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Convergence of Methodologies: A Comparative Analysis of Project Management Practices in Information Technology and Education

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Abstract

In the context of large-scale digital transformation, management paradigms are converging across traditionally heterogeneous sectors—information technology (IT) and education. The aim of the study is a comparative analysis of project methodologies, key competencies of managers, and risk profiles in these domains, with the identification of patterns of their divergence and convergence. The methodological basis includes a systematic review of scholarly publications, comparative analysis, and a case study grounded in empirical data on the activities of project managers in both sectors. The results demonstrate that, despite fundamental differences in project objectives and stakeholder configurations, both industries are shifting toward a hybrid management continuum: the IT sector augments the flexibility of Agile approaches with elements of formalized control, whereas education integrates Agile principles to enhance the adaptability of traditional processes, including curriculum development. It is established that competency and risk profiles remain context dependent, requiring managers to apply different proportions of technical, behavioral, and strategic skills. The study concludes in favor of the hypothesis of methodological convergence, driven by common external factors. The material is addressed to the academic community, project leaders, and administrators of educational organizations focused on optimizing the management of complex initiatives in a digital environment.

Keywords

project management, Agile, Scrum, Waterfall, information technology, education, curriculum development, project manager competencies, risk management, hybrid methodologies.

Introduction

Global digital transformation is not merely a set of technological innovations, but a mechanism of profound structural shift that redefines the logic of industry operations, blurs intersectoral boundaries, and forms a unified operational platform [1]. Under these conditions, organizations, including universities, are compelled to rethink business models and managerial practices in order to maintain competitive positions and meet new environmental requirements [2, 3]. Against this backdrop, project management acquires the status of a key instrument for implementing strategic change — from software development to the modernization of academic programs. The relevance of the topic is driven by the convergence of previously divergent development trajectories in IT and

education: both spheres operate under similar regimes of volatility, uncertainty, complexity, ambiguity (VUCA) [4].

Empirical data and forward-looking assessments record an acceleration of these processes. In 2024, there will be large-scale integration of artificial intelligence technologies into project activities: 54% of organizations use generative AI in 16–50% of implemented projects [5]. Expectations for 2025 confirm the further strengthening of AI's role in automating routine functions — primarily planning and reporting — and the consolidation of hybrid formats of work and management organization [6]. These trends are universal in nature, equally affecting the technology sector and the system of higher education, which are compelled to adapt to remote and blended formats of learning and work [7, 8].

Despite a growing body of publications on the application of project management (PM) methods in IT and in the education system, a substantial scholarly gap remains: there is no holistic comparative analysis that traces the mechanisms of methodological adaptation and mutual borrowing between these domains [9, 11]. The predominant share of studies examines the industries separately, ignoring the fact that their development trajectories are synchronously shaped by similar exogenous drivers.

The purpose of this study is to conduct a comparative analysis of methodological frameworks for project management, core competencies of project leaders, and configurations of risk profiles in IT and education, in order to identify stable patterns of divergence and convergence.

The scientific novelty lies in the development of a conceptual model of methodological convergence, demonstrating how both sectors, starting from fundamentally different initial points, converge toward a shared hybrid continuum of project management practices.

The proposed hypothesis is that, despite differences in project objectives and the diversity of stakeholder environments, the pressure of digital transformation induces a convergence of managerial practices in IT and education toward a unified hybrid model that combines the adaptability of Agile with the normative-structural elements of traditional approaches.

Materials and methods

This study relies on a qualitative research strategy that integrates several mutually complementary analytical procedures in order to achieve depth and integrity in the interpretation of data.

First, a systematic literature review was conducted, encompassing peer-reviewed articles, monographs, and industry reports for 2020–2025. The corpus of sources was assembled from authoritative indexes (Scopus, Web of Science) and catalogs of leading publishers (in particular, Springer, IEEE, MDPI), which made it possible to consolidate contemporary theoretical and empirical perspectives on project management practices in the sectors under analysis.

