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Enhancing project quality through effective team management

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Abstract:
This study aims to explore the relationship between team management and project quality, identify key contributing factors, and examine the role of employee involvement, commitment, and innovation. An empirical, cross-sectional study was conducted using an online survey to gather data from 510 respondents across various industries, projects, and experiences. Data analysis employed statistical techniques to reveal patterns and trends. Key factors contributing to project success include communication, comprehensive planning, clear roles and responsibilities, stakeholder requirements, and a supportive work environment. The significance of proper management approaches, techniques, and attitudes was also highlighted. The findings contribute to the current body of knowledge on project quality management and emphasize the need for a human-centered management approach to achieve high-quality project outcomes. This study sheds light on the pivotal role of effective team management in project quality, providing valuable insights and recommendations for project managers, team leaders, and organizations seeking to improve project performance.

Keywords:
team management; project quality; leadership competencies; human-centered approach; employee involvement.

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1. Introduction

In today's competitive business landscape, project quality is of utmost importance as organizations strive to meet the ever-evolving needs of their clients [1]. Quality orientation has its economic justification. While in the 1970s, quality costs were estimated at up to 30% of revenues [2], at the beginning of the 21st century, they amounted to 5-10% of revenues [3]. Reducing quality costs in projects is particularly difficult because it requires very good planning and performing tasks right the first time. Achieving this relies heavily on the effective management of teams, which are at the heart of driving innovation, ensuring efficiency, and fostering a culture of excellence [4]. As such, understanding the critical relationship between effective team management and project quality has become essential for project managers, team leaders, and organizations aiming to consistently deliver high-quality results [5].

Quality management in project management is acknowledged as a distinct domain, emphasizing planning, assurance, and quality control [6]. This ensures that project requirements are fulfilled by establishing strong stakeholder relationships and adhering to quality standards. However, the connection between team and project quality management remains ambiguous in existing literature [1], [7]. Contemporary organizations recognize that project quality is determined by both the outcomes and the methods employed to achieve them. Basu highlighted three facets of project quality: product quality, management process quality, and organizational quality (e.g., leadership, skills, and communication). Other scholars propose that quality comprehension varies according to the project phase, introducing notions such as design quality and process quality [7]. Consequently, project quality can be characterized as the capacity to produce results that satisfy stakeholder requirements and expectations by combining the quality elements related to organization, design, and process [8].

Effective team management ensures that project teams develop a quality management policy and focus on quality control, meeting customer requirements and stakeholder needs [1], [4]. This involves creating a performance-oriented culture emphasizing continuous improvement, clear goals, and competent task delegation [1], [9]. Effective team management also involves fostering inter-organizational cooperation, utilizing quality management tools and methods, and providing top management support for quality management practices [10]. Furthermore, teams should be assessed for their capability to undertake tasks and employ quality assurance processes, risk management plans, and the expertise of team members [11].

The existing literature has extensively investigated the variables influencing a team's performance. Nevertheless, the association between these variables and the attainment of project quality remains ambiguous. This can be attributed to the intricate interplay between team and quality management domains [12]. Moreover, the unique constraints imposed by the temporary nature of project implementation further complicate the applicability of a substantial portion of quality methodologies typically employed in industrial or service-based contexts.

The primary objectives of this article are to provide a comprehensive understanding of the relationship between team management and project quality. Specifically, the aim is to address the following research questions:

- How does effective team management contribute to enhancing project quality?
- What are the key factors in team management that influence project quality?
- How can different team management practices impact employee involvement, commitment, and innovation in projects?

By exploring these research questions, we aim to investigate the connection between effective team management and project quality across various industries and organizations and seek to identify the key factors and practices in team management that significantly contribute to high-quality project outcomes. Additionally, the role of employee involvement, commitment, and innovation in enhancing project quality through effective team management will be examined.

This article has the following sections: literature review, methodology, results, discussion, and conclusions. The literature review synthesizes existing research, followed by the methodology that details our study's approach. The results section presents findings, while the discussion elaborates on their implications. Finally, the article concludes with a summary and recommendations for future research and practice.

As projects become increasingly complex and diverse, the need for cohesive and high-performing teams to deliver high-quality results is more critical than ever [13]. Project managers and team leaders need to understand and adopt the best practices in team management, as this can ultimately determine the success or failure of their projects [14]. The findings and recommendations in this article can serve as a valuable resource for researchers and project managers seeking the best practices for their teams and projects, ultimately leading to higher-quality results and project success.

2. Literature review

Quality is achieved thanks to people, their attitudes, and their commitment [15]. Many scientific publications and those popularizing pro-quality approaches focus on implementing methods and techniques [1]. However, without the involvement of employees, management, consultants, and the board of directors, the tools will not bring the intended results [16]. This will not be changed even by the advent of quality 4.0, despite the extensive use of computer applications, machine learning, and artificial intelligence. The tools and technical skills are necessary. However, studies show that soft skills are more important for the project's success [17].

