Skill and Competencies for Effective Software Project Management: An Exploratory Study

Mohamad Firdaus Mat Saad1, 2, a), Thiaku Murugam1, b), Xin Yin Lam1, c) and Towsif Ahmed1, d)

1Center for Digital Innovations, COE of Immersive Experience, Multimedia University (MMU),63100 Cyberjaya, Selangor, Malaysia.

2Faculty of Computing and Informatics (FCI), Multimedia University (MMU),63100 Cyberjaya, Selangor, Malaysia.

*a) Corresponding author: firdaus.matsaad@mmu.edu.my*

*b) 1231401810@student.mmu.edu.my*

*c) LAM.XIN.YIN@student.mmu.edu.my*

*d) 1231402294@student.mmu.edu.my*

**Abstract.** This study explores the evolving competencies and behavioral attributes required for effective software project management in Agile and hybrid environments. It combines a systematic literature review with a case study to examine six core competencies: leadership, teamwork, communication, resource management, technical expertise, and decision-making. These were consistently linked to successful project outcomes across diverse contexts. The study also uses the Myers-Briggs Type Indicator (MBTI) as a reflective framework to examine personality tendencies observed in project leadership. While MBTI is not treated as predictive, it offers insights into team dynamics and behavioral role alignment. Case evidence highlights that project managers who exhibit decisiveness, empathy, and adaptive communication often perform better under pressure. In high-stakes scenarios, clear instruction and timely decisions were more effective than prolonged consultation. The findings support a holistic view of project leadership that integrates both structural competencies and behavioral awareness. This research contributes to the academic understanding of human factors in software engineering and offers practical guidance for project team formation and leadership development.

# Introduction

## Background

The practice of software project management continues to evolve in response to the increasing complexity of contemporary development environments. Agile and hybrid methodologies have become standard in many organizations, yet project managers face significant challenges, including geographically distributed teams, diverse cultural expectations, and rapidly changing technologies [1][2][3][4][5]. These conditions demand a broader skillset that includes technical expertise, interpersonal awareness, and adaptive leadership [6][7][8]. Despite widespread adoption of Agile frameworks, many projects still encounter difficulties in aligning team capabilities with evolving requirements and stakeholder demands [9][10][11].

This research endeavors to examine the fundamental competencies essential for the proficient management of software projects, with a particular emphasis on Agile and hybrid environments. The objective is to ascertain which specific skill sets most significantly facilitate project success and to investigate the way behavioral inclinations, such as those illustrated by the Myers-Briggs Type Indicator (MBTI), may enhance task alignment and role efficacy [8][12][13][14]. The study synthesizes existing literature and incorporates a case study to extract competency categories and assess their practical implications.

A clearer understanding of project manager competencies and personality-based behavioral patterns can support more effective role assignment and team formation, especially in virtual and cross-functional settings [7][15][16]. This research contributes academically by combining two areas of study: competency frameworks and behavioral profiling. Together, these provide a unified lens for evaluating software project leadership [17][18][19]. Practically, the findings offer guidance for improving planning, recruitment, and skills development strategies in technology-driven organizations [20][21][22].

# Literature Review

## Competency Requirements in Modern Project Management

Software project managers must operate across technical, managerial, and interpersonal domains. In Agile and hybrid environments, where continuous feedback and adaptability are essential, success depends on more than following structured methodologies [2][3][7]. Competencies such as leadership, communication, teamwork, and decision-making have been identified as central to project delivery [8][9][11]. These capabilities are particularly important when managing distributed or cross-functional teams, where cultural and operational diversity can affect coordination and outcomes [1][4][15]. Although training initiatives in Agile practices are widely available, gaps remain in applying interpersonal and leadership skills under real project constraints [6][10][23].

## Behavioral Attributes and Personality Considerations

Behavioral awareness increasingly contributes to the evaluation of project success. Interpersonal skills, particularly those associated with communication, adaptability, and emotional intelligence, significantly affect the way project managers guide teams and navigate uncertainty [12][17][24][25][26]. Personality characteristics influence interactions, levels of motivation, and approaches to conflict resolution [19][27][28]. The Myers-Briggs Type Indicator (MBTI) is frequently employed in practice to illustrate behavioral inclinations, although its validity as a predictive model is not substantiated in scholarly contexts [13][29][30]. Certain research indicates correlations between distinct personality types and effectiveness in roles, yet the MBTI should be approached with caution, serving primarily as a reflective instrument rather than a metric of performance [12][14].

