for "flexible" competencies (soft skills) – such as teamwork, time management, communication, and solving non-standard tasks – combined with proficiency in modern collaboration tools, is becoming critically important. Project management skills enable specialists not only to accomplish set tasks in any field of activity but also play a significant role in self-discipline and self-development. Furthermore, the requirement for the speed of acquiring new knowledge is growing. Therefore, the professional education system faces the challenge of providing rapid yet high-quality instruction for students in the field of project management. It has been repeatedly demonstrated (in

research by many educators – I.A. Zimnaya, A.V. Khutorskoy, P.S. Lerner, V.M. Monakhov, and others) that one can only learn project management by practically implementing projects. Consequently, project-based learning formats are actively being integrated into educational programs and higher education standards. However, their implementation is often reduced to the completion of fragmented learning tasks, only formally combined into a "project," without immersion in the integrated system of norms, values, and tools characteristic of authentic project activity. A gap emerges between the declared goals of forming project competence and the actual educational outcomes. The problem of administering students' project activities is also clearly identified, due to the lack of tools for tracking work results.

II. MAIN PART

A large number of researchers have also studied the applications of EIS (D.M. Voronin, V.I. Toktarova, E.N. Yakovleva, R.A. Shaukhalova, and others), and they unanimously conclude that integrating information technologies into the educational process increases the effectiveness of educational activities through the accessibility and adaptation of materials to students' needs. Table 1 presents the advantages of using PMIS and EIS. When introducing only a PMIS into the educational process, additional organizational measures would be necessary, as the system lacks mechanisms for training, monitoring, and feedback in the format required for learning.

To enhance the effectiveness of mastering project management skills, it was decided to combine the functionality of two types of systems – PMIS and EIS. This integration will accelerate the process of managing project documentation, help increase the number of projects implemented during the learning process, while simultaneously allowing students to master all key project management skills through working with information systems and receive educational content at the moment it is needed to solve the current task. At the same time, the educational environment should be as close as possible to professional systems. Let us term the system under development the Educational Project Management Information System (EPMIS). EPMIS will allow students to gain the advantages of both systems: on the one hand, students will master project management technologies in digital form; on the other hand, they will be able to receive individually adapted educational content [1].

The Project School of the Directorate for Priority Educational Initiatives at RANEPa has been operating since 2023, and student projects of various levels and scales are constantly being implemented on its basis. By the end of the 2024-2025 academic year, the number of simultaneously implemented projects exceeded 50, which significantly complicates their administration and support. It also makes identifying project management errors more difficult, and student engagement decreases due to minimal feedback. Therefore, a decision was made to develop a special module of the project management information system as the core of the digital educational environment for developing components of students' project culture.

TABLE I. ADVANTAGES OF USING EIS AND PMIS

EIS	PMIS
Accessibility of knowledge Access to educational materials at any time	Process transparency All participants have access to up-to-date project information
Interactivity and personalization – IT and AI technologies make it possible to motivate mastery of the material and conduct initial assessment without involving human resources	Process optimization – Automation of routine operations reduces time spent on administrative tasks
Information relevance – Updating digital teaching materials is much easier and faster	Error risk reduction – The system helps avoid task duplication, omission of important stages, and other errors
Learning effectiveness – Students can choose the forms of information presentation that are most convenient and understandable to them	Faster decision-making – Rapid access to up-to-date data enables real-time decision-making
Collaboration and experience exchange – Communication within the system allows students to share their ideas, developing teamwork skills	Collaborative work – Project participants can work together on tasks
Progress assessment and feedback – Tests, assignments, and other types of control allow tracking student progress and timely curriculum adjustment	Work technologies – The systems provide technologies for project activities and their automation
Increased motivation – Interactive elements and gamification of the learning process contribute to increased student interest and engagement	Notifications – Enable timely action in response to various situations

The development and implementation of EPMIS are based on two approaches: the cultural approach and the setting-incremental approach.

