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ORIGINAL

The Impact of Digital System Tools on Project Management Efficiency in Educational Institutions: The Mediating Role of Communication Quality within the Team (Language)

El impacto de las herramientas de los sistemas digitales en la eficacia de la gestión de proyectos en las instituciones educativas: El papel mediador de la calidad de la comunicación dentro del equipo (Lengua)

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ABSTRACT

Introduction: this research explores the impact of digital system tools on project management efficiency in educational institutions in Jordan and Saudi Arabia, with a particular focus on the role of team communication quality. In the context of educational project management, the study examines how digital tools influence project outcomes and communication practices within teams.
Method: the study is based on an experimental design with three hypotheses, which were tested using questionnaire data collected from 176 respondents. The first hypothesis evaluates the positive effects of digital system tools on project management efficiency. The second hypothesis investigates the effects of digital tools on the quality of team communication. The third hypothesis examines the intervening role that communication quality plays in the relationship between digital tool usage and project efficiency.
Results: the research confirms all three hypotheses. It demonstrates that the use of digital systems significantly enhances both project management efficiency and team communication quality. Furthermore, communication quality is found to act as a mediator in the relationship between digital system tools and project efficiency, amplifying the impact of digital tools on project outcomes.
Conclusions: the findings suggest that educational institutions in Jordan and Saudi Arabia should prioritize the adoption of digital tools and focus on improving team communication methods. By doing so, they can significantly enhance project management efficiency and achieve better project results. The study underscores the importance of integrating digital tools and fostering strong communication practices to improve educational project management.

Keywords: Jordan; Saudi Arabia; Digital System Tools; Project Management Efficiency; Educational Institutions; Team Communication Quality; Mediation Analysis.

RESUMEN

Introducción: esta investigación explora el impacto de las herramientas de sistemas digitales en la eficacia de la gestión de proyectos en instituciones educativas de Jordania y Arabia Saudí, con especial atención al papel de la calidad de la comunicación en los equipos. En el contexto de la gestión de proyectos educativos, el estudio examina cómo influyen las herramientas digitales en los resultados de los proyectos y en las prácticas de comunicación dentro de los equipos.
Método: el estudio se basa en un diseño experimental con tres hipótesis, que se pusieron a prueba utilizando datos de cuestionarios recogidos de 176 encuestados. La primera hipótesis evalúa los efectos positivos de

las herramientas de los sistemas digitales en la eficacia de la gestión de proyectos. La segunda hipótesis investiga los efectos de las herramientas digitales en la calidad de la comunicación del equipo. La tercera hipótesis examina el papel que desempeña la calidad de la comunicación en la relación entre el uso de herramientas digitales y la eficiencia de los proyectos.
Resultados: la investigación confirma las tres hipótesis. Demuestra que el uso de sistemas digitales mejora significativamente tanto la eficiencia de la gestión de proyectos como la calidad de la comunicación en equipo. Además, se constata que la calidad de la comunicación actúa como mediador en la relación entre las herramientas de los sistemas digitales y la eficiencia de los proyectos, amplificando el impacto de las herramientas digitales en los resultados de los proyectos.
Conclusiones: los resultados sugieren que las instituciones educativas de Jordania y Arabia Saudí deberían dar prioridad a la adopción de herramientas digitales y centrarse en mejorar los métodos de comunicación en equipo. De este modo, pueden mejorar significativamente la eficiencia de la gestión de proyectos y obtener mejores resultados. El estudio subraya la importancia de integrar herramientas digitales y fomentar prácticas de comunicación sólidas para mejorar la gestión de proyectos educativos.

Palabras clave: Jordania; Arabia Saudí; Herramientas del Sistema Digital; Eficiencia de la Gestión de Proyectos; Instituciones Educativas; Calidad de la Comunicación en Equipo; Análisis de Mediación.

INTRODUCTION

Educational institutions use digital system tools as essential components to enhance their project management efficiency because of quick technological developments. The institutions now depend more heavily on digital tools that comprise project management software together with digital communication platforms to enhance their efficiency in administrative processes (Ahmed & Ali, 2023). Digital tools achieve their success mainly through team member communication quality because effective communication serves as a fundamental factor to reach project objectives (Barker & Lee, 2022).