Second, a comparative analysis was applied, aimed at juxtaposing basic methodological frameworks (for example, Waterfall and Agile), their key components and process contours, as well as the competence and risk profiles characteristic of IT and educational projects. This operationalization of comparison revealed both invariant elements and industry-determined differences.

Third, a case-study design was employed. The empirical basis consisted of information provided on the professional trajectory of a project manager who successively led initiatives for the development of educational materials (creation of textbooks and applications with elements of augmented reality) and in an international IT company

(optimization of business processes, implementation of an HR platform). The unique double optics provides a rich context for illustrating theoretical propositions and testing the research hypothesis, demonstrating the practice of adapting management approaches during cross-sectoral transitions.

Results and discussion

Historically, the evolution of project management in IT and in the education, system followed different trajectories, driven by the specifics of their products and the configuration of the external environment. IT projects, primarily in software development, operate under high requirements uncertainty and a rapidly changing technological context. These features have encouraged the adoption of iterative and adaptive approaches such as Agile, Scrum, and others, where the key principle is the rapid delivery of a working increment through short cycles (sprints) and continuous collection of user feedback [9, 10]. Value is accumulated stepwise, and success criteria are aligned with implemented functionality and customer satisfaction.

In educational projects, for example in the design of curricula or the development of a new course, a more linear, waterfall logic has been historically established. The life cycle of such initiatives is structured into sequential and clearly delineated stages: needs analysis, design, content development, implementation, and subsequent evaluation of results [20]. The product is an organized educational experience, and the outcome — an increase in learners' knowledge and competencies — is less tangible and harder to measure within short iterations [22].

A noticeable dividing line also runs along the stakeholder landscape. In IT projects, the core of stakeholders is often limited to the client, the development team, and end users, whose feedback directly shapes the contours of the product [9]. In education, a multilayer ecosystem of participants operates: students, instructors, administration, accreditation bodies, relevant ministries, parents, and employers of future graduates. Each group has its own understanding of success, often mutually exclusive, which complicates the alignment of expectations and the development of unified evaluation metrics [4].

Despite all differences, digital transformation creates a zone of convergence. The scaling of educational technologies (EdTech), online platforms, and digital learning materials effectively shifts a significant share of educational initiatives into the category of quasi-IT projects, for which similar principles of development and implementation are appropriate. The comparison of methodological approaches in these two domains is summarized in Table 1.

Table 1. *Comparative characteristics of Waterfall and Agile methodologies in the context of IT and educational projects (compiled by the author based on [9]).*

Criterion	IT project (Waterfall)	Educational project (Waterfall)	IT project (Agile)	Educational project (Agile adaptation)
Approach to planning	Detailed planning of all phases at the initial stage.	Sequential planning: from concept to curriculum rollout.	Iterative planning, adaptation at each sprint.	Module/topic-based planning, flexible adjustment of content.
Flexibility of requirements	Low. Changes are costly and complex.	Low. The curriculum is approved for a long term.	High. Changes are welcomed at any stage.	Moderate. Adaptation of teaching methods is possible, but not of foundational objectives.
Delivery cycle	One-time delivery of the finished product at the end of the project.	Program rollout at the beginning of the academic year.	Frequent deliveries of working increments (every 2–4 weeks).	Pilot implementation of individual modules, collection of feedback from students.
Key metrics	Conformance to budget, schedule, and the initial technical specification.	Compliance with educational standards, successful accreditation.	Team velocity, user satisfaction, business value.	Student engagement, academic performance, satisfaction with learning.
Stakeholder engagement	Formalized, at key milestones (acceptance).	Approval at the level of boards and committees.	Continuous, daily interaction with the product owner.	Regular feedback from student and faculty focus groups.