## Research Gap and Case Study Framing

While existing studies require competencies and soft skills, there is limited research connecting these attributes to actual leadership behavior in Agile projects [16][22][31]. This study addresses the gap by integrating a literature review with a case study from an Agile transformation [32]. The goal is to examine how managers apply competencies in context and whether personality traits influence leadership style and decision-making [18][21][33].

# Research Methodology

This study adopted a qualitative research design to investigate the competencies and behavioral traits that influence project management effectiveness in Agile and hybrid software environments. The approach combines a systematic review of academic and industry literature with an embedded case study, allowing both conceptual synthesis and practical application [3][7][8][18].

## Research Design

An exploratory framework was employed to investigate the non-quantifiable aspects of project management, including communication, leadership behavior, and role alignment [11][16][25]. The literature review concentrated on peer-reviewed publications released between 2020 and 2025, chosen for their pertinence to Agile methodologies, competency enhancement, and project team dynamics [2][3][17][20]. Subsequently, a case study was conducted that analyzed a practical Agile transition within a multinational software endeavor. The case was selected due to its operational intricacy and significance in relation to the research aims [18][21].

## Data Collection

Academic databases such as IEEE Xplore, Scopus, and ScienceDirect were used to extract relevant studies. Search terms included “Agile project management competencies,” “hybrid methodology,” “project leadership skills,” and “MBTI in software teams” [8][9][12][13]. The case study drew on project documentation, internal assessments, and anonymized observations collected during the Agile adoption phase. No primary interviews or human subject data were used.

## Data Analysis

Thematic analysis was used to identify recurring competency categories and behavioral trends across the literature and case study data [7][11][19]. Coding focused on leadership, adaptability, technical proficiency, and communication. MBTI was used only as a lens to reflect personality-driven behavioral tendencies, in line with prior studies cautioning its predictive application [12][13][14][30]. The analysis examined consistency between academic models and observed practices in the field [8][31].

## Validity and Ethical Considerations

To ensure credibility, only peer-reviewed or institutionally validated sources were included in the literature review [3][18][22]. The case study analysis was cross verified with multiple documentation sources to strengthen interpretative reliability. No human subjects were involved, and all case data were anonymized in accordance with institutional ethics guidelines. Proper citation and source integrity were maintained throughout the research process.

# Results and Discussion

This chapter presents findings across two key dimensions: (1) core competencies required in software project management, and (2) personality-based behavioral patterns relevant to role alignment. Results are drawn from both literature review and a case study.

## Core Competencies Observed

Six core competencies consistently emerged as critical to Agile and hybrid project success: leadership, teamwork, communication, resource management, technical expertise, and decision-making [7][8][9][11][31]. These domains were consistently cited in recent studies and validated through observed practice (refer to Table 1).

|  |  |  |
| --- | --- | --- |
| **TABLE 1.** Most-cited project management competencies | | |
| **Competency** | **Sub-Domains** | **References** |
| Leadership | Vision, conflict resolution, adaptability | [8][11][12][19][31] |
| Teamwork | Collaboration, task distribution | [8][11][14][19][36] |
| Communication | Stakeholder updates, team clarity | [11][12][14][36] |
| Resource Management | Budgeting, time estimation | [8][19][31] |
| Technical Knowledge | System tools, Agile practice | [8][14][36] |
| Decision-Making | Prioritization, risk assessment | [7][16][27] |

*Note: Sub-skills were grouped under primary domains for clarity and space efficiency.*

In the study, managers who demonstrated role flexibility, rapid planning adaptation, and active stakeholder engagement showed better alignment with Agile expectations. Their ability to navigate ambiguity reinforced the need for integrated technical and interpersonal skills.