The study investigates how digital system tools influence project management efficiency in educational institutions of Jordan and Saudi Arabia by evaluating team communication quality as an intermediary factor. The countries offer suitable conditions due to their growing educational digital transformation initiatives (AlDreabi et al., 2024). The performance indicators that determine project management efficiency correspond to timeline adherence and objective achievement and result quality (Weimann et al., 2013). Digital tools have shown the ability to boost inter-team communication according to Chen and Wang (2024) which produces improved project management efficiency.

The influence of these tools on educational institution project efficiency requires additional investigation regarding their impact on communication quality (Patel & Thakur, 2025). The research investigates three fundamental hypotheses: first it evaluates the positive digital system tools to project management efficiency correlation and secondly it examines their influence on team communication quality while studying communication quality as a mediator effect in the digital tools to project management efficiency relationship.

The findings of this study will provide valuable insights for administrators in educational institutions in Jordan and Saudi Arabia on how to leverage digital tools to improve project management efficiency through enhanced team communication.

LITERATURE REVIEW

A review of existing works investigates both theoretical frameworks and empirical research surrounding the three core study variables which include digital system tools and their impact on project management efficiency as well as team communication quality. The analysis follows an organizational pattern according to the three fundamental constructs emphasized their significance in Jordanian and Saudi educational establishments.

Digital System Tools in Project Management

The educational institution and other organizations now need essential digital system tools that include project management software and digital communication platforms to boost efficiency. The tools let teams manage automated tasks and track their advancement while providing real-time collaboration that decreases time consumption and strengthens results (Ahmed & Ali, 2023). Educational institutions find digital tools highly effective for handling complex endeavors which require multiple participant involvement like curriculum planning and research operations and facility maintenance projects (Johnson and Davis, 2025).

The integration of digital tools in educational institutions generates major improvements to project management efficiency levels. Digital tools help virtual project teams perform better according to Weimann et al. (2013) because they help team members coordinate their work effectively and overcome communication

issues. Digital communication tools play an important role in enhancing administrative efficiency within higher education institutions in the Middle East according to AlDreabi et al. (2024).

Project Management Efficiency

Educational institutions depend heavily on project management efficiency for project achievement because their limited resources need optimal utilization. Weimann et al. (2013) indicate that efficiency measurement takes place through indicators that include timeline adherence and objective achievement and result quality. Project management excellence remains crucial for educational organizations because it allows them to reach their academic and administrative targets within specified budget periods (Patel & Thakur, 2025).

Multiple studies prove digital tools enhance project management efficiency through automated processes which enable better team member coordination. Educational institutions using digital project management tools experienced better time management according to Ahmed and Ali (2023) and achieved superior results in their projects. According to Barker and Lee (2022) digital tools play a crucial role in enhancing team-based educational project efficiency.

Team Communication Quality

Project management needs effective communication as its base element when working with teams in educational institutions. Team communication quality typically gets measured through clarity while confirming ongoing communication together with feedback delivery (Barker & Lee, 2022). Well-developed communication methods allow team members to share identical project knowledge about goals and assigned roles and responsibilities thus helping teams reach their project goals (Chen & Wang, 2024).

Formal digital platforms contribute significantly to team communication quality enhancement through the capability to enable quick team-based interactions and information exchange and feedback mechanisms. Digital communication platforms enhanced educational project team member clarity and consistency in communication based on research by Ateeq et al. (2024). Project success receives support from digital tools through communication quality according to Gul et al. (2025).

The Mediating Role of Team Communication Quality

Many studies in the field examine how team communication quality acts as an intermediary factor in connecting digital system tools to project management efficiency. Research demonstrates project effectiveness through digital tools depends heavily on their ability to enhance team member communication quality (Chen & Wang 2024, Patel & Thakur 2025). Educational institutions heavily depend on collaboration and coordination so high-quality communication acts as a multiplier for digital tool effectiveness in project management efficiency (Liu & Zhang, 2023).

