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COMPETENCY ASSESSMENT MODEL FOR PROJECT SPECIALISTS IN THE CONTEXT OF DIGITALIZATION

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ABSTRACT

The effectiveness of project management is largely determined by the quality of human capital and the set of competencies that ensure successful implementation of project tasks. This study aims to analytically identify and structure key characteristics of human resources in order to define priorities for forming project teams and distributing functional workload within project offices. Traditional statistical models typically consider competencies in isolation, which limits their applicability in multidimensional and interconnected managerial processes.

The methodological basis of the study includes content analysis of labor market requirements presented in job vacancies on the hh.kz platform and a comparative analysis of employers' practice-oriented expectations and the normative competency model IPMA ICB v4. To analytically interpret the interconnections between the identified competencies, the DEMATEL method is used as a conceptual framework that allows competencies to be viewed as elements of a single system.

The study results show that the labor market emphasizes such characteristics as motivation, adaptability, innovative thinking, professional training, and the ability to maintain work–life balance, which form the foundation for effective functioning of project teams. At the same time, competencies related to interaction management, conflict resolution, and stakeholder communication appear mainly as a response to organizational and contextual conditions.

The findings highlight the need to apply systemic approaches to competency assessment and development in a project environment. Integrating structured analytical tools into project office management practice increases the soundness of managerial decisions and the effectiveness of forming project teams.

Keywords: human capital; project management; content analysis; competency-based approach; DEMATEL; project team formation; organizational effectiveness

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INTRODUCTION

In modern project-oriented structures, effective human capital management—especially at the analytical stages of planning—acts as a key factor in achieving organizational strategic goals. The implementation practice of innovation and R&D projects demonstrates a consistently high failure rate, a substantial portion of which is caused by resource allocation conflicts and insufficient coordination among project team members (Bader et al., 2024; Dong & Qiu, 2024). Previous studies show that a significant share of cross-functional initiatives does not reach the stage of practical implementation, indicating systemic issues in project activity management (James & Frank, 2015).

Numerous studies confirm that project viability and performance largely depend on the human factor, including the level of professional training, motivation, and behavioral characteristics of project team members

(Amiri et al., 2021; Lin & Lu, 2023; Salih et al., 2022; Wuni et al., 2022). Destructive processes such as inefficient allocation of functional tasks, mismatch between competencies and project requirements, and schedule violations lead to higher costs, lower efficiency and overall stagnation of project activity (Abdullahi et al., 2022; Deselnicu et al., 2023; Sundararajan & Madhavi, 2023; Vrchota & Rehoř, 2021). In a broader context, such phenomena negatively affect socio-economic development and macroeconomic indicators (Chiriță et al., 2021).

Academic literature reflects a stable consensus that integrative and systemic approaches to human capital management outperform linear models focused on isolated assessment of individual staff characteristics (James & Frank, 2015; Romulo et al., 2022). At the same time, the question remains open as to how the set of competencies of project management specialists can be structured and interpreted given their interconnected nature and the practical requirements of the project environment (Amiri et al., 2021; Barak & Dahooei, 2018; Yazdani et al., 2019).

Traditional statistical methods and some multi-criteria decision-making techniques such as AHP, SWARA, and BWM usually aim to produce aggregate scores and assume relative independence of factors, which limits their applicability when studying complex human-capital systems in project activity (Estiri et al., 2021). Under high uncertainty and the dynamic nature of project environments, team performance is shaped not by single competencies but by their interaction and mutual reinforcement.

In this context, it is relevant to apply the systemic logic underlying DEMATEL (Decision-Making Trial and Evaluation Laboratory), which in this study is considered as an analytical and conceptual framework. This approach makes it possible to interpret competencies as elements of an interconnected system and to analyze the potential direction of influences among them without numerical modeling (Estiri et al., 2021; Sun, 2021). Unlike approaches focused on identifying isolated priorities, a systemic approach provides a more holistic understanding of human capital structure and the conditions for forming effective project teams.

