

The impact of IT tools on project management efficiency in the public sector: The mediating role of team communication**Abdel Hakim O. Akhorshaidah^a, Saleh Yahya AL Freijjat^b, Hadeel Sa'ad Muhammed Al-Hyari^c, Qais Hammouri^{d*}, Mohammad Alfraheed^e and Saleh Al Hammouri^f**^a*Department of Public Administration, School of Business, The University of Jordan, Jordan*^b*Amman Arab University, Jordan*^c*Department of Financial and Administrative Sciences, Al Salt Collage for Human Sciences, Al-Balqa Applied University, Jordan*^d*Applied Science Private University, Jordan*^e*Department of Computer Science, College of Information and Communications Technology, Tafila Technical University, Jordan*^f*Mohammed Bin Rashid School of Government, United Arab Emirates***CHRONICLE****ABSTRACT***Article history:*

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This study investigates the impact of various IT tools on project management efficiency within the public sector, specifically examining the mediating role of team communication quality. The study utilized a quantitative approach, data was collected from 197 public sector organizations across Jordan, Saudi Arabia, and Lebanon. The study employed PLS-SEM to analyze the relationships between project management software, communication platforms, collaboration tools, team communication quality, and project management efficiency. The findings confirm that project management software, communication platforms, and collaboration tools each positively influence project management efficiency. Moreover, the study reveals the crucial mediating role of team communication quality. Specifically, the positive impact of these IT tools on project management efficiency is significantly channeled through their ability to enhance team communication. These findings underscore the importance for public sector organizations to not only invest in diverse IT tools but also to prioritize initiatives that foster effective team communication to maximize project success and overall organizational efficiency.

1. Introduction

Information technology tools have become valuable in modern project management, fundamentally reshaping how projects are conceived, executed, and overseen (Kabeyi, 2019). Their integration has taken place in an era of unprecedented efficiency and effectiveness, empowering teams with real-time data analytics, streamlined communication channels, and a host of other capabilities (Dandis et al., 2021). However, the true impact of these tools extends far beyond their mere functionality. While they streamline processes, their transformative potential lies in their ability to reshape team communication, a critical driver of project success (Abu-Shanab et al., 2018; Cichosz et al., 2020). Simply implementing tools is not enough; understanding how they influence, and mediate communication dynamics is paramount for utilizing their full value (Evans et al., 2017). Effective team communication is the cornerstone of successful project outcomes (Antonio, 2023). It supports seamless collaboration, facilitates efficient information sharing, and empowers decisive action among team members. IT tools play a pivotal role in fostering this communication-rich environment, providing a powerful platform for virtual meetings, real-time project tracking, seamless document sharing, and instant communication (Ilavarasi, 2024). By transcending geographical limitations, these tools empower teams to tap into diverse expertise and maintain cohesive workflows, ultimately driving project success.

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This paper explores the relationship between IT tools, team communication, and project management efficiency, with a specific focus on the mediating role of team communication. By examining how IT tools influence both the quality and frequency of communication within project teams, we aim to shed light on their profound impact on key project performance metrics, including cost-effectiveness, timeliness, and stakeholder satisfaction. Understanding these complex dynamics is important for organizations striving to optimize their project management strategies in our increasingly digital world (Raed et al., 2023). Through a comprehensive review of existing literature coupled with insightful empirical analysis, this study aspires to make significant contributions to both theoretical advancements and practical applications within the realm of IT tools in project management. By uncovering the mediating mechanisms of team communication, we seek to provide actionable recommendations, empowering project managers and IT professionals to fully leverage the benefits of technological integration. Ultimately, this research seeks to equip organizations with the knowledge and tools to unlock greater project success and enhance their competitive edge in today's dynamic business landscape.

By positioning team communication as a mediating factor, we aim to discover the mechanisms through which IT tools influence project outcomes. This investigation contributes to existing theoretical frameworks by providing a nuanced understanding of how technology shapes communication patterns and, consequently, impacts project performance metrics such as cost-effectiveness, timeliness, and stakeholder satisfaction. Beyond theoretical advancement, this research offers actionable insights for practitioners. By explaining the mediating role of team communication, we empower project managers and IT professionals to make informed decisions regarding technology adoption and implementation. The study will provide practical recommendations for leveraging IT tools to foster seamless collaboration, optimize information flow, and enhance decision-making within project teams. Ultimately, this research will support organizations with the knowledge to harness the transformative power of IT tools, driving project success and bolstering competitiveness in today's dynamic business environment.