Many publications have been devoted to project team management principles, methods, and techniques. What is lacking, however, is a clear link between activities aimed at creating and managing project teams and the effects in the form of the project quality and the quality of its results [10], [18], [19]. Studies show that the sources of project failures should not be sought in technological problems, but they are primarily sociological, related to mistakes made at various stages of project team management [20], [21]. One of the most common excuses for omitting quality-related activities in a project is time pressure, and such an approach has a disastrous effect on the quality of the design, process, and results [22, p. 17]. The level of innovation, commitment, and quality can also be limited by different values shared by employees and the organization, dehumanization, accusing of making mistakes, searching protection against potential liability for errors, lack of a holistic view, unclear roles and expectations, lack of explanation of the reasons, "command and control" approach [23, p. 53]. The analysis of publications, research results, case studies, and practical experience show that the most important quality factors in a project team are based on planning pro-quality activities, awareness of the goals, needs, and expectations of stakeholders, team structure tailored to the needs, proper division of roles and responsibilities, respecting the decision-making chain, procedures and policies to improve the efficiency of operations and decision-making, tools supporting efficient work, ensuring an even pace of work (flow), and feedback [23].

Achieving high-quality results by the team requires, among others, commitment, cooperation, openness, and trust [15], [24]. In some cases, a project-oriented and collaborative mindset may be more critical than those competencies that can be acquired quickly. This was confirmed, for example, by research conducted in teams implementing projects at Google [25].

One of the best-known models of creating and managing a project team is the B.W. Tuckman model from the 1960s, which distinguishes forming, storming, norming, and performing. Research conducted in recent years shows that nowadays, the actual life cycle of a project team increasingly deviates from this pattern. The much higher dynamics of today's projects mean that the storming phase often occurs throughout the project implementation period [26]. Other research shows that this model does not work in virtual teams, where the volatility of team members is much higher, and it often becomes necessary to return to previous phases [27, p. 57]. Researchers also emphasize the non-linearity of team development, which is influenced by external factors, including time pressure [28, p. 22].

The importance of virtual teams has increased during the pandemic. They are currently used in many projects to streamline work and reduce costs. New challenges related to virtual teams are still being explored. However, it is already known that managers of these teams face difficulties related to effective communication, knowledge sharing, trust building, and working conditions conducive to cooperation [29]. This forces a different approach to building and managing teams.

Competencies, understood as an employee's ability to use their knowledge, skills, and experience in a professional situation to solve problems, are a crucial resource that enables the achievement of project objectives [30, p. 17]. Therefore, managers should strive to create teams with diverse competencies covering all areas of project activities. Such cross-functional teams have the potential to achieve better results thanks to the ability to apply more solutions and combine them creatively. The world of VUCA (volatility, uncertainty, complexity, and ambiguity) surrounding projects makes it impossible to manage quality mechanically using a fixed set of basic tools and techniques today. Quality-related competencies necessary to work in a project team include primarily those that increase efficiency, including situational orientation, memory, meta-cognition (i.e., cognition based on indirect premises), the ability to recognize repetitive patterns, efficient decision making, troubleshooting, mental flexibility and creativity, group work, communication, expert skills, resistance, and critical thinking [31, p. 29].

Competencies related to quality should enable teams to prevent biases in projects that may arise due to over-optimism, mistakes during planning, anchoring to suboptimal technologies, methods, approaches, cognitive dissonance, and limitations in accepting proposals that go beyond accepted standards. It should also prevent biases related to loss aversion towards expenses already incurred (sunk costs), limiting the field of view, omitting broader aspects of the project, and prejudice within the group or towards the environment. [32, p. 97]. Young, inexperienced project managers are especially prone to this mistake [17]. An additional difficulty for them may be the lack of support and inappropriate culture of the organization where the project is implemented [33].

High competencies of team members enable increasing their autonomy. Research shows that this improves the quality of long-term decisions and increases commitment and cooperation [33]. It should be emphasized that these competencies should be adapted to the project's specificity. Therefore, competence needs should be diagnosed already at the recruitment stage [34].

The increasing complexity of the environment and the resulting limited predictability and high volatility mean that managers of even small projects face significant and unexpected obstacles [35]. The possibility of obtaining support from a team with diverse competencies, experience, and different viewpoints can significantly help overcome problems. Therefore, the modern project manager striving to achieve high-quality results and good project management should avoid the "command and control" approach and instead demonstrate leadership behavior [36], [37].

Complexity in projects results mainly from the behavior of stakeholders, the behavior of systems that are the object of design work or their background, and the lack of clarity. It can refer to four main areas: structure, methodology, concept, and changeability over time [32, p. 39]. A complex project manager should use leadership skills to build a team to reduce complexity and accomplish things [27, p. 49]. Project leaders' most desirable leadership competencies include [38] coordination instead of control, availability for subordinates, ensuring the right amount of information, providing feedback, fairness, decision-making ability, sincerity, focus on individual development, team building, and respect.

Leadership behavior in projects, especially complex ones, requires an individual approach and planning. Due to the temporary nature of projects, the high competence of employees, and the complex environment, leaders rarely exceed the knowledge and skills of all team members [39]. The expectations of employees are also changing, especially those from the Y and Z generations. They expect more significant participation in management, but in return, they offer commitment and a creative approach to solving problems [40].