Based on the above, the goal of this research is to analytically identify and structure key competencies of project management specialists by considering labor market requirements and international normative standards. The study includes content analysis of vacancies on hh.kz, as well as a comparative analysis of employers' practice-oriented requirements and the IPMA ICB v4 competency model. The results aim to form a systemic view of project team competencies and provide an analytical basis to enhance human capital management in project-oriented organizations.

Methodology

This study applies an integrated methodological approach aimed at forming, structuring, and analyzing the system of competencies necessary for effective formation and functioning of project teams. The research methodology combines analysis of labor market requirements, comparison with international normative standards, and the use of analytical/system approaches, enabling a transition from a descriptive list of competencies to their structured interpretation within project management.

At the first stage, an initial list of competencies demanded for forming project teams was developed. For this purpose, a content analysis of vacancies posted on hh.kz was conducted for the positions of Project Manager, PMO Specialist, Team Lead, and related roles. The hh.kz platform was chosen as a representative source reflecting practical labor market requirements in the Republic of Kazakhstan

As a result, key groups of competencies were identified, including professional (hard skills), communication, leadership, team skills, digital competencies, HR competencies, and personal (soft skills). These competencies were systematized in terms of how they appear in employer requirements and their significance for forming sustainable and effective project teams. The structured list of competencies used as the analytical basis of the study is presented in Table 1.

Table 1 - Set of Project Team Competencies Based on Labor Market Analysis in Kazakhstan (hh.kz)

| № | Competency Group | Specific Competencies | How it appears in hh.kz vacancies | Significance for project team formation |
|----|--------------------------------------|---|---|---|
| 1 | Hard Skills | Project life-cycle management (Scope, Time, Cost) | Requirement of project management experience; PMBOK / Agile / Scrum | Enables team structuring and role distribution |
| 2 | | Schedule planning and control | Ability to work with plans, deadlines, KPIs | Helps select participants under time constraints |
| 3 | | Analytical skills | Risk/resource analysis; team workload analysis | Key for forming a balanced team |
| 4 | Communication Competencies | Business communication | Interaction with clients, stakeholders, team | Critical for coordination and conflict prevention |
| 5 | | Team facilitation skills | Meetings, retrospectives, working sessions | Strengthen cohesion and efficiency |
| 6 | | Negotiation skills | Aligning deadlines, resources, requirements | Increases team stability under pressure |
| 7 | Leadership Competencies | Leadership and motivation | Team leadership; employee engagement | Determines team stability throughout the project |
| 8 | | Decision-making | Responsibility under uncertainty | Key factor of team effectiveness |
| 9 | | Conflict management | Resolving disagreements | Reduces risk of team breakdown |
| 10 | Team Skills | Team collaboration | Experience in cross-functional teams | Creates competency synergy |
| 11 | | Role allocation | Defining roles (PM, analyst, developer, etc.) | Critical for project team formation |
| 12 | | Maintaining team climate | Building trust and openness | Increases productivity |
| 13 | Digital Competencies | Using digital tools | Jira, Trello, MS Project, Bitrix24 | Necessary for remote/hybrid teams |
| 14 | | Digital communication | Online meetings; digital platforms | Improves transparency |
| 15 | HR competencies (in projects) | Recruitment and assessment | Participation in project team staff | Enables competency-based selection |
| 16 | | Performance assessment | Performance review, KPI | Supports team development |
| 17 | | Adaptation and development | Training and onboarding | Improves team sustainability |
| 18 | Soft Skills | Flexibility and adaptability | Readiness for change | Key under project uncertainty |
| 19 | | Responsibility and initiative | Independence | Increases autonomy |
| 20 | | Stress tolerance | Working under pressure | Affects team stability |

Source: compiled by the authors based on hh.kz data.

At the second stage, a comparative analysis was conducted between the practice-oriented labor market requirements and the normative competency model presented by the international standard IPMA ICB v4 (International Competence Baseline). The goal of this stage was to identify methodological differences in how competencies of project management specialists are formed, structured, and assessed.