## Behavioral Patterns and Role Alignment

Behavioral tendencies were examined using MBTI as a reflective tool. While not used as a predictive model, it provided structure to interpret observed behaviors in relation to leadership and team coordination [12][13][30]. Traits such as extroversion, intuition, and feeling were frequently observed in high-performing managers, particularly in roles involving stakeholder engagement, team guidance, and conflict mediation. Figure 1 outlines the 16 MBTI personality types used as a reference in this study.

A chart of different types of personality

AI-generated content may be incorrect.

**Figure 1.** The 16 Myers-Briggs personality type

Table 2 shows the top-performing MBTI types mapped to key project KPIs from the case study

|  |  |  |  |
| --- | --- | --- | --- |
| **TABLE 2.** High-performing MBTI types by project KPI | | | |
| **#** | **Key Performance Indicators (KPI)** | **Top-ranked MBTI** |
| 1 | On-time delivery | ENFJ, ESFP, ESTJ, INFP, INTJ, ISFJ |
| 2 | Budget adherence | ESTJ, INTJ, INTP |
| 3 | Output quality | INTP, ENFJ, ISFJ, ESTJ, INTJ |
| 4 | Bug reduction | ESFP, ENFJ, ISTP |
| 5 | Team stability (low turnover) | ENFP, INFP, ESFJ, INTJ, ISTJ, ISFP |
| 6 | Stakeholder trust | ENFJ, ENFP, ESFJ |

While some profiles aligned with specific project traits, effectiveness varied depending on task demands and team structure [34]. The case findings suggest that behavioral flexibility, rather than personality type alone, contributes more directly to outcome consistency [14][30].

## Integrating Literature and Case Findings

The synthesis revealed convergence between theory and practice in prioritizing core competencies (refer to Table 3). However, the case highlighted greater emphasis on emotional regulation, contextual leadership, and adaptability than formal role definitions typically prescribe [35].

|  |  |  |  |
| --- | --- | --- | --- |
| **TABLE 3.** Literature vs case: Emphasis in competency application | | | |
| **Competency Area** | **Literature Focus** | **Case Observations** |
| Leadership | Authority, scope control | Emotional regulation, negotiation |
| Collaboration | Synergy, process alignment | Informal rituals, role fluidity |
| Technical knowledge | Framework mastery | Tool fluency, situational use |
| Role Alignment | Framework-mapped roles | Personality-fit and team chemistry |

The case also revealed that in high-stakes Agile delivery cycles, managers often shifted from open-ended dialogue to direct decision-making. While collaboration remains essential, prolonged consultation sometimes delayed resolution. In such cases, decisive action, specifically providing clear instructions instead of open-ended questioning, proved more effective for maintaining delivery momentum [3][8][21].

These findings reinforce that project outcomes are shaped not only by structured competencies but also by behavioral awareness, contextual judgment, and the ability to shift leadership style when necessary.

# CONCLUSION

This study examined the competencies and behavioral factors that influence software project success, particularly within Agile and hybrid environments. Six key competencies were identified: leadership, teamwork, communication, resource management, technical expertise, and decision-making [7][8][9][11][31]. These consistently appeared in both literature and practice as central to effective project execution.

Behavioral tendencies, viewed through the MBTI framework, offered additional insight into role alignment and leadership styles [12][13][14][30]. Traits such as empathy, adaptability, and intuitive communication were frequently observed among effective managers [19][36].

Case findings revealed that under delivery pressure, successful project managers shifted from open-ended consultation to decisive action [3][8][21]. Providing clear direction helped maintain momentum and team confidence [16][18].

This research reinforces the importance of integrating technical competencies with behavioral awareness. Future work should further explore personality-informed role alignment and evolving skill demands in software project contexts [17][22][33][37].

# Acknowledgments

The authors received no funding from any party for research and publication of this article.