3. Methodology

Prior research in project quality management has been characterized by a disjointed approach, concentrating on particular standards, methodologies, approaches, or techniques. Comprehensive investigations demonstrating how project managers and team members handle quality multidimensionally are scarce. Dialogues with experienced project managers and literature reviews indicate that quality is frequently not regarded as a vital component of project management. In-depth research on attitudes toward quality in projects has been largely absent. The findings discussed in this article are part of an extensive research program dedicated to project quality management. Given the wide-ranging nature of the research, individual topics are addressed in distinct articles.

The research was conducted in October and November 2022, targeting project managers and team members. The research sample's selection criteria ensured a diverse spectrum of industries, projects, and experiences (Fig. 1). Criteria for differentiating respondents included project size, competencies, organizational size and location, and industry.

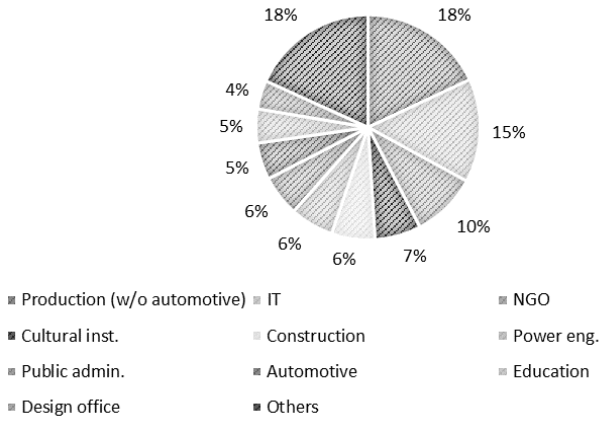


Fig. 1. Structure of organizations participating in the study

The study centered on participants' perceptions of quality. Due to the extent of the research, the number of questions, and the anticipated number of participants, an online questionnaire-based survey was selected as the research instrument (see Appendix A). The survey comprised 17 questions concerning requirements management, respondent demographics, projects, and organizations.

To reduce respondent discouragement, four types of questions were employed: ranking, 7-point scale questions, yes/no questions, and open-ended questions. The ranking question is more labor-intensive for the respondent but allows showing the preferred order of answers. This type of question allows for a deeper examination of respondents' preferences when the answers are related, e.g., questions about the competencies of managers and team members. The 7-point scale was used in relation to questions examining the preferences of respondents when the relation between individual answers was not crucial, e.g., a question about a manager's influence on motivation. In turn, the yes/no questions were used to find whether the specific phenomena exist in the organization, e.g., questions about phases of team building.

A potential risk in survey research is the restricted ability to validate the answers provided. Verification techniques involved analyzing completion time, comparing responses from participants within the same organization, and examining response patterns. In the case of answers given much faster than average, respondents were asked to explain this and, in some cases, to complete the survey again. With regard to yes/no questions, it was possible to compare the answers given by employees of the same organization. Contradictory answers were explained to respondents. The

scripts analyzing the answers have been programmed to detect situations when the respondent marked the same value in all responses, which suggested using the answer template without analysis. In a few rare instances of dubious responses, participants were requested to complete the questionnaire again.

The analysis of the results was conducted using custom Python scripts and spreadsheets. The following packages were utilized: *scipy.stats, scipy.spatial, pingouin, scikit_posthocs, math, statistics, pandas*. The length of scripts exceeds 3,000 lines of code. The results of scripts were presented in the form of large arrays with over 100 columns, which were further analyzed using spreadsheets. Therefore, this paper will present them in a processed form of figures and descriptions. L. Cronbach's Alpha coefficient was employed to assess the survey's internal consistency, yielding a value of 0.8777, which surpasses the recommended minimum of 0.8. The coefficient was calculated using the *cronbach_alpha* function of the *pingouin* package for all the questions except demographic ones [41].

As most questions employed an ordinal scale, non-parametric statistical techniques and measures were chosen for analysis and interpretation, including median, absolute deviation of the median, Spearman's rank correlation coefficient, Chi2 test, Mann-Whitney U test, Shapiro-Wilk distribution test, Kruskal-Wallis test, Dunn test, Kendall's W coefficient, and cosine similarity measure [42]–[47]. The use of non-parametric statistics constrains the presentation of results.

4. Results

4.1 Sample

The survey garnered participation from 510 respondents across more than 170 organizations. The gender distribution was somewhat biased towards male respondents (51%), with two participants opting not to reveal their gender. Women were more commonly involved in projects with smaller budgets. In projects exceeding €500,000, women constituted 35%, while in other categories, they accounted for 50-60%. This discrepancy can be ascribed to the educational background and the nature of the projects examined. Large-budget projects were mainly associated with engineering industries, where women comprised approximately 30% of individuals with engineering education. Female respondents were predominantly found in organizations related to public administration, education, non-governmental organizations, culture, and financial services. Men were more prevalent in the construction and information technology (IT) industries.