The analysis showed that requirements in hh.kz vacancies are mainly functional and applied, typically formulated as expected experience and skills. In contrast, IPMA ICB offers a holistic and formalized system of competencies structured across People, Practice, and Perspective. The comparative analysis, including differences in formalization level, assessment approaches, and applicability in education, is presented in Table 2.

Table 2 - Comparative Analysis of Labor Market Requirements (hh.kz) and the IPMA ICB v4 Competency Model.

| Comparison criterion | hh.kz (Kazakhstan labor market) | IPMA ICB (International Competence Baseline) | Analytical conclusion |
|---|---|---|--|
| Source of requirements | HeadHunter (hh.kz): analysis of vacancies (Project Manager, PMO, Team Lead) | International Project Management Association — стандарт IPMA ICB v4 | hh.kz reflects practical demand; IPMA ICB is a normative model |
| Approach to competencies | Functional/applied; focused on results and experience | Systemic; competency-based | IPMA provides a holistic competency structure |
| Competencies structure | Not formally structured; presented as job requirements | Clear structure: People, Practice, Perspective | IPMA provides a holistic competency structure |
| Communication | Often stated as “communication skills”, “teamwork” | Core element of People (Communication, Engagement) | Full alignment in importance |
| Leadership | Team management experience required | Leadership is a core People competence | hh.kz confirms practical relevance of IPMA |
| Teamwork | Cross-functional team experience | Teamwork, Conflict & Crisis | Similar, but IPMA provides deeper detail |
| Conflict Management | Mentioned episodically | Structured competence | Understated in vacancies, critical in the standard |
| Digital competencies | Jira, MS Project, Bitrix24, Agile-инструменты | Digitalization embedded in Practice and Perspective | Market details tools more explicitly |
| Decision-making | Required under uncertainty | Decision-making as a People element | Full alignment |
| HR competencies (selection, evaluation) | Often required for PM/Team Lead | Indirectly through Leadership and Engagement | hh.kz more strongly stresses the PM’s HR role |
| Competency assessment methods | Not formalized (experience, interviews) | Assumes systematic competency assessment | Methodological gap exists |
| Team formation | Practical PM task | Embedded in People competencies | IPMA provides a scientific basis |
| Focus on project results | KPI, schedule, budget | Value, Governance, Strategy | IPMA expands focus to strategic value |
| Formalization level | Low | High | Integration is needed |
| Applicability in education | Indirect | Direct | IPMA ICB is suitable for curricula |

Source: compiled by the authors based on hh.kz and IPMA ICB v4.

The comparison confirms a methodological gap between practical labor market requirements and normative competency models, which justifies the need to integrate them when developing systemic approaches to assessing human capital in project activity.

To analytically interpret the relationships among the identified competencies, DEMATEL (Decision-Making Trial and Evaluation Laboratory) is used. The choice of this method is driven by its systemic logic, which allows interpretation of competencies as elements of an interconnected system. In this study, DEMATEL is applied as a conceptual and analytical framework to interpret the potential direction of influence among competency groups without numerical modeling and without calculating influence matrices

Thus, the proposed methodology integrates labor market analysis, international normative standards, and systemic interpretation tools, enabling a transition from descriptive competency listing to a structured analytical understanding within project management. This methodological approach forms the basis for interpreting results in the context of improving project team formation and performance.

Results

As a result of the content analysis of vacancies posted on hh.kz, key groups of competencies demanded for forming and operating project teams in a project-oriented economy were identified. The analysis shows that employers primarily focus on applied professional skills related to managing the project life cycle, schedule planning, resource control, and the use of common project management methodologies. These requirements are most often expressed through expected experience and the ability to perform specific project functions effectively

Alongside professional competencies, the labor market places significant emphasis on communication and teamwork skills. Vacancy descriptions regularly mention the ability to interact with stakeholders, conduct negotiations, coordinate cross-functional teams, and participate in collective decision-making. This indicates that employers associate project effectiveness not only with technical training but also with the ability to ensure alignment of actions and stable teamwork.