2. Hypotheses Development

Several empirical research supports the positive impact of project management software on efficiency (Pellerin et al., 2013; Abu-Shanab et al., 2016; Murni, 2024). Such studies found a strong correlation between software utilization and project performance, particularly in terms of schedule adherence and budget control. Similarly, Ghansah et al., (2021) highlighted how automation and integration technologies, often embedded within project management software, contribute significantly to stakeholder success. These findings are reported in a study conducted by Radhakrishnan et al., (2022), which emphasizes the role of effective planning and resource allocation, facilitated by specialized software, in achieving project success. Effective communication is a critical factor to project success, and dedicated platforms play a crucial role in enhancing it (Yeoh & Popovič, 2016). In addition, Silva (2019) demonstrated that ICT tools, particularly those facilitating communication, positively impact new product development performance and collaboration. Moreover, Marinho et al., (2018) emphasizes the importance of clear communication channels in reducing uncertainties in software project management. These findings support the value of communication platforms in fostering transparency, alignment, and timely information dissemination, ultimately contributing to project efficiency (Anders, 2016). Collaboration tools have become indispensable for fostering teamwork and streamlining workflows, directly impacting project efficiency (Wang et al., 2021). Furthermore, Dodgson et al., (2022) highlights how technology-enabled collaboration enhances project planning and control, leading to improved outcomes. (Gunatilake et al., 2024) suggests that collaborative platforms can mitigate the negative effects of time pressure in software engineering, a common challenge impacting efficiency. These studies underscore the value of collaboration tools in enabling real-time information sharing, task coordination, and collective problem-solving, ultimately contributing to enhanced project efficiency. Based on the previous discussion, the following hypotheses are formulated:

H₁: *Project management software positively influences project management efficiency.*

H₂: *Communication platforms positively influence project management efficiency.*

H₃: *Collaboration tools positively influence project management efficiency.*

Project management software encompasses tools designed to streamline project planning, execution, and monitoring (Baul et al., 2022). This includes features like task management, scheduling, resource allocation, and progress tracking (Shirodkar, 2020). Empirical evidence focuses on the direct link between project management software and efficiency, some studies suggest a positive influence on communication quality (Bond-Barnard et al., 2018; Jitpaiboon et al., 2019; Zada et al., 2023). For instance (Kovaitė et al., 2020) found that while meetings are considered the most efficient communication channel, project management software closely follows. This suggests that such software, by providing a centralized platform for information sharing and task updates, can enhance communication clarity and reduce ambiguity. Similarly (Rahman et al., 2021) found that using project management methodologies, often implemented through software, facilitated intra-team communication and positive collaborative behavior. Therefore:

H₄: *Project management software positively influences team communication quality.*

Communication platforms encompass tools specifically designed to facilitate real-time and asynchronous communication within teams (Zahra et al., 2024). This includes instant messaging applications, video conferencing tools, and email platforms. Mato-Santiso et al., (2021) emphasizes the importance of effective communication channels in overcoming barriers to stakeholder management, suggesting that dedicated platforms can facilitate this process. Furthermore, research on virtual teams highlights the crucial role of communication platforms in bridging geographical distances and fostering a sense of connectedness, ultimately contributing to clearer and more frequent communication (Hacker et al., 2019; Swart et al., 2022). Thus:

H₅: *Communication platforms positively influence team communication quality.*

Collaboration tools encompass technologies that enable teams to work together on shared documents, tasks, and projects in a synchronized manner (Kim et al., 2017). This includes cloud-based document editing suites, shared workspaces, and online whiteboarding tools (Hammouri & Abu-Shanab, 2020). Collaboration tools are inherently designed to enhance communication quality by providing shared spaces for idea exchange, feedback provision, and co-creation (Jones, 2018). Studies have shown that these tools can foster a sense of shared understanding, reduce communication breakdowns, and promote more inclusive and equitable participation from all team members (McLoughlin et al., 2018; Cutler et al., 2021; Masadeh et al., 2024). Therefore:

H₆: *Collaboration tools positively influence team communication quality.*

Team communication quality refers to the clarity, timeliness, and effectiveness of information exchange within a project team (Kwofie et al., 2020). It encompasses aspects like active listening, clear message conveyance, and constructive feedback (Vanamali, 2023). The positive relationship between team communication quality and project management efficiency is widely recognized in the literature (Fung, 2014, Bond-Barnard et al., 2018). Effective communication minimizes misunderstandings, prevents rework, and enables faster decision-making, all of which contributes to enhanced efficiency (Love & Matthews, 2022). Conversely, poor communication is often cited as a leading cause of project delays, budget overruns, and stakeholder dissatisfaction (Dick-Sago et al., 2023). Therefore, the following hypothesis is formulated:

H₇: *Team communication quality positively influences project management efficiency.*

While direct links between project management software and efficiency are well-established, research specifically exploring the mediating role of communication quality is limited. However, studies like (Weflen et al., 2022), which found that visualizing work in progress through Kanban tools (a feature often found in project management software) improved communication, conferencing, and consultation quality, provide indirect support. This suggests that by enhancing transparency and facilitating shared understanding, project management software can indirectly boost efficiency through improved communication (Bhatti et al., 2021). Moreover, Schneider et al., (2018) found that while assessing the quality of meetings is complex, simply analyzing meeting frequency and duration (data easily captured by communication platforms) can offer insights into project pressure and communication patterns. This suggests that communication platforms, by providing data and facilitating more frequent interaction, can indirectly enhance efficiency through improved communication flow and reduced bottlenecks (Joshi, 2009; Sweis et al., 2019). In addition, several studies highlighting the positive impact of collaboration tools on knowledge sharing, co-creation, and reducing communication breakdowns indirectly support this hypothesis (Tajvidi et al., 2020; Haverila et al., 2022). By fostering a more collaborative and communicative environment, these tools can indirectly contribute to efficiency gains. Based on that:

H₈: *Team communication quality mediates the relationship between project management software and project management efficiency.*

H₉: *Team communication quality mediates the relationship between communication platforms and project management efficiency.*

H₁₀: *Team communication quality mediates the relationship between collaboration tools and project management efficiency.*

3. Methodology

3.1 Instrument Development

This study adopts a quantitative methodology to investigate how the use of IT tools influences project management efficiency within public sector organizations. A structured survey instrument, consisting of 21 carefully selected statements, was deployed to collect data from participants. Each statement was designed to capture specific aspects of the relationship between IT tool utilization and project outcomes. Participants were asked to rate their level of agreement with each statement on a five-point Likert scale, ranging from “Strongly Disagree” to “Strongly Agree”. This approach allowed for nuanced measurement of participant perceptions and experiences. To ensure the reliability and validity of the data, the survey instrument incorporated established measurement scales, based on prior research in the study field. Project management software

measured using a scale adapted from Murni et al., (2024). Communication platforms and collaboration tools measured using a scale adapted from Zeng et al., (2023). Team communication quality measured using a scale adapted from Valls et al., (2016). Project management efficiency measured using a scale adapted from Spalek (2014). By leveraging these validated scales, the study ensures a robust and credible assessment of the complex interplay between IT tools and project management efficiency in the public sector.

3.3 Sample and Sampling Process

This study aims to investigate the relationship between IT tools and project management efficiency within the public sectors of Jordan, Saudi Arabia, and Lebanon. A robust quantitative approach was employed, leveraging a structured questionnaire disseminated via Google Drive to ensure ease of access for participants. This strategic approach yielded an impressive 95.1% response rate, with 197 out of 207 invited industry professionals, specifically project managers and team members, contributing valuable insights. After data cleaning, a final dataset of 197 valid responses was deemed statistically sound for comprehensive analysis. Table 1 depicts the demographic characteristics of the respondents.

The study attracted a diverse group of professionals from the public sector, offering a valuable snapshot of the industry's demographic. A majority (59.9%) of the respondents were male, highlighting a potential gender gap within these sectors. Geographically, Saudi Arabia dominated the respondent pool, with 72.6% of participants forming from the Kingdom. Age-wise, the study revealed a seasoned cohort, with over a third (37.6%) of respondents aged 41 and above, underscoring the experience prevalent within the field. Conversely, younger professionals (18-25 years) were less represented, comprising only 8.6% of the sample. In terms of education, a bachelor's degree emerged as the standard qualification, held by 52.2% of respondents. Interestingly, team members constituted the largest respondent group (65%), surpassing project managers who represented 35% of the sample. This discrepancy might suggest a greater interest in the study's subject matter among team members, highlighting the importance of IT tools for effective collaboration and project execution at the team level.