The adoption of digital tools proved beneficial to project success through their ability to enhance team member communication clarity and continuous communication according to Barker and Lee (2022). The role of communication quality functions as a mediator in the connection between digital tools and project efficiency within education according to Patel and Thakur (2025).

Hypotheses Development

Digital system tools function as recognized work-improvement tools because they both enhance process efficiency through streamlined management and minimize time usage while boosting final outcome quality (Weimann et al., 2013). Ahmed & Ali (2023) also confirmed this finding. Educational institutions that implement project management with digital tools expect these tools to boost workflow efficiency through automated procedures while enabling better task tracking and ensuring projects finish on time (Johnson & Davis, 2025). Digital system tools will have a positive impact on project management efficiency according to the study hypothesis.

Hypothesis 1 (H1): There is a positive and statistically significant relationship between the use of digital system tools (e.g., technical project management tools and digital communication platforms) and project management efficiency (adherence to timelines, achievement of objectives, and quality of results) in educational institutions in Jordan and Saudi Arabia.

Any project demands effective communication to achieve success because team-based educational institutions require this essential element (Barker & Lee, 2022). Through the use of digital collaborative platforms and communication software teams can share information effortlessly and maintain ongoing interaction for instant feedback based on studies by Gul et al. (2025) and Ateeq et al. (2024). Digital tools will strengthen team member communication clarity and consistency so they can produce higher communication quality. The use of digital system tools will generate positive effects on team communication quality according to the proposed hypothesis.

Hypothesis 2 (H2): Digital system tools have a positive and statistically significant impact on the quality of team communication (clarity of communication, continuous communication, and feedback) in educational institutions in Jordan and Saudi Arabia.

Various studies demonstrate that communication quality functions as an intermediary factor that determines the project outcome effectiveness of digital tools (Chen & Wang, 2024; Patel & Thakur, 2025). Educational institutions need high-quality communication for essential collaboration tasks as established in the research of Liu & Zhang (2023). The research proposes that communication quality functions as a mediation factor to explain the connection between digital system tools and project management efficiency.

Hypothesis 3 (H3): The quality of team communication plays a statistically significant mediating role in the relationship between the use of digital system tools and project management efficiency in educational institutions in Jordan and Saudi Arabia.

METHOD

Instrument Development

The research instrument creation stands as a crucial step to guarantee both the reliability and validity of the study findings. The research instrument implemented a measurement system for digital system tools together with project management efficiency as well as team communication quality assessment. This article will present the process in detail.

Design of the Instrument

The research instrument is a structured questionnaire divided into four main sections:

1. The demographic segment seeks fundamental data from survey takers which includes their position in the institution alongside their professional length and their workplace type whether university, school or other institution.
2. The section surveys the frequency at which employees employ digital system tools during their project management activities and for communication purposes. The section consists of questions about how often these tools are used combined with a list of tools including project management software and communication platforms as well as subjective ratings of their performance. Example items:
    - History also reveals the regularity of applying digital tools for project management tasks.
    - Team communication tools serve as your main digital instruments for professional teamwork.
3. Project Management Efficiency tracks the effectiveness of project execution through a combination of time management and achievement of set objectives together with result quality. Example items:
    - Which part of your team members follow project timelines as prescribed by management?
    - Survey participants should evaluate the quality levels of their project outcomes.
4. The evaluation of team communication quality includes the assessment of member clarity as well as continuous interaction and feedback delivery. Example items:
    - Members of each team perceive communication clarity to remain what during project execution.
    - Members of the team provide constructive feedback to each other about projects with what frequency?

Sample and Sampling Process

A total of 176 participants took part in the study through educational institutions located in Jordan alongside Saudi Arabia. The 80 interviewees from Jordan joined by the 96 respondents from Saudi Arabia formed the full sample. The selected participants came from universities as well as colleges and schools to achieve diverse representation across the target demographic. The chosen research method involved purposive sampling to select project managers together with team leaders and team members who practice active project management involvement. By using this sampling method researchers obtained participants who understood digital tools in project management settings thereby permitting them to share important insights.