The growing need to rapidly reconfigure educational programs in response to shifting labor market demands and technological shifts is prompting universities and schools to adopt, in a considered manner, flexible methodologies that have emerged in the IT environment [11]. This is not a mechanical transfer but a creative translational effort to implement Agile principles and artifacts in a pedagogical context. In the Scrum logic, the product backlog is redefined as the course backlog, where thematic blocks, expected learning outcomes, and drafts of assignments are systematically recorded; sprints are interpreted as cycles for developing individual modules; and the role of Product Owner is assumed by the lead instructor or the head of the educational program [21, 23].

The textbook development case demonstrates the effectiveness of such a hybrid solution. A project to produce more than 50 textbooks and 11 AR applications for the NIS system was organized within a paradigm close to Agile: cross-functional teams (authors, editors, designers, AR developers) carried out the work, which ensured a high

degree of interdisciplinary coordination. Instead of a long linear cycle, an iterative model was used: two textbooks were released into a pilot and received approval from the National Committee — a de facto analogue of Sprint Review with targeted feedback from stakeholders. In parallel, training sessions were conducted for more than 80 authors and editors, serving as regular retrospectives and enabling the enhancement of content quality. The outcome was external validation — an award at the EdCrunch Award conference, which attests to the high effectiveness of the adapted flexible practices.

The advantages of the approach manifest at several levels: student engagement as co-participants in the educational process increases, the quality of interaction within the course development team improves, and the capacity to respond promptly to environmental changes grows [26]. At the same time, the transfer of Agile into the academic ecosystem encounters cultural constraints. The university tradition relies on thoroughness, detailed planning, and rigorous expertise, which stands in a tense relation to the principles of fail fast and the priority of a working product over comprehensive documentation [27, 28]. Alleviating this tension requires a transformation of mindsets both within the managerial hierarchy and among the faculty.

Project performance in any domain is largely determined by the quality of the managerial competencies of its leader. The set of universal soft skills—leadership, persuasive communication, emotional intelligence, and problem-oriented thinking—constitutes a necessary condition for success in both IT and education [6]. At the same time, the balance of technical, behavioral, and contextual-strategic competencies systematically varies with industry specifics, as confirmed by empirical evidence [29, 30].

A comparative case-study analysis demonstrates this differentiation. In an IT company, the project manager was tasked with institutionalizing management through the establishment of a project management office (PMO) to standardize processes, coordinating the selection of an HR-platform vendor, and implementing a cost-reduction initiative. The attainment of target indicators here relied primarily on advanced technical competencies (proficiency with PMO methodologies and the principles of expert evaluation of software solutions) and on higher-level contextual competencies—strategic understanding of the business and the ability to provide financial-analytical interpretation of effects. In the educational project on the development of textbooks, the manager's focus shifted to organizing the work of the author team, negotiating the acquisition of copyrights to more than 250 illustrations, and introducing marketing approaches. Within this logic, behavioral competencies became dominant (managing a creative team, negotiation practice), underpinned by specialized technical knowledge in pedagogical design and the publishing process. The integrated matrix of key competencies is presented in Table 2.

Table 2. *Competency matrix of a project manager for IT and education (compiled by the author based on [30-32]).*

Type of competencies	IT domain	Education domain
Technical	Knowledge of the software development life cycle (SDLC), cloud platforms, CI/CD, and systems architecture. Proficiency with Jira and MS Project.	Principles of instructional design, curriculum development technologies, work with LMS (Moodle, Canvas), SCORM standards.
Behavioral	Management of cross-functional teams (developers, QA, DevOps). Facilitation of Scrum ceremonies. Conflict management under tight deadlines.	Management of teams of authors and subject-matter experts. Negotiation skills (e.g., on copyright). Motivation of academic staff.
Contextual	Understanding of the company business model, market analysis, product management, strategic planning of IT infrastructure.	Understanding of educational standards and regulatory requirements. Labor-market analysis to define learning objectives. Interaction with academic councils.