Nearly 70% of respondents were aged between 26 and 45 years. Almost half possessed a total professional experience of up to 10 years; an additional 32% had up to 20 years. Project work experience was generally shorter, with 79% of respondents having no more than ten years. Although project management has been evolving for several decades, organizations have only recently started to concentrate on project-based approaches. There has been a recent trend toward treating conventional processes as projects, which is more prevalent among public administration representatives, possibly due to the implementation of EU-funded projects.

The survey targeted both project managers and team members. Some respondents occupied multiple roles across various projects, with 43% indicating they were managers in at least one project. Nearly 90% of respondents held a higher education degree, 9% had secondary education, and about 1% had a PhD or higher degree. The most prevalent fields of education were technical (42%), economic and managerial (32%), humanities (7.5%), and IT (5.3%). Respondents also reported backgrounds in pedagogy, sociology, administration, law, and other fields.

Over 170 organizations were represented in the survey. Among the surveyed teams, 35% had no more than five members, and 39% had up to 10 members. The industry and nature of the project primarily influenced team size. A statistically significant relationship was discovered between budget and team size, but only for teams with up to 20 members ($p=0.003$). Larger teams were more prevalent in large and very large organizations.

The budget distribution of the surveyed projects was relatively uniform across different ranges, with a slight dominance of projects exceeding €500,000. Most projects had a planned implementation time of 1-2 years, with a statistically significant relationship between budget size and implementation time ($p<0.001$). Among participating organizations, 28% were very large (over 1,000 employees), and 25% were small. Micro-enterprises and large organizations were less

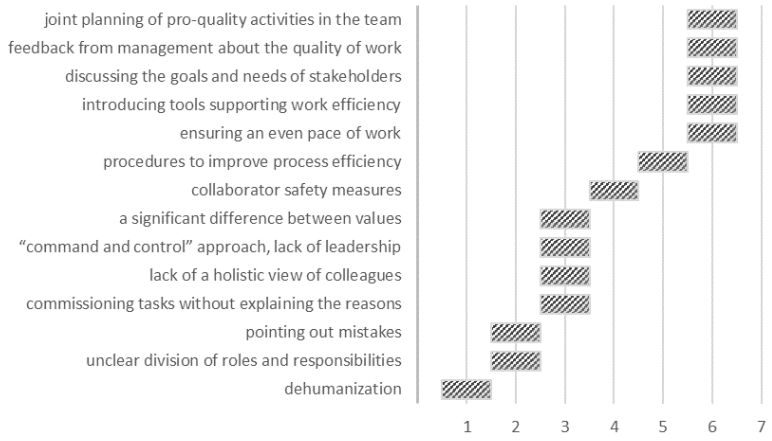
represented. The most common industries included IT, non-governmental organizations, cultural organizations, construction, energy, and public administration. Manufacturing companies constituted 40 of the surveyed organizations, with nine being from the automotive industry.

Respondents were inquired about the project methodologies employed in their work, allowing multiple answers due to potential experience across different projects and organizations. Over half of the respondents reported using their methodology. Agile, Scrum, and Kanban methodologies were primarily mentioned in the IT, automotive, and transportation industries. Waterfall methodologies were more prevalent in consumer goods production and industrial sectors. The Project Cycle Management (PCM) methodology was predominantly used in cultural institutions.

An absence of any project management methodology was most frequently reported by educational institutions (71%), consulting institutions (60%), and public administration (54%). The waterfall and agile methodologies were more commonly utilized by respondents working on longer projects with larger budgets. In large and very large organizations, methodologies were applied twice as often as in organizations with fewer than 250 employees.

4.2 Survey results

High quality is achieved thanks to people, their commitment, and innovation. Moreover, the management staff must use suitable approaches and techniques and present the right attitudes. Respondents were asked to indicate how their motivation, commitment, and innovation would be influenced by selected situations (Fig. 2). The situations were presented randomly to avoid filling in the questionnaire mechanically. In their assessments, respondents chose the highest level of answers (definitely positive) less often than in other questions. There were also fewer responses declaring no impact. The median's absolute deviation was low, proving the answers are consistent.



Legend: 1 – definitely negative, 2 – negative, 3 – rather negative, 4 – no impact, 5 – rather positive, 6 – positive, 7 – definitely positive.

Fig. 2. Influence of project manager's behavior on motivation

Only 6% of the respondents declared using the B.W. Tuckman model in accordance with its assumptions. At the same time, however, 75% partially use this model (Fig. 3). Respondents could select several answer options if they were not mutually exclusive. These findings are consistent with previous literature studies. There is a need to reformulate the model of building a project team that will respond to contemporary challenges faced by teams. At the same time, it is worth moving away from teaching and presenting the B.W. Tuckman model in the project management frameworks and handbooks as the current and binding rule.