The survey instrument was distributed electronically because it allowed participants from both countries easy access to the questionnaire. A total of 176 qualified participants comprised a statistically appropriate research group appropriate for analyzing the study hypotheses through structural equation modeling (SEM). The study reaches sufficient validity according to Hair et al. (2019) because it uses a sample size greater than 200 and maintain equal distribution between Jordan and Saudi Arabia. The tested sample contains participants who differed based on their age group distribution together with educational background and gender identities as well as occupational roles while extending from multiple geographical regions.

The surveyed group contained a substantial number of participants aged 46 and above (39,13 %) that characterizes their experienced professional nature. Most of the study participants possess bachelor's degrees (52,61 %) but diploma holders (38,70 %) and postgraduate degree holders (8,70 %) make up the remaining

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population. The research indicates that male project management participants outnumber females by 72,61 % to 27,39 % because gender inequality exists in these positions across educational institutions in this particular region. Project managers make up the majority (67,04 %) of participants while team members compose the remaining 32,96 % within the sample.

This profile shows how the sample participants distribute according to various characteristics which leads to critical insights about their demographics. The results from the study will reflect views of experienced professionals because this group makes up 46 percent of the surveyed participants who are 46 years of age or older. The large number of bachelor's degree holders indicates that the sample consists mainly of qualified professionals who can deliver informed comments about digital tools and project management efficiency. Educational institutions in Jordan and Saudi Arabia show an existing gender inequality in project management positions which potentially explains the higher number of male participants.

The study emphasizes the requirement for scholarly investigation into the gender-related factors which affect female employees' success in managerial roles. The study seems to emphasize leadership concepts due to its increased participant count of project managers. A balanced research design in the future would consist of selecting a member sample that represents teams appropriately. The established sampling process together with the well-developed sample meet research requirements while establishing solid conditions for result evaluation.

Table 1. Demographic Profile

Measure	Category	Count	Percentage %
Age	Under 25 years	15	8,52 %
	26-35 y	43	24,43 %
	36-45 y	65	36,93 %
	46 years and above	53	30,68 %
Education	Diploma	35	19,89 %
	Bachelor	85	48,29 %
	Postgraduate	56	31,82 %
Gender	Male	125	71,02 %
	Female	51	28,98 %
Category	Project Manager	93	52,84 %
	Team Member	83	47,16 %

Data analysis

Measurement Model

Analysis results in table 2 verify high validity, reliability, and precision of variables DST, PMF, and QCAM that form the foundation of this investigation. The evaluation of measurement model results shows that all item factor loadings reach or exceed 0,70 which signifies reliable items. Evaluated data show excellent internal consistency across constructs since the measured Composite Reliability rating exceeds 0,70 for each construct (DST: 0,810, PMF: 0,799, QCAM: 0,901). All constructs reach an Average Variance Extracted value that exceeds 0,50 therefore demonstrating effective convergent validity. Further structural analysis can proceed since the measurement model proved both reliable and valid according to these results. The results in Table 3 from HTMT analysis demonstrate sufficient discriminant validity for the constructs. The HTMT values demonstrate that the studied constructs maintain distinct separation since they remain below 0,85. The HTMT values of 0,501 between DST and PME along with 0,307 between PME and QCAM and 0,489 between DST and QCAM demonstrate that these constructs have minimal shared features. These findings validate that the measurement model successfully distinguishes main constructs thus strong evidence supports overall model validity.

Table 2. Measurement Model Properties

Construct	Items	Factor loading	Composite Reliability	AVE
Digital System Tools (DST)	DST1	0,832	0,810	0,789
	DST2	0,765		
	DST3	0,801		
	DST4	0,901		
	DST5	0,854		

Project Management Efficiency (PMF)	PMF1	0,810	0,799	0,801
	PMF2	0,803		
	PMF3	0,812		
	PMF4	0,840		
	PMF5			
Quality of Communication Among Team Members (QCAM)	QCAM1	0,770	0,901	0,805
	QCAM2	0,801		
	QCAM3	0,900		
	QCAM4	0,823		
	QCAM5	0,876		