# References

1. I. García, C. Pacheco, E. Guzmán‐Ramírez, B.L. Flores-Ríos, M.A. Astorga-Vargas, and J.E. Ibarra-Esquer, “Collaborative Working Spheres for Global Software Development Education During the COVID-19 Pandemic: An International Experience,” IEEE Access 11, 24655 (2023).
2. M. Hussain, H.U. Khan, A.W. Khan, and S.U. Khan, “Prioritizing the Issues extracted for Getting Right People on Right Project in Software Project Management From Vendors’ Perspective,” IEEE Access 9, 8718 (2021).
3. J. Alqahtani, A. Siddique, A.M. Aseere, A. Alasiry, and Q.N. Naveed, “Evaluating Success Factors of Software Project Management in Global Software Development,” IEEE Access 12, 22345 (2024).
4. E.D. Suárez-Gómez, and C.A. Hoyos-Vallejo, “Scalable Agile Frameworks in Large Enterprise Project Portfolio Management,” IEEE Access 11, 98666 (2023).
5. J.A. Khan, S.U.R. Khan, J. Iqbal, and I.U. Rehman, “Empirical Investigation about the Factors Affecting the Cost Estimation in Global Software Development Context,” IEEE Access 9, 22274 (2021).
6. H. Davies, J. Posillico, and D.J. Edwards, “Soft Skills for Teams in Public Linear Infrastructure: The Development of a Decision Support Tool,” Buildings 15(7), 1197 (2025).
7. M.J. Bianchi, E.C. Conforto, E. Rebentisch, D.C. Amaral, S.O. Rezende, and R. De Padua, “Recommendation of Project Management Practices: A Contribution to Hybrid Models,” IEEE Transactions on Engineering Management 69, 3558 (2022).
8. K. Ahsan, and M. Ho, “Analysis of Agile Project Manager Competencies From Recruitment Signals,” IEEE Transactions on Engineering Management 71, 3892 (2024).
9. H. Cornide-Reyes, and others, “Key Skills to Work with Agile Frameworks in Software Engineering: Chilean Perspectives,” IEEE Access 9, 84724 (2021).
10. N. Nigar, M.K. Shahzad, S. Islam, O. Oki, and J.M. Lukose, “A Novel Multi-Objective Evolutionary Algorithm to Address Turnover in the Software Project Scheduling Problem Based on Best Fit Skills Criterion,” IEEE Access 11, 89742 (2023).
11. Md. Shamim, A.B.A. Hamid, T.E. Nyamasvisva, and N.S.B. Rafi, “Advancement of Artificial Intelligence in Cost Estimation for Project Management Success: A Systematic Review of Machine Learning, Deep Learning, Regression, and Hybrid Models,” Modelling—International Open Access Journal of Modelling in Engineering Science 6(2), 35 (2025).
12. I. Avença, L. Domingues, and H. Carvalho, “Project managers soft skills influence in knowledge sharing,” in Proceedings of Elsevier Conference (Elsevier B.V., 2023), p. 1705.
13. N. Qasimi, and A.A. Malik, “A Project Manager’s Personality is a Treasure Trove of Information,” in Proceedings of IEEE Conference (IEEE, 2022), p. 320.
14. A. Ellahi, Y. Javed, M.F. Jan, and Z. Sultan, “Determining the Effect of Software Project Managers’ Skills on Work Performance,” International Journal of Information Technology Project Management 15, 1 (2023).
15. H.U. Rahman, M. Raza, P. Afsar, M. Khan, N. Iqbal, and H.U. Khan, “Making the Sourcing Decision of Software Maintenance and Information Technology,” IEEE Access 9, 11492 (2021).
16. E.C. Manole, P.L. Curșeu, and S. Trif, “The Differentiation–Integration Paradox of Hybrid Work: A Focus Group Exploration of Team and Individual Mechanisms,” Administrative Sciences 15(6), 201 (2025).
17. M.A. Oltra-Rodríguez, P. Stonehouse, N. Afonso-Alonso, and J.A. Holgado-Terriza, “Disciplined Delivery and Organizational Design Maturity: A Socio-Technical Evolutionary Journey,” Systems 13(5), 374 (2025).
18. P.O. Pacheco, D. Coello-Montecel, M. Tello, V. Lasio, and A. Armijos, “How do project managers’ competencies impact project success? A systematic literature review,” PLoS One 18, (2023).