Digital competencies occupy a distinct place in the structure of labor market requirements, including proficiency in project management tools and digital collaboration platforms. Their systematic presence reflects the shift of project activity toward remote and hybrid work formats and highlights the need to integrate digital skills into specialist training. The full set of identified competencies and their significance for sustainable and effective project teams are summarized in Table 1

Additional results were obtained through comparing labor market requirements and the IPMA ICB v4 model. The analysis shows that hh.kz requirements are primarily functional and applied, oriented toward short-term performance and operational readiness. In contrast, IPMA ICB v4 offers a holistic and formalized system of competencies structured across People, Practice, and Perspective, implying a systemic approach to development and assessment that includes professional, behavioral, and contextual dimensions.

Despite differences in formalization and presentation logic, the labor market requirements and IPMA ICB v4 overlap substantially in core areas such as leadership, communication, teamwork, and decision-making. At the same time, market requirements less strongly reflect long-term competency development and systematic assessment, which indicates a methodological gap between practice and normative models. The main results of this comparison are shown in Table 2.

Overall, the results support viewing competencies not as an isolated list of attributes but as elements of an interconnected system that shapes project team effectiveness. Using the systemic logic underlying DEMATEL makes it possible to interpret the identified competencies in terms of their functional role in project activity. Competencies such as motivation, adaptability, innovative thinking, and professional training form baseline conditions for the manifestation and development of other skills, including communication, interaction management, and team coordination. Competencies related to conflict resolution and stakeholder interaction are more dependent on organizational context and project implementation conditions.

Thus, the results confirm the relevance of moving from a fragmented approach to competency assessment toward systemic analytical interpretation, providing a basis for more grounded project team formation and improving human capital management practices in project-oriented organizations.

Discussion

The results confirm that the effectiveness of forming and operating project teams is determined not by individual competencies but by the system of their interconnections, which aligns with studies that consider human capital a complex socio-organizational system (Tsai, 2018; Tooranloo et al., 2017). Applying the systemic logic underlying DEMATEL allowed an analytical interpretation of the architecture of potential interconnections between human-capital characteristics and demonstrated that different competency groups may play different functional roles in project activity (Estiri et al., 2021).

The analysis indicates that motivation, innovativeness, adaptability, and the ability to maintain work–life balance form baseline conditions for effective project team functioning. Similar conclusions about the leading role of behavioral and psychological factors in project environments are reported in studies on HRM in project-based organizations (Isac & Waqar, 2016; Lin & Lu, 2023). Developing these competencies creates conditions for more stable manifestation of other skills, including communication, teamwork, and decision-making.

At the same time, competencies related to objectivity, impartiality, and certain aspects of social responsibility appear more as responses to the quality of managerial practices and the maturity of the project environment, which is consistent with research in organizational behavior and leadership (James & Frank, 2015; Sundararajan & Madhavi, 2023).

Comparing the conclusions with labor market requirements (Table 1) shows that employers intuitively emphasize a number of key competencies but generally do not use formal tools to assess their systemic interaction. This aligns with studies identifying the gap between practical HR requirements and normative competency models (Romulo et al., 2022). This confirms the methodological gap between labor market requirements and the normative model IPMA ICB v4 (IPMA, 2015).

From an academic standpoint, the results are consistent with prior research emphasizing the importance of behavioral and psychological factors in human capital effectiveness, while extending existing approaches through systemic analysis of competencies in project contexts (Sun, 2021). Viewing competencies as elements of a connected structure allows moving from broad statements to applied managerial guidelines that reflect the specifics of project teams

The practical value of the study lies in the possibility of using the findings to support managerial decision-making in project office and HR units. A similar emphasis on systemic competency management is highlighted in contemporary studies on HRM and project performance (Wuni et al., 2022; Deselnicu et al., 2023).

In higher education and professional training for project management specialists, the results indicate the need to move from fragmented skill formation to systemic competency development, consistent with recommendations in international standards and academic publications (IPMA, 2015; Lin & Lu, 2023).