Risk profiles exhibit pronounced sectoral differentiation. For IT projects, technological threats prevail: volatility and rapid drift of requirements, instability of the employed technology stacks, high integration complexity, and cybersecurity vulnerabilities. In educational projects, pedagogical risks dominate (misalignment of the curriculum with learning objectives), institutional risks (inertia and resistance of instructors, bureaucratic barriers, insufficient managerial support), and implementation risks driven by the low level of digital literacy of end users — students and instructors. A comparison of the criticality of the specified risks is presented in Figure 1.

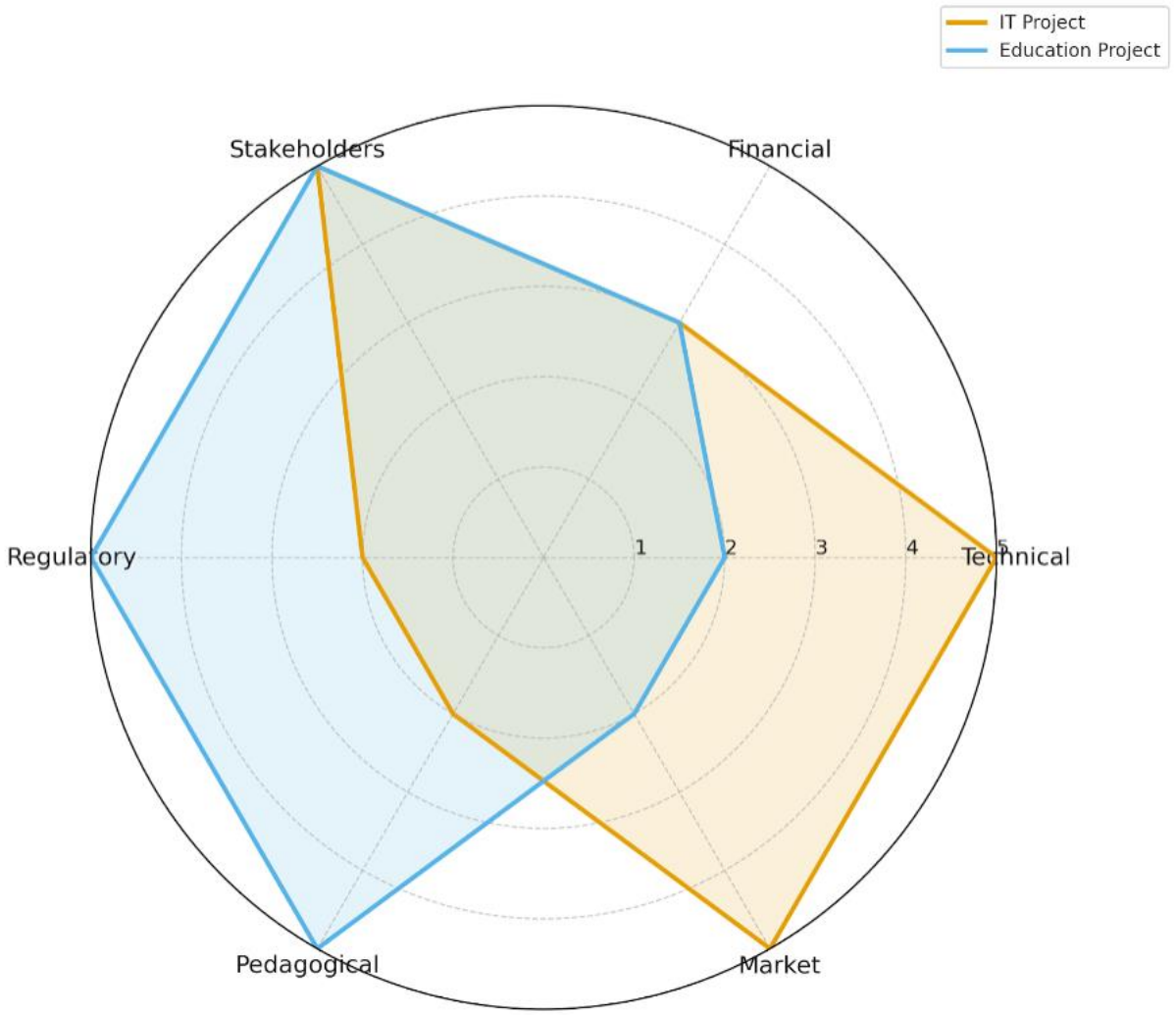

Fig. 1. Diagram comparing the criticality of project risks in IT and educational projects (on a scale from 1 to 5) (compiled by the author based on [13, 14, 30]).