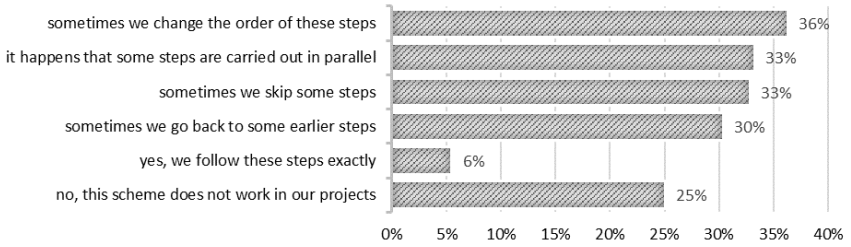
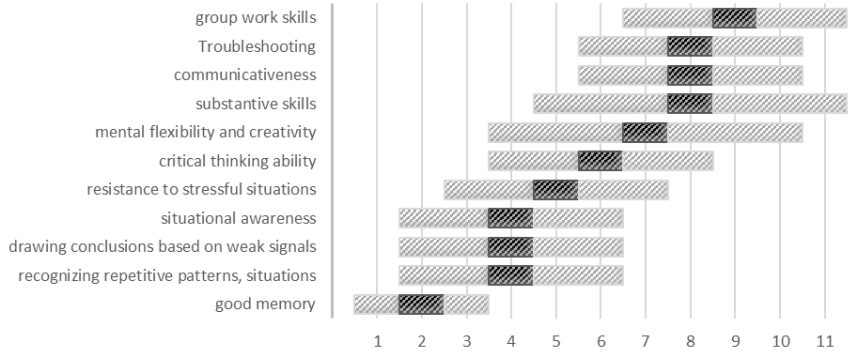


Fig. 3. Application of the B.W. Tuckman model to build a team

According to the assumptions, older respondents use this model slightly more often – the number of indications increases from 2% in the group under 25 to 9% in the groups over 45. There are also industry specifics, and the model is more often used in the construction and automotive industries and less often in public administration, trade, financial services, or cultural institutions.

The study participants were asked to create a ranking of the competencies of project team members and project managers. In the first case, they were given a choice of 11 characteristics of a team member, and in the second, 10 characteristics of a project manager were selected based on the results of a literature review. The optimal way to conduct this study would be a pairwise comparison. However, with so many answer options, it would mean asking dozens of questions. The negative effect of using the ranking technique is the lower consistency of assessments. This effect can be minimized in the future in detailed studies devoted to this topic.

Teamwork was considered the most important competence of a team member, followed by problem-solving and communication skills (Fig. 4). These competencies are used practically regardless of the project's specifics, hence their high position in the ranking. Most doubts arose concerning the importance of substantive skills, flexibility, and creativity. It can be assumed that it is related to the type of results delivered in the project. Substantive skills were more valued in consulting, automotive, and transport and less in non-governmental organizations and companies producing consumer goods.



The median (dark bars) and the absolute deviation of the median (light bars) are marked on the graph.

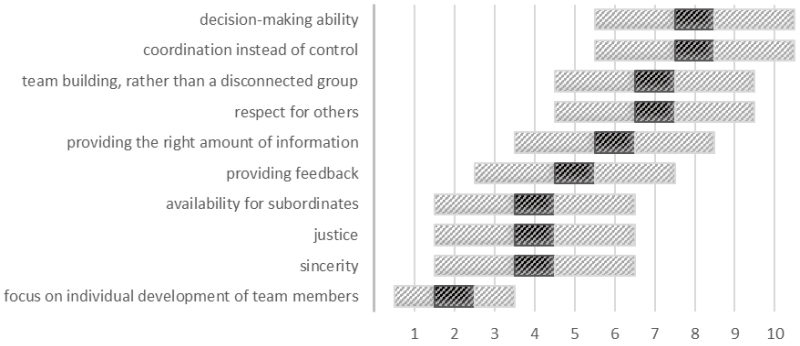
Fig. 4. The importance of competencies of project team members

Many respondents placed critical thinking skills and resistance to stressful situations near the middle of the ranking. These are appreciated competencies, but they are not fundamental. Critical thinking was more valued in educational institutions and the transport industry. At the same time, stress resistance was given more attention by respondents from the construction industry, food production, and non-government organizations (NGOs).

Situational awareness and analytical skills were classified as less important. While these are important competencies, they may be limited to a few team members, and probably not in every project they are fully used. The ability to detect repetitive patterns was valued more in the IT, transportation, and financial services industries and less in NGOs, education, and cultural institutions. In turn, the ability to analyze weak environmental signals was more often pointed out by respondents from the construction, energy, and industrial goods industries. Situational orientation was rated as more important in trading.

The least important competence, with a higher agreement of the respondents, was a good memory. It was slightly more important for design companies and less for education and consulting, which is surprising.

Regarding the project manager competencies, the most important were decision-making skills and "coordination instead of control" (Fig. 5). These two competencies were more often placed at the top of the ranking than the others. Respondents' understanding of decision-making skills needs further clarification, especially in the context of attaching little importance to leadership. It is not clear whether it is about individual or rather group decision-making. Regarding coordination instead of control, there is an inconsistency with the answers to the previous question on the "command and control" approach. It was assessed as only slightly demotivating, while avoiding this approach is the most important thing here.