The cultural approach to developing project culture (E.V. Bondarevskaya, S.G. Vershlovsky, B.S. Gershunsky, I.F. Isaev, M.S. Kagan, B.T. Likhachev, V.A. Slastenin, and others) addresses the necessity of mastering and immersing oneself in a professional culture, which possesses its own "language" (project management terms), characteristic artifacts (project goal, project passport, Gantt chart), rituals (discussions, retrospectives), and values. The task of higher education is to immerse the student in this subculture. In this case, the information system acts not merely as a tool, but as a key carrier of culture, which organizes project activities, sets their structure and norms [2]. Working within EPMIS, the student does not simply "go through" the stages of a project, but internalizes the documentation standards, approval procedures, and reporting principles accepted in the professional environment – in other words, "grows into" the culture of project management.

The setting-incremental approach focuses on designing an educational environment (a setting) that evolves as students' competencies grow (L.S. Vygotsky, N.S. Garkusha). The approach involves a step-by-step, measured increase in the complexity of both the project tasks themselves (from local and clearly defined to complex and ill-structured) and the instrumental environment for their implementation. EPMIS is the technological embodiment of this approach: the system consistently "opens" new modules and functions for the student (proposal creation → passport formation → planning), corresponding to the logic of increasing their responsibility and the complexity of the tasks being solved. This prevents cognitive overload and ensures gradual, confident mastery of all aspects of project activity. At the same time, the knowledge necessary for solving a specific current task is available to the student at the moment of need for that knowledge. Incrementality is expressed not only in the sequence of completing a single project, but also in the role performed by the student (participant, administrator, manager, curator), as well as in the scale of the project itself.

The combination of these approaches within the unified digital environment of EPMIS creates a powerful pedagogical construct, where the technological platform becomes a conductor of cultural norms and provides a supportive, evolving environment for their assimilation.

Traditional educational project work often encounters a number of systemic problems that hinder the formation of an integrated project culture:

1) *Information fragmentation* – project data (tasks, deadlines, documents) are dispersed among participants across messengers, email, and local files. This makes it difficult to track the current version of the project passport and plans, hinders the formation of a unified project picture among participants, and complicates access to up-to-date document versions for all project participants.

2) *Dominance of "paper" culture* – documents such as the project passport and plans are created in text editors "for the report," which makes it impossible to understand the project's current state at any given moment or conduct analytics. Approving documents in paper form often leads to a loss of understanding of the final document's signing process.

3) *Lack of monitoring and reflection tools* – students, supervisors, and teachers are deprived of the ability to see project progress, participant workload, and emerging risks in real time. This hinders timely adjustment and analysis, and most importantly, interferes with timely educational interventions.

4) *Oversimplified model* – project activities are often reduced to substantive work, bypassing the critically important processes of initiation, planning, formal coordination, and control characteristic of real-world practice.

EPMIS, developed on the basis of the "Digital Resource" information system, was designed as a direct response to these challenges. Its functionality is structured as an end-to-end project management cycle:

1) *Project portal and personal account* – centralizes information, creating a single entry point. The student sees their roles, tasks, and project statuses, forming a habit of systematic work.

2) *Project proposal initiation and approval module* – students fill out a structured electronic form that obliges them to elaborate the problem area, goals, indicators, results, budget, and risks from the very start. The built-in approval workflow with the curator simulates the real process of defending an idea before a stakeholder.

3) *Project passport module* – after the project proposal is approved, the core information is automatically transferred to the project passport — the main document. Here, functionality for team formation with role distribution is added. The project's complexity is automatically calculated based on the entered parameters, which develops analytical skills and an objective assessment of the work's scale.

4) *Project management plan module* – for the approved passport, the team develops detailed plans. The system ensures data continuity, minimizing routine rewriting, and focuses efforts on the substantive planning of tasks, deadlines, and resources. It highlights time gaps and risks identified during planning. At this stage, a unified space for collaboration on the project emerges for all team members. All project participants listed in the project passport see the project under their EPMIS account in accordance with their assigned role. Thus, the project manager and administrator can edit all plans under development, while team members can view them in real time.

5) *Document management and reporting system* – all forms (proposal, passport, PMP) function simultaneously as digital registers and templates for generating printed versions. This instills a culture of working in a digital environment and with document versioning.