Table 1
Demographic Profile

| Measure | Category | Count | Percentage % |
|-----------|-----------------|-------|--------------|
| Age | 18 – 25 | 17 | 8.6 |
| | 26 – 33 | 59 | 29.9 |
| | 34 – 41 | 47 | 23.9 |
| | Age > 41 | 74 | 37.6 |
| Education | Diploma | 29 | 14.8 |
| | Bachelor | 103 | 52.2 |
| | Postgraduate | 65 | 33.0 |
| Gender | Male | 118 | 59.9 |
| | Female | 79 | 40.1 |
| Category | Project Manager | 69 | 35.0 |
| | Team Member | 128 | 65.0 |
| Country | Jordan | 33 | 16.8 |
| | Saudi Arabia | 143 | 72.6 |
| | Lebanon | 21 | 10.6 |

4. Data Analysis

4.1 Measurement Model

Table 2 presents a rigorous evaluation of the measurement model's efficacy, employing confirmatory factor analysis to assess the quality of individual item measures and the overall model fit. The results demonstrate exceptional model validity and reliability. All standardized factor loadings exhibit statistically significant strength, exceeding the recommended 0.5 threshold, with values ranging from 0.654 to 0.884. This indicates that each item effectively measures its intended latent construct. Furthermore, the analysis reveals strong convergent validity, as evidenced by Average Variance Extracted values surpassing the critical 0.5 benchmark for all variables, ranging from 0.781 to 0.811. This signifies that a high proportion of the variance in each measured variable is explained by its corresponding latent construct. Internal consistency reliability is also well-established, with composite reliability values for all constructs exceeding the accepted 0.7 threshold, falling between 0.741 and 0.822. This demonstrates the high degree of internal consistency among the items within each construct.

Table 3 further strengthens the validation of the measurement model by providing compelling evidence for discriminant validity. The Heterotrait-Monotrait ratios, a rigorous measure of construct differentiation, are all significantly below the accepted 0.90 threshold, ranging from 0.144 to 0.441. This signifies minimal overlap between the latent variables, confirming that each construct is distinct and captures a unique theoretical concept. The combined evidence of both convergent and discriminant validity provides strong support for the measurement model's robustness.

Table 2
Measurement Model Properties

| Construct | Items | Factor loading | Composite Reliability | AVE |
|-------------------------------------|-------|----------------|-----------------------|-------|
| Project Management Software (PMS) | PMS1 | 0.725 | 0.771 | 0.811 |
| | PMS2 | 0.689 | | |
| | PMS3 | 0.741 | | |
| | PMS4 | 0.695 | | |
| | PMS5 | 0.735 | | |
| Communication Platforms (CP) | CP1 | 0.789 | 0.802 | 0.796 |
| | CP2 | 0.720 | | |
| | CP3 | 0.709 | | |
| | CP4 | 0.754 | | |
| Collaboration Tools (CT) | CT1 | 0.841 | 0.795 | 0.781 |
| | CT2 | 0.826 | | |
| | CT3 | 0.810 | | |
| | CT4 | 0.778 | | |
| Team Communication Quality (TCQ) | TCQ1 | 0.698 | 0.741 | 0.803 |
| | TCQ2 | 0.654 | | |
| | TCQ3 | 0.663 | | |
| | TCQ4 | 0.704 | | |
| Project Management Efficiency (PME) | PME1 | 0.884 | 0.832 | 0.795 |
| | PME2 | 0.836 | | |
| | PME3 | 0.810 | | |
| | PME4 | 0.851 | | |

Table 3
HTMT Analysis for Construct Discrimination

| | PMS | CP | CT | TCQ | PME |
|-----|-------|-------|-------|-------|-----|
| PMS | | | | | |
| CP | 0.144 | | | | |
| CT | 0.351 | 0.190 | | | |
| TCQ | 0.408 | 0.217 | 0.267 | | |
| PME | 0.354 | 0.248 | 0.441 | 0.348 | |

4.2 Direct Testing

Structural equation modeling was employed to test the proposed relationships between study variables. Table 4 demonstrated the significant relationships between key project management elements: project management software (PMS), communication platforms (CP), collaboration tools (CT), team communication quality (TCQ), and project management efficiency (PME). The analysis, employing T-statistics and p-values, reveals compelling support for all proposed hypotheses. Hypotheses H1, H2, and H3, which posited positive relationships between PMS, CP, CT, and PME, are strongly supported. The results demonstrate statistically significant positive effects ($p < 0.005$) with substantial T-statistics of 8.734, 9.506, and 18.172, respectively. This suggests that effective utilization of these IT tools significantly enhances project management efficiency. Similarly, Hypotheses H4, H5, and H6, which proposed positive relationships between PMS, CP, CT, and TCQ, are also confirmed. The analysis reveals statistically significant positive effects ($p < 0.005$) with notable T-statistics of 12.412, 7.655, and 10.541, respectively. This highlights the crucial role of these tools in fostering high-quality team communication. Finally, Hypothesis H7, which suggested a positive relationship between TCQ and PME, is strongly supported. The analysis demonstrates a statistically significant positive effect ($p < 0.001$) with a robust T-statistic of 9.440. This underscores the critical link between effective team communication and overall project success.