The median (dark bars) and the absolute deviation of the median (light bars) are marked on the graph.

Fig. 5. The importance of the project manager's competencies

Next came team building and showing respect for others. This may reflect the high importance of teamwork skills for project team members.

Even though the factors related to communication were the most motivating, the project manager's competencies related to ensuring the right amount of information and accessibility were in the middle of the list. They are undoubtedly treated as necessary but not crucial. Representatives of public administration appreciated these competencies more. The fairness and sincerity of the project manager were assessed as slightly less important competencies. Representatives of the transport industry paid more attention to fairness and sincerity.

At the very end, with a lower rating and higher consensus, there was an orientation towards the individual development of team members. Development is an important factor of pro-quality culture. However, it is possible that development issues are transferred to the organizational level due to the relatively short time of project implementation and are not

accounted for by project members. Another reason may be the assumption that development is an individual matter for each employee. This would not be the right approach in terms of quality assurance. Interestingly, representatives of educational and advisory institutions rated this competence the lowest. The same industries previously rated the importance of good memory lower.

Comparing the managers' answers with the project team members did not show statistically significant differences in assessing the importance of the discussed competencies in both rankings.

5. Discussion

Effective communication and well-thought-out management processes are critical motivating factors for project team members. Providing employees with clear instructions and expectations fosters engagement and commitment to achieving project goals. Moreover, transparent communication channels nurture trust and collaboration among team members, enabling them to work more efficiently and effectively. These findings confirm previous research on the importance of communication [21], involvement in setting and achieving goals [33], and trust [24].

Involving team members in planning pro-quality activities significantly impacts project outcomes. Active participation in planning and decision-making processes motivates team members and promotes commitment to achieving project objectives. Joint planning also fosters a sense of ownership and responsibility among team members, enhancing quality outcomes, which confirms the results obtained by Gustavsson et al. [33]. Project managers must recognize the importance of active participation and collaboration during the planning phase, ensuring team members' engagement and investment in the project's success. By embracing a collaborative approach, project managers can harness diverse skills and perspectives, ultimately contributing to improved project quality and overall performance.

Understanding and addressing stakeholder requirements are essential to project success [23]. Project team members should actively participate in discussions and decision-making processes related to stakeholder needs. Providing specific, substantive feedback on project deliverables' quality helps identify areas for improvement and reinforces the importance of quality in project outcomes. This encourages team members to strive for excellence and maintain a pro-quality mindset throughout the project.

The survey results suggest that increased use of safeguards against potential liability for errors may indicate a fear-driven work environment where employees prioritize protecting themselves from blame over fostering collaboration and innovation. This phenomenon has already been noticed by Moura et al. [24]. This defensive approach can waste resources and reduce efficiency, as team members may hesitate to take risks or share ideas due to fear of repercussions. To enhance project quality through effective team management, organizations should focus on building trust and promoting a culture of shared responsibility and learning. Encouraging open communication, acknowledging mistakes as opportunities for growth, and emphasizing the importance of teamwork help create a supportive environment where team members feel empowered to contribute fully to their skills and expertise, leading to improved project outcomes and increased stakeholder satisfaction. This is in contradiction with Ngereja and Hussein [37], who showed a positive relationship between performance assessments and team innovation. In the tradition of pro-quality approaches, e.g., in Deming principles, it is assumed that trust and openness should replace assessments.

Situations that motivate project team members, as presented in Fig. 2, suggest that respondents considered joint planning of pro-quality activities, stakeholder requirements, and specific feedback on achieved quality as most important. Efficient methods and procedures also contribute to motivation. Good communication and well-thought-out management processes are key motivating factors. The top demotivating factors are pointing out mistakes rather than discussing solutions, unclear division of roles and responsibilities, and dehumanizing co-workers. Proper task planning and division of responsibilities are crucial to avoid these issues. Investing more time in project planning can eliminate the above-mentioned factors, especially in longer projects. Discussing solutions, rather than errors, can improve motivation and future results. This confirms studies that highlight the role of transparency [33], openness, cooperation [20], and attitude [21].

Focusing on team members' mistakes without offering constructive solutions can have a detrimental impact on motivation levels. Such an approach can create a hostile working atmosphere and hinder the team's ability to learn from their mistakes. Instead, project managers should encourage open communication and problem-solving, allowing the team to address issues collectively and foster a more supportive environment. Psychological safety leads to a better exchange of ideas and creates a pro-quality culture [29].

Addressing ambiguity in roles and responsibilities is essential for team performance and project quality. The lack of clear definitions and expectations can lead to inefficiencies and frustration among team members, ultimately affecting the project's overall success [23]. Conversely, when roles and responsibilities are clearly defined, team members experience a greater sense of ownership and accountability, contributing to improved motivation and engagement. This highlights the crucial role of project managers in ensuring that expectations and responsibilities are well-communicated and understood by all team members. In doing so, project managers can foster a more cohesive and effective team, ultimately enhancing the quality and outcomes of their projects.