CONCLUSION

This study examined multifaceted dependencies between human-capital characteristics in project-oriented structures by using the systemic logic of DEMATEL to analytically interpret project team formation processes. The conclusions confirm the importance of implementing a structured and systemic approach to HR management, showing that project team productivity is determined by an integrated combination of qualifications, engagement, adaptability, and professional mobility.

The study demonstrates the need for a comprehensive approach to workforce planning in which recruitment, training, and professional development processes are aligned with both individual competencies and the strategic goals of the project office. Effective coordination of group interaction, open information flows, and continuous knowledge updating form the basis for creating flexible and sustainable project teams

The findings also highlight the dynamic nature of workforce factors and their interconnected influence on project performance. Systemic human capital management contributes not only to higher individual contribution but also to creating organizational conditions for achieving key project goals. This confirms the relevance of analytically grounded management approaches aimed at competency development, increasing engagement, and supporting managerial decision-making in project environments.

Understanding the identified interconnections enables project office leaders to prioritize human capital development directions and concentrate management efforts on key performance drivers. Building a corporate culture that supports professional and expert growth enables more rational use of human resources and increases the probability of successful project implementation under uncertainty and high competition.

Despite the methodological significance of the results, the study has limitations. In particular, the analysis is based on content-analysis data and comparative examination of normative models, which limits the possibility of quantitative verification of the identified interconnections. In addition, the composition and interpretation of competencies may depend on industry and organizational specifics of project teams

Future research may expand the proposed analytical approach through empirical testing across different industries and organizations, as well as possible integration of quantitative modeling and digital analytics. A separate area of interest is how digital transformation and evolving work formats influence the development of human capital management systems in project-oriented organizations.

In summary, this study provides a conceptual basis for systemic understanding of project team formation and human capital development mechanisms. The conclusions may be used in designing management and educational solutions aimed at improving project management effectiveness in modern organizations

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ЦИФРЛАНДЫРУ ЖАҒДАЙЫНДАҒЫ ЖОБАЛЫҚ МАМАНДАРДЫҢ ҚҰЗЫРЕТТЕРІН БАҒАЛАУ МОДЕЛІ

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АҢДАТПА

Жобалық басқарудың тиімділігі көп жағдайда адами капиталдың сапасымен және жобалық міндеттердің табысты орындалуын қамтамасыз ететін құзыреттер жиынтығымен айқындалады. Осы зерттеу жобалық командаларды қалыптастыру және жобалық офистер шеңберінде функционалдық

жүктемені бөлу кезінде басымдықтарды анықтау мақсатында адами ресурстардың негізгі сипаттамаларын аналитикалық тұрғыда айқындауға және құрылымдауға бағытталған. Дәстүрлі статистикалық модельдер, әдетте, құзыреттерді оқшау түрде қарастырады, бұл олардың көпөлшемді және өзара байланысты басқарушылық үдерістер жағдайында қолданылу мүмкіндігін шектейді.

Зерттеудің әдіснамалық негізін hh.kz платформасында ұсынылған еңбек нарығы талаптарына жүргізілген контент-талдау, сондай-ақ жұмыс берушілердің практикалық бағдарланған күтулері мен IPMA ICB v4 нормативтік құзыреттілік моделінің салыстырмалы талдауы құрайды. Анықталған құзыреттер арасындағы өзара байланыстарды аналитикалық тұрғыда зерделеу үшін DEMATEL әдісі біртұтас жүйе элементтері ретінде құзыреттерді қарастыруға мүмкіндік беретін концептуалдық негіз ретінде қолданылды.

Зерттеу нәтижелері еңбек нарығы мотивация, бейімделгіштік, инновациялық ойлау, кәсіби даярлық және жұмыс пен жеке өмір арасындағы тепе-теңдікті сақтай білу сияқты сипаттамаларға басымдық беретінін көрсетеді. Аталған қасиеттер жобалық командалардың тиімді жұмыс істеуінің негізін қалыптастырады. Ал өзара әрекеттесуді басқару, қақтығыстарды шешу және стейкхолдерлермен коммуникацияға байланысты құзыреттер көбінесе ұйымдық және контекстуалдық жағдайларға жауап ретінде көрініс табады.