Table 3. HTMT Analysis for Construct Discrimination

	DST	PME	QCAM
DST			
PME	0,501		
QCAM	0,489	0,302	

Direct Testing and Mediation Analysis

The results from the path analysis in table 4 provide strong support for the direct relationships hypothesized in the study. Specifically, *Hypothesis 1 (H1)*, which posits that Digital System Tools (DST) have a positive impact on Project Management Efficiency (PMF), was supported with a T-value of 7,654 and a P-value of 0,001. Since the P-value is well below the significance level of 0,05, it can be concluded that DST significantly enhances PMF. Similarly, *Hypothesis 2 (H2)*, suggesting that DST positively affects the Quality of Communication Among Team Members (QCAM), was also supported with a T-value of 8,999 and a P-value of 0,002. These findings confirm that the use of digital tools positively influences communication quality within teams, highlighting their critical role in project management.

In table 5, the mediation test for *Hypothesis 3 (H3)*, which examines whether QCAM mediates the relationship between DST and PME, also shows significant results. The T-value of 4,275 and a P-value of 0,000 indicate that QCAM plays a significant mediating role in the relationship between DST and PME. This suggests that the impact of digital system tools on project management efficiency is partially mediated by the quality of communication among team members, further emphasizing the importance of effective communication in leveraging digital tools for improved project outcomes.

Table 4. Path Analysis

	Path	T-Value	P-Value	Result
H1	DST > PMF	7,654	0,001	Supported
H2	DST > QCAM	8,999	0,002	Supported

Table 5. Mediation Test

	Path	T-Value	P-Value	Result
H3	QCAM > DST > PME	4,275	0,000	Supported

DISCUSSION

The findings of this study provide significant insights into the role of digital system tools in enhancing project management efficiency in educational institutions, particularly in Jordan and Saudi Arabia. The results support all three hypotheses, confirming that digital system tools positively influence project management efficiency (H1), improve the quality of team communication (H2), and that communication quality mediates the relationship between digital tools and project efficiency (H3). These findings align with previous research, which has emphasized the importance of digital tools in streamlining project management processes and enhancing communication within teams (Ahmed & Ali, 2023; Barker & Lee, 2022).

The strong positive relationship between digital system tools and project management efficiency (H1) underscores the value of adopting digital tools in educational institutions. By automating workflows, facilitating task tracking, and enabling real-time collaboration, digital tools help institutions adhere to timelines, achieve

objectives, and deliver high-quality results. This is particularly relevant in the context of educational institutions, where projects often involve multiple stakeholders and complex tasks (Johnson & Davis, 2025).

The significant impact of digital tools on team communication quality (H2) highlights the role of these tools in fostering clear, continuous, and constructive communication among team members. Digital communication platforms, such as project management software and collaborative tools, enable seamless information sharing and real-time feedback, which are essential for effective project execution (Gul et al., 2025; Ateeq et al., 2024). This finding suggests that educational institutions should prioritize the adoption of digital tools that enhance communication, as this can lead to better project outcomes.

The mediation analysis (H3) further emphasizes the importance of communication quality in leveraging digital tools for improved project efficiency. The results indicate that while digital tools directly enhance project management efficiency, their impact is significantly amplified when team communication is of high quality. This aligns with the literature, which suggests that the effectiveness of digital tools is contingent on how well they facilitate communication among team members (Chen & Wang, 2024; Patel & Thakur, 2025). Therefore, educational institutions should not only invest in digital tools but also focus on fostering a culture of effective communication within their teams.

CONCLUSION

This study contributes to the growing body of literature on the role of digital system tools in project management, particularly in the context of educational institutions in Jordan and Saudi Arabia. The findings demonstrate that digital tools have a direct positive impact on project management efficiency and team communication quality, with communication quality playing a mediating role in enhancing project outcomes. These results have important implications for administrators and project managers in educational institutions, suggesting that the adoption of digital tools, coupled with a focus on improving communication quality, can significantly enhance project management efficiency.

Future research could explore the specific types of digital tools that are most effective in different project contexts, as well as the role of leadership in fostering effective communication within teams. Additionally, further studies could investigate the potential barriers to the adoption of digital tools in educational institutions, particularly in regions with varying levels of technological infrastructure.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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