The findings suggest that treating team members as tools or machines negatively impacts motivation and collaboration. This dehumanization hinders team dynamics and stifles creativity and innovation, ultimately affecting overall project quality. Promoting a human-centered approach to management fosters a more supportive and engaging work environment. As found by Hefley and Bottion [17], it is especially important for young project managers who underestimate soft skills. Recognizing team members' individual needs and contributions encourages personal and professional growth. This approach builds trust and commitment within the team and drives members to strive for excellence in their work, ultimately leading to enhanced project quality. Adopting a human-centered management style enables project managers to better understand team members' unique strengths and weaknesses, facilitating more effective allocation of resources and tasks and ultimately contributing to project success.

Insufficient planning can result in unclear roles and responsibilities, leading to confusion and frustration within the project team [17]. This can ultimately affect team motivation and project quality. To avoid these consequences, project managers should allocate sufficient time during the project initiation phase to develop comprehensive plans, ensuring that tasks and responsibilities are well-defined and understood by all team members.

Project managers play a crucial role in defining and communicating the roles and responsibilities of team members. By setting clear expectations and providing guidance, project managers can help create a sense of ownership and accountability among team members. This improves team motivation and contributes to the overall quality of the project outcomes.

The study implies that small enterprises may embrace ambiguous roles and responsibilities due to employees assuming multiple roles, fostering innovation, and positively impacting project quality. Conversely, large enterprises may struggle to define roles and responsibilities due to a larger workforce and complex project structures, potentially lowering project quality. Therefore, tailored team management strategies should be developed to address the specific needs and challenges of different enterprise sizes, ultimately enhancing project quality. This confirms that team competencies should be adjusted to the type and conditions of the project [34].

The findings from this study highlight the importance of effective team management in enhancing project quality. Project managers should focus on fostering open communication, promoting a pro-quality culture, and ensuring clear roles and responsibilities within the team. By doing so, they can create an environment where team members are motivated and committed to delivering high-quality results.

Based on the insights gained from this study, project managers, team leaders, and organizations should consider the following recommendations to improve project quality through effective team management:

- Invest time in developing comprehensive project plans that clearly define tasks and responsibilities. Identification of multiple ways of implementing a project, as well as potential problems associated with them, increases the project manager's situational awareness, reduces the technical debt, and facilitates making good decisions during the project.

- Encourage open communication and collaboration among team members. Collaboration and exchange of ideas contribute to early detection of problems, increased innovation, and team involvement. At the same time, excess communication, e.g., keeping everyone informed about everything, can limit efficiency.
- Focus on identifying and addressing stakeholder requirements. Incorrect or incomplete identification of stakeholder requirements may result in project results passing the verification stage, which is based on documented requirements, but being rejected at the validation stage, which is based on the real requirements.
- Provide specific, substantive feedback on project deliverables to reinforce the importance of quality. Acceptance of low-quality results by stakeholders and the project manager leads to demoralization of the team members and a gradual reduction in their quality orientation.
- Promote a supportive working environment by discussing solutions rather than highlighting mistakes. Dehumanization and emphasizing mistakes are indicated by respondents as the factors that limit motivation to the greatest extent.

By implementing these recommendations, organizations can better leverage the power of effective team management to enhance project quality and achieve desired outcomes.

6. Conclusions

The research findings emphasized the importance of effective team management in enhancing project quality. Critical factors such as communication, comprehensive planning, clear roles and responsibilities, stakeholder requirements, and a supportive work environment were identified as essential elements contributing to project success.

This study makes a theoretical contribution to the field of project quality management by examining the interplay between team management and project quality. Through an analysis of empirical data collected from diverse industries and projects, this study sheds light on the key factors contributing to project success. These factors include effective communication, thorough planning processes, well-defined roles and responsibilities, alignment with stakeholder requirements, and cultivating a supportive work environment. The findings unequivocally underscore the paramount importance of adopting appropriate management approaches, employing proven techniques, and fostering the right attitudes to achieve high-quality project outcomes. Additionally, this study advocates for a human-centric management approach, emphasizing the requisite focus on employee involvement, commitment, and innovation to enhance project quality and ultimately attain desired objectives.

For practice, the study presents evidence-based recommendations to enhance project quality through effective team management. The study suggests that investing time in developing comprehensive project plans is crucial. This involves outlining project objectives, outlining the tasks and responsibilities of team members, and conducting a thorough assessment of potential challenges and risks. This approach enables project managers to enhance their situational awareness, minimize technical debt, and make informed decisions throughout the project lifecycle.

Furthermore, the study emphasizes fostering open communication and collaboration among team members. This can be achieved by establishing clear communication channels and facilitating regular meetings and discussions. Effective communication promotes early detection of problems, increases innovation, and encourages team involvement. It is important, however, to strike a balance between collaboration and excessive communication, as excessive communication can impede efficiency and productivity. Therefore, project managers should implement effective communication strategies that keep team members informed without overwhelming them with unnecessary details.