Current observations of practices in both domains show that both IT and education are gradually moving away from polar methodological stances and are converging within a common hybrid field. Building on accumulated experience with Agile, the IT industry has placed on the agenda the scaling of flexibility to the level of the entire organization. This requires measured institutionalization — the introduction of elements of formalized governance for the sake of predictability, controllability, and strategic alignment. Case evidence demonstrates this shift: the deployment of a Project Management Office (PMO) in an IT company serves as a direct indicator of movement toward standardization and centralization, consistent with the logic of frameworks such as PMBOK [15, 17]. A PMO ensures the embedding of individual initiatives into corporate strategy and the management of the project portfolio — beyond classical Scrum, which is oriented predominantly to the level of a single team [16, 19].

At the same time, the education system is actively appropriating Agile tools, seeking to overcome the inertia and inflexibility of traditional waterfall models [4]. As a result, a counter movement toward a hybrid middle is taking shape: IT complements flexibility with the necessary structure, whereas education introduces elements of flexibility into initially structured processes.

The convergence is reinforced by universal technological trends. The integration of AI to automate project management tasks (report preparation, resource allocation), the use of advanced data analytics in support of managerial decision-making, and the institutional strengthening of strategic PMOs form a shared technological and managerial language that smooths interindustry differences [7]. A conceptual schema of this process is presented in Figure 2.

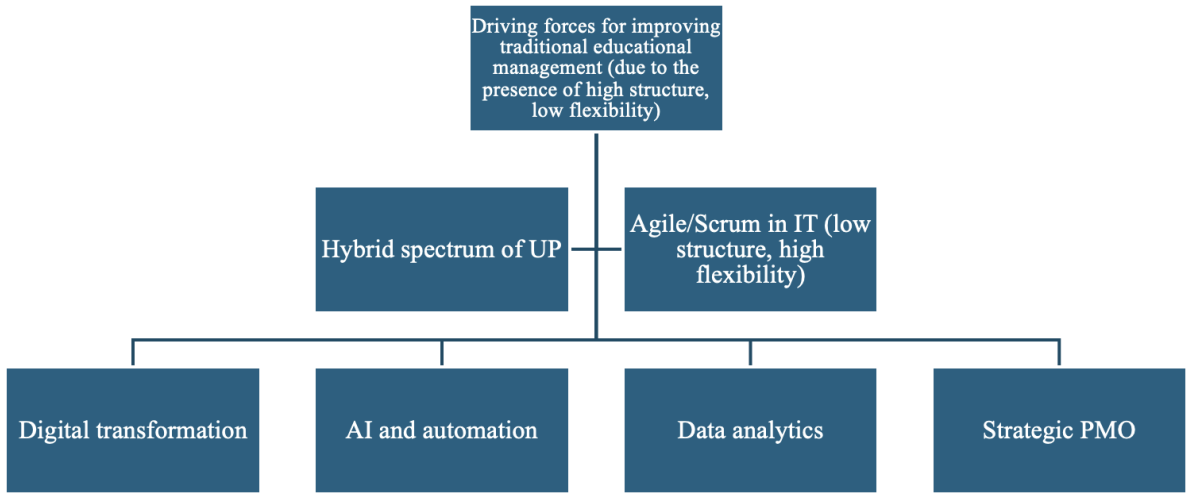

Fig. 2. Conceptual model of convergence of project management practices in IT and education (compiled by the author based on [7]).

The assessment of the expected impact of leading technological trends on project management practices in both domain areas is summarized in Table 3.