19. A. Ribeiro, A. Amaral, and T. Barros, “Project Manager Competencies in the context of the Industry 4.0,” in Proceedings of Elsevier Conference (Elsevier B.V., 2021), p. 803.
20. N. Ahmad, and A.A. Malik, “Software Project Management-Gap between Theory and Practice,” in Proceedings of IEEE Conference (IEEE, 2023), p. 1.
21. A. Rödlund, A. Toropova, R. Lengnick‐Hall, B.J. Powell, L.S. Elinder, C. Björklund, and L. Kwak, “Mechanisms of change of a multifaceted implementation strategy on fidelity to a guideline for the prevention of mental health problems at the workplace: a mechanism analysis within a cluster-randomized controlled trial,” Implementation Science 20(1), (2025).
22. A. Ahmadi, F. Delkhosh, G. Deshpande, R.A. Patterson, and G. Ruhe, “Learning Software Project Management From Analyzing Q&A’s in the Stack Exchange,” IEEE Access 11, 5429 (2023).
23. S. Moghaddasi, K. Kordani, H. Sarvari, and A. Rashidi, “Redefining Project Management: Embracing Value Delivery Offices for Enhanced Organizational Performance,” Buildings 15(7), 1176 (2025).
24. C. Xu, and S.E. Cho, “Factors Affecting Human–AI Collaboration Performances in Financial Sector: Sustainable Service Development Perspective,” Sustainability 17(10), 4335 (2025).
25. C.M. Martínez, J. Carracedo, and J.S. Gallego, “Characterizing Agile Software Development: Insights from a Data-Driven Approach Using Large-Scale Public Repositories,” Software 4(2), 13 (2025).
26. A.D. Pino-Marchito, A. Galán-García, and M. de los Á. Plaza-Mejía, “The Hersey and Blanchard’s Situational Leadership Model Revisited: Its Role in Sustainable Organizational Development,” World 6(2), 63 (2025).
27. J.C. Dash, A. Ivo, M. Ferreira, and R.R. Silva, “SOHCO: A Strategy for Constructing Efficient Teams,” IEEE Access 11, 14575 (2023).
28. R.E. Reyes-Acosta, R. Mendoza-González, E.O. Díaz, M.V. Martín, F.J.L. Rosas, J.C.M. Romo, and A. Mendoza-González, “Cybersecurity Conceptual Framework Applied to Edge Computing and Internet of Things Environments,” Electronics 14(11), 2109 (2025).
29. A. Sadeh, K. Rogachevsky, and D. Dvir, “The Role of the Project Manager in the Agile Methodology,” (2022).
30. D. Allen, “National personality day: Meyer-Briggs personality test helps you understand which personality to lead with,” (2024).
31. R. Hans, and E. Mnkandla, “The role of the PMO in enforcing and standardizing attendance to the needs of software project teams by project managers,” in Proceedings of Elsevier Conference (Elsevier B.V., 2021), p. 782.
32. A. Nili, C. Fidge, and M. Rosemann, “Why do project managers underuse Management Information Systems theories in their management of IT projects?” in Proceedings of Elsevier Conference (Elsevier B.V., 2024), p. 1578.
33. M.A.S.A.S. Abdulrahman, and F. Dweiri, “Development of an Agile and Sustainable Framework for Resilient and Inclusive Public Transport Organizations,” Sustainability 17(10), 4652 (2025).
34. S. Joshi, “The Role of AI in Enhancing Teamwork, Resilience and Decision-Making: Review of Recent Developments,” (2025).
35. H. Santos-Tiberio, A. Vinueza, and J. Jadan-Guerrero, “Role changes in software development projects using agile methodologies: A case study of private companies in Guatemala City,” in Proceedings of IEEE Conference (IEEE, 2022), p. 1.
36. P. Pawar, S. Balasubramaniam, and A. Ramachandran, “Design of a Graduate level Software Engineering Program with a Product Perspective and a Product Management Specialization,” in Proceedings of IEEE Conference (IEEE, 2023), p. 152.
37. S. Starke, and I. Ludviga, “Unlocking Digital Potential—The Impact of Innovation and Self-Determined Learning,” Systems 13(5), 396 (2025).