Алынған қорытындылар жобалық ортада құзыреттерді бағалау және дамыту барысында жүйелі тәсілдерді қолдану қажеттілігін айқындайды. Құрылымдалған аналитикалық құралдарды жобалық офистерді басқару тәжірибесіне енгізу басқарушылық шешімдердің негізділігін арттыруға және жобалық командаларды қалыптастырудың тиімділігін жоғарылатуға ықпал етеді.

Түйін сөздер: адами капитал; жобалық басқару; контент-талдау; құзыреттілік тәсіл; DEMATEL; жобалық командаларды қалыптастыру; ұйымдық тиімділік.

Қаржыландыру туралы ақпарат

Осы зерттеу Қазақстан Республикасы Ғылым және жоғары білім министрлігінің Ғылым және жоғары білім комитеті тарапынан қаржыландырылды (№ AP26102429 гранты «Қазақстан Республикасында жобалық менеджментті қолдану негізінде мемлекеттік басқаруда цифрлық жобаларды жоспарлау және іске асыру кезінде есептілік пен ашықтықты арттыру»).

МОДЕЛЬ ОЦЕНКИ КОМПЕТЕНЦИЙ ПРОЕКТНЫХ СПЕЦИАЛИСТОВ В УСЛОВИЯХ ЦИФРОВИЗАЦИИ

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АННОТАЦИЯ

Эффективность проектного управления во многом определяется качеством человеческого капитала и совокупностью компетенций, обеспечивающих успешную реализацию проектных задач. Настоящее исследование направлено на аналитическое выявление и структурирование ключевых характеристик человеческих ресурсов с целью определения приоритетов при формировании проектных команд и распределении функциональной нагрузки в рамках проектных офисов. Традиционные статистические модели, как правило, рассматривают компетенции изолированно, что ограничивает их применимость в условиях многомерных и взаимосвязанных управленческих процессов.

Методологическую основу исследования составляют контент-анализ требований рынка труда, представленных вакансиями на платформе hh.kz, а также сравнительный анализ практико-ориентированных ожиданий работодателей и нормативной компетентностной модели IPMA ICB v4. Для аналитического осмысления взаимосвязей между выявленными компетенциями используется

метод DEMATEL в качестве концептуальной рамки, позволяющей рассматривать компетенции как элементы единой системы.

Результаты исследования показывают, что рынок труда акцентирует внимание на таких характеристиках, как мотивация, адаптивность, инновационное мышление, профессиональная подготовка и способность поддерживать баланс между работой и личной жизнью, которые формируют основу эффективного функционирования проектных команд. В то же время компетенции, связанные с управлением взаимодействием, разрешением конфликтов и коммуникацией со стейкхолдерами, проявляются преимущественно в ответ на организационные и контекстуальные условия.

Полученные выводы подчёркивают необходимость применения системных подходов к оценке и развитию компетенций в проектной среде. Интеграция структурированных аналитических инструментов в практику управления проектными офисами способствует повышению обоснованности управленческих решений и эффективности формирования проектных команд.

Ключевые слова: человеческий капитал; проектное управление; контент-анализ; компетентностный подход; DEMATEL; формирование проектных команд; организационная эффективность.

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THE ROLE OF AI-BASED EDUCATIONAL PLATFORMS IN HUMAN CAPITAL BUILDING

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ABSTRACT

Purpose – This paper examines the relationship between AI-driven educational platforms, economic efficiency, and human capital formation in the context of digital transformation in education. It focuses on extra-curricular education and considers how AI-enabled personalization and gamification may contribute to more efficient learning processes and to the development of cognitive and non-cognitive skill

Methodology – The study adopts an exploratory analytical approach grounded in human capital theory and the economics of education. It uses a conceptual framework to assess an AI-based extracurricular learning