Table 4
Path Analysis

| | Path | T-Value | P-Value | Result |
|----|-----------|---------|---------|-----------|
| H1 | PMS > PME | 8.734 | 0.000 | Supported |
| H2 | CP > PME | 9.506 | 0.001 | Supported |
| H3 | CT > PME | 18.172 | 0.000 | Supported |
| H4 | PMS > TCQ | 12.412 | 0.002 | Supported |
| H5 | CP > TCQ | 7.655 | 0.000 | Supported |
| H6 | CT > TCQ | 10.541 | 0.002 | Supported |
| H7 | TCQ > PME | 9.440 | 0.000 | Supported |

Table 5 represents the relationship between IT tool utilization and project success by examining the mediating role of team communication quality. Specifically, it investigates whether the positive impact of project management software, communication platforms, and collaboration tools on project management efficiency is channeled through enhanced team communication. The mediation analysis provides compelling evidence to support Hypotheses H8, H9, and H10. These hypotheses proposed that team communication quality mediates the relationship between the IT tools and PME. The results reveal statistically significant positive indirect effects ($p < 0.005$) with notable T-statistics of 2.351, 1.449, and 3.107, respectively.

These findings underscore the crucial role of team communication quality as a vital link between IT tool utilization and enhanced project management efficiency. While these tools provide valuable support for project management processes, their effectiveness is amplified when they foster seamless communication and collaboration within the team. This highlights the importance of not only implementing these tools but also encouraging a collaborative communication environment to maximize their positive impact on project outcomes.

Table 5
Mediation Test

| | Path | T-Value | P-Value | Result |
|------------|-----------------|---------|---------|-----------|
| H8 | PMS > TCQ > PME | 2.351 | 0.000 | Supported |
| H9 | CP > TCQ > PME | 1.449 | 0.000 | Supported |
| H10 | CT > TCQ > PME | 3.107 | 0.000 | Supported |

5. Discussion

This study examined the impact of various IT tools, namely project management software, communication platforms, and collaboration tools, on project management efficiency. The study also investigated the mediating role of team communication quality in this relationship. The findings provide strong support for all proposed hypotheses. The results confirm that the use of project management software, communication platforms, and collaboration tools is positively associated with project management efficiency. This finding aligns with previous research (Ramesh et al., 2018) that highlights the positive impact of technology use in project planning and control on project success. Specifically, the study findings revealed a link between the level of project management software utilization and project performance. Our findings extend this understanding by demonstrating the positive effects of various IT tools on overall project efficiency. Furthermore, the study provides evidence that the use of these IT tools significantly enhances team communication quality. This finding is consistent with Valls et al., (2016) which emphasizes the role of ICT in improving collaboration during new product development. Effective communication platforms and collaboration tools can facilitate information sharing, reduce misunderstandings, and promote a shared understanding among team members, ultimately contributing to improved project outcomes. Finally, this study highlights the crucial mediating role of team communication quality in the relationship between IT tool utilization and project management efficiency. The findings suggest that the positive impact of IT tools on project efficiency is channeled through their ability to enhance team communication. This finding underscores the importance of not just implementing these tools but also fostering a communication-rich environment where team members can effectively leverage these technologies.

6. Conclusion

This study underscores the significant role of IT tools in enhancing project management efficiency. Our findings demonstrate that project management software, communication platforms, and collaboration tools positively influence project success, primarily by fostering a more collaborative and communicative team environment. This research highlights the importance for organizations to invest in robust IT infrastructure and prioritize a communication-rich culture to fully realize the benefits of these technologies. By embracing these tools and fostering effective communication, organizations can significantly enhance project outcomes and achieve greater success. Future research could explore the impact of different types of project management software, communication platforms, and collaboration tools on specific aspects of project efficiency. Additionally, investigating the moderating effects of factors such as team size, project complexity, and organizational culture would provide a more nuanced understanding of the relationships examined in this study.

6.1 Practical Implications

The findings of this study have important practical implications for organizations and project managers.

1. Investing in IT Infrastructure: Organizations should prioritize investing in comprehensive IT infrastructure that includes project management software, communication platforms, and collaboration tools.
2. Training and support: Providing adequate training and support to ensure that team members can effectively utilize these tools is crucial.
3. Fostering a communication culture: Organizations should cultivate a culture that values and encourages open and effective communication among team members.

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