Additionally, the study emphasizes the significance of identifying and addressing stakeholder requirements. Proper identification and understanding of stakeholder needs are crucial to project success. This necessitates the active participation of team members in discussions and decision-making processes related to stakeholder needs. By providing specific, substantive feedback on project deliverables, project managers can reinforce the importance of quality and

facilitate continuous improvement. This feedback loop ensures project outcomes meet stakeholder expectations and prevent potential issues from escalating.

To promote a supportive working environment, the study recommends that project managers prioritize discussing solutions rather than highlighting mistakes. This approach avoids demoralizing team members and fosters a culture of learning and improvement. By acknowledging mistakes as opportunities for growth, project managers can create a psychologically safe environment where team members feel comfortable sharing ideas and thoughts. This, in turn, stimulates creativity, innovation, and collaboration, ultimately leading to enhanced project quality.

While having a large sample size, this study may contain possible biases in the sample population and may not fully represent all industries and project teams. The study's cross-sectional nature also limits its ability to capture the dynamics of team management over time. Future research could benefit from incorporating interviews or deepened case studies to provide more insightful conclusions.

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Appendix A. Questionnaire

1. How would the following situations affect your motivation, commitment and innovativeness in the project (scale: 1 – strongly disagree, 2 – disagree, 3 – slightly disagree, 4 – neutral, 5 – slightly agree, 6 – agree, 7 – strongly agree; random order of answers)?

- significant difference between me and organizational values
- dehumanization – team members treating me as another tool, computer, machine
- pointing out the mistakes made instead of discussing possible solutions to the problem
- creating measures by team members against potential liability for errors (redundant correspondence, unnecessary papers)
- focusing by team members only on their tasks, lack of a holistic view, limiting to performing only assigned tasks
- unclear division of roles and responsibilities, imprecise expectations of the managers
- giving tasks without explaining the reasons or connection with the client's requirements
- "command and control" approach – no leadership, relationships limited to performing and controlling the tasks
- all team members planning together the activities leading to improving the quality
- communicating and discussing the goals, needs, and expectations of stakeholders
- introducing procedures and policies to increase the efficiency of processes
- introducing tools supporting work efficiency
- ensuring an equal pace of work, without overtime and waiting for others
- frequent, specific, and substantive feedback from management about the quality of my work

2. B.W. Tuckman formulated the steps for creating a project team, including forming, storming, norming, and performing. Do these steps work for the projects in which you participate? Please choose all that apply (yes/no):

- yes, we follow these steps exactly one after the other in the same order
- it happens that we go back to some of the previous steps (e.g., in the case of the new team member)
- it happens that some steps are carried out in parallel (e.g. by different sub-teams)
- it happens that we change the order of these steps depending on the needs of the project
- it happens that having experienced team members, we skip some steps
- no, this scheme does not work for our projects
- other

3. Please rank the competencies of the project team members in order of importance, starting with the most important ones (ranking).

- situational awareness
- good memory
- drawing conclusions from weak signals in the project environment
- the ability to recognize repeating patterns, situations
- effective troubleshooting
- mental flexibility and creativity
- ability to work in a group
- communicativeness
- expert skills important for the project
- resistance to stressful situations
- critical thinking skills

4. Please prioritize the project manager's competencies in order of importance, starting with the most important ones. (ranking)

- coordinating instead of controlling
- availability for team members
- giving the right amount of information
- providing feedback

- justice
- ability to make decisions
- sincerity
- focus on individual development of team members
- building a team instead of an unrelated group of people
- respect for others

5. Sex
   - Female
   - Male
   - Other
   - I refuse to answer

6. Age (in years)
   - below 18
   - 18 - 25
   - 26 - 35
   - 36 - 45
   - 46 - 55
   - 56 - 65
   - 66 or above
   - I refuse to answer

7. Total experience (years)

8. Experience in projects (years)

9. The function performed in the current project (or the last completed one), e.g. project manager, analyst, team member

10. Education
    - basic
    - junior high school
    - vocational
    - secondary
    - higher
    - PhD or more

11. Education profile. You can give a few, starting with the most important, e.g., technical, managerial, economical, chemical

12. Number of employees of the organization in which you work.
    - less than 10
    - 10 - 49
    - 50 - 250
    - 250 - 1000
    - more than 1000

13. Please provide the type of organization and the main branch/industry in which it operates, e.g., a chemical industry company, local government office, university

14. The size of the town where the branch of the organization where you work is located.
    - village
    - city up to 50,000 residents
    - city 50,001 – 150,000 residents
    - city 150,001 – 500,000 residents

- city with over 500,000 residents
- I work only remotely (100% of my working time)

15. Please provide the size of the project team
    - less than 5
    - 5 - 10
    - 11 - 20
    - 21 - 30
    - more than 30
16. Please provide the size of the project budget
    - less than €10 000
    - €10 000 - 20 000
    - €20 001 - 100 000
    - €100 001 - 500 000
    - more than €500 000
17. Please provide the planned period of the project.
    - less than 6 months
    - 6 - 12 months (up to 1 year)
    - 13 - 24 months (up to 2 years)
    - 25 - 60 months (up to 5 years)
    - more than 60 months

Biographical notes

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