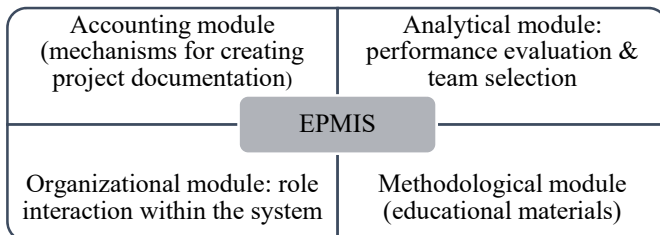


Fig. 1. EPMIS components

Figure 1 shows the components of EPMIS. The tracking module contains the functionality of a PMIS, i.e., it enables the development of the project plan and passport, including tasks, stages, and deadlines, with subsequent visualization; resource control and task allocation; monitoring task deadlines; evaluating the project budget; generating reports; and analyzing risks. The organizational module includes units for communication, feedback, notifications, and role interaction. The analytical module is responsible for automating the evaluation of project documentation, team selection, and individualization of educational content. The methodological module contains educational content, presented in various forms and divided according to project stages.

The introduction of EPMIS as a tool for developing project culture has an impact on value orientations, intellectual potential, and the focus of activity, revealing the level of project culture of the subject.

The transparency of procedures for creating and approving documents fosters respect for regulations. The need to clearly formulate goals and indicators before starting work reinforces the value of planning and the measurability of the result. The automatic calculation of complexity and the public visibility of the project status cultivate responsibility and adequate self-assessment. Tracking team formation, role assignment, and project progress fosters an understanding of collective responsibility.

Skills in strategic planning and goal-setting are developed through the structure of document forms, which compel movement from an abstract idea to concrete, measurable, and time-bound tasks. EPMIS teaches how to document and work with digital artifacts, recognizing the importance of maintaining a hierarchy of interconnected digital records, which aligns with modern project management standards. Knowledge about a specific project management tool appears at the moment of need, which increases the value of studying these tools. The necessity to work with indicators, assess risks and opportunities, and use various summaries and dashboards develops systematic and critical thinking.

Visualizing the entire project lifecycle in one space provides a unique opportunity for retrospective analysis — what was planned, what was changed and why, and what difficulties arose. This is the foundation for professional reflection and learning from experience. The section for recording the project's experiences and lessons learned makes it impossible to bypass this final stage of the project.

The introduction of EPMIS into the educational process of the RANEPА Project School has yielded initial qualitative results. Project team members (students) note a significant simplification of documentation processes and increased clarity regarding their tasks and work stages. Chaotic file sharing disappears, and transaction costs for communication decrease. For teachers and supervisors, the system has provided a tool for high-level monitoring of projects, allowing them to objectively assess progress and provide timely support to students.

The key achievement is the observed shift in students' mindset: the project ceases to be a "homework assignment" and begins to be perceived as a managed process with clear rules, intermediate results, and formal responsibility. EPMIS acts as a "coach," disciplining activities and making the invisible norms of project culture visible and binding.

III. CONCLUSION

The analysis conducted suggests that a specially designed project management module within an educational environment represents a highly effective tool for developing the project culture of university students. By integrating the cultural and setting-incremental approaches, EPMIS is transformed from an automation tool into a pedagogically enriched environment that:

1) Structures project activities in accordance with the professional standards and methodologies of the RANEPА Project School;

2) Progressively and incrementally increases the complexity of student interaction with the project through immersion in the environment, facilitated by the roles performed and the scale of the project;

3) Contributes to the assimilation of the values, norms, and practices of project culture through daily work in a collaborative digital team environment.

Thus, EPMIS constitutes an effective tool that assists students in acquiring relevant knowledge, developing practical skills, and preparing for work in an authentic professional environment, while simultaneously streamlining the process of supporting student projects for methodologists. Such an environment ensures accessibility, interactivity, material relevance, and ease of use, thereby rendering the learning process more productive and efficient. The RANEPА experience demonstrates that such systems possess high potential for transfer to other educational institutions, and the development and scaling of similar digital environments appear to be among the most promising avenues for bridging the gap between academic education and the actual requirements of a project-oriented economy.

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