Table 3. *Forecast of the impact of key technological trends (2025+) on project management in IT and education (compiled by the author based on [5, 15, 18]).*

Technological trend	Impact on PM in IT	Impact on PM in education
Generative AI	Automation of code writing, test scenarios, and project documentation. Creation of user interface prototypes.	Automatic generation of drafts of instructional materials, test items, and lesson plans. Personalization of educational trajectories.
Advanced data analytics	Predictive modeling of project schedule and budget. Real-time identification of bottlenecks in the development process.	Analysis of student performance data to identify dropout risks. Evaluation of the effectiveness of different pedagogical methods.

Strategic PMO	Management of the portfolio of IT projects in alignment with business objectives. Centralized enterprise-level management of resources and risks.	Coordination of interdisciplinary educational projects. Ensuring the compliance of new programs with the university strategic goals and accreditation requirements.

Taken together, the analysis demonstrates that the historically divergent trajectories of project management in IT (the iterative–adaptive logic of Agile) and in education (the linear–cascading logic of Waterfall) are converging in a hybrid zone under the pressure of digital transformation: EdTech initiatives are turning part of educational projects into quasi-IT, where sprints, a course backlog, and piloting cycles operate, as confirmed by the successful case of developing NIS textbooks and by external validation; at the same time, the sectors retain distinct profiles of stakeholders, managerial competencies, and risks (technological and market in IT; pedagogical, institutional, and regulatory in education). The effectiveness of hybridization is determined not by the mechanical borrowing of Scrum artifacts, but by their translation into the academic context, reinforced by managerial soft skills and selective institutionalization (PMO, portfolio standardization), which in IT increases predictability at the enterprise level, and in universities aligns programs with accreditation and the labor market. The key tension is the cultural conflict between the academic commitment to stability and the principles of fast cycles, resolved through regular retrospectives, focus groups, and adaptive metrics (engagement, academic performance, satisfaction) in addition to traditional indicators. On the 2025+ horizon, generative AI, advanced analytics, and strategic PMOs are forming a shared managerial language, automating routine work, strengthening predictiveness, and linking project decisions to organizational strategy.

Conclusion

The conducted study made it possible to formulate a set of key theses that simultaneously confirm the initial hypothesis and demonstrate the multilayered nature of processes that arise at the intersection of project management in IT and education.

First, it shows a fundamental divergence of the initial managerial paradigms of the specified domains. The IT industry has historically relied on iterative, adaptive models designed for the development of a tangible product under conditions of high uncertainty, whereas educational practice traditionally follows linear, regulated schemes oriented toward the formation of an intangible outcome — educational experience and competence changes.

Second, it has been established that the transfer of Agile approaches into the educational context is not reducible to direct borrowing. It concerns a complex cultural and terminological adaptation that encounters the institutional constraints of the academic environment and requires a redefinition of participant roles and procedures in the design of educational initiatives.

Third, comparative analysis revealed that despite the universality of flexible skills, the profiles of critically important competencies of managers and the contours of key risks retain pronounced contextual specificity. In IT, success is to a greater extent determined by technical and market knowledge, whereas in education pedagogical, organizational-institutional, and regulatory factors dominate.

The final conclusion is consistent with the advanced hypothesis: under the influence of shared challenges of digital transformation, project management practices in IT and education exhibit a stable tendency toward convergence. Both sectors are shifting toward a hybrid spectrum of models, seeking a balanced equilibrium between adaptability

and formalized structure.

The practical value of the work lies in the applicability of the results for managers undertaking cross-sector transitions, for heads of project offices in the development of context-adapted methodologies, and for administrators of educational organizations optimizing the management of complex programs of modernization and digitalization.

As subsequent directions, it is advisable to pursue: quantitative verification of the effectiveness of hybrid models in educational projects, analysis of the impact of artificial intelligence tools on the productivity of project teams in both domains, as well as an in-depth study of the evolution of the role of the project manager under conditions of pervasive automation.

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