Contents lists available at GrowingScience

Journal of Project Management

homepage: www.GrowingScience.com

The role of artificial intelligence in project management performance: The mediating effects of competence retention and top management support

Sura Alayed[a*]

[a]*College of Business Studies, Arab Open University, Saudi Arabia*

A B S T R A C T

This study examines the impact of artificial intelligence (AI) on project management performance, with a focus on the mediating roles of top management support and project management competence retention. A cross-sectional research design was employed, and data were collected from 309 employees using a convenience sampling technique. Conducted within the context of Saudi Arabia's manufacturing sector, the research aligns with the nation's Vision 2030 goals of economic diversification and technological advancement. Data analysis was performed using structural equation modeling (SEM) to examine the relationships between the constructs. The results reveal that AI has a significant direct impact on both top management support (β = 0.865) and competence retention (β = 0.827), while also indirectly enhancing project performance through these mediating factors (β = 0.666 and β = 0.471, respectively). Additionally, top management support (β = 0.771) and competence retention (β = 0.507) directly influence project performance. The findings highlight the critical role of AI in improving decision-making, resource allocation, and skill retention, ultimately leading to better project outcomes. The findings have significant implications for organizations and policymakers. Practically, organizations in Saudi Arabia's manufacturing sector can leverage AI to enhance project outcomes by improving decision-making, resource allocation, and skill retention.

Article history:
Received October 3, 2024
Received in revised format December 26, 2024
Accepted March 17 2025
Available online March 17 2025

Keywords:
Artificial intelligence
Performance
Project management
Business

© 2025 by the authors; licensee Growing Science, Canada.

1. Introduction

Artificial intelligence (AI) is reshaping project management by enhancing efficiency, decision-making, and strategic execution. As organizations face increasing project complexity, AI-driven tools are being leveraged to improve planning, forecasting, and risk mitigation (Savio & Ali, 2023). These technologies enable project managers to analyze vast datasets, automate routine tasks, and optimize resource allocation, ultimately leading to better project performance (Bento et al., 2022). AI's ability to provide predictive insights and real-time decision support enhances overall project efficiency, making it a valuable asset in today's dynamic business environment. The successful integration of AI in project management is influenced by multiple organizational factors, among which top management support and project management competence retention play critical roles. Top management support is essential for facilitating AI adoption, ensuring resource allocation, and fostering an innovation-driven culture (Taboada et al., 2023). Leadership commitment directly impacts AI-driven transformation by addressing resistance, aligning AI initiatives with organizational goals, and promoting a structured implementation process. Without strong managerial backing, AI adoption may face operational inefficiencies and fail to achieve its intended benefits (Shoushtari et al., 2024). Similarly, project management competence retention is a key factor in ensuring AI's long-term impact. Organizations must focus on developing employees' skills and expertise to effectively leverage AI-driven solutions (Shamim, 2024). As AI automates various project management tasks, continuous learning and competency development become necessary to maintain human oversight and strategic decision-making capabilities. The ability of employees to adapt to AI-driven workflows determines the sustainability of AI's benefits in project management (Hossain et al., 2024; Alateeg & Al-Ayed, 2024). By enhancing knowledge retention and upskilling employees, organizations can maximize AI's contribution to improved project outcomes.

* Corresponding author
E-mail address s.alayed@arabou.edu.sa (S. Alayed)

ISSN 2371-8374 (Online) - ISSN 2371-8366 (Print)
© 2025 by the authors; licensee Growing Science, Canada.
doi: 10.5267/j.jpm.2025.3.005

Saudi Arabia's Vision 2030 emphasizes economic diversification and technological advancement, making AI adoption in project management particularly relevant to the nation's industrial transformation (Bakr et al., 2023). The manufacturing sector, a major pillar of Saudi Arabia's economy, is actively integrating AI to enhance operational efficiency and competitiveness. However, despite the growing recognition of AI's potential, there is limited research on how AI influences project management performance through mediating factors such as top management support and competence retention. Understanding these relationships is crucial for organizations aiming to maximize AI's effectiveness in achieving project success.

This study examines the impact of AI on project management performance, focusing on the mediating roles of top management support and competence retention. By examining these dynamics, the research provides valuable insights for industry practitioners and policymakers. The findings highlight the need for strategic AI integration to enhance decision-making, resource utilization, and skill development. As organizations continue to embrace digital transformation, leveraging AI effectively will be a key driver of sustainable project outcomes and long-term business success.

2. Literature Review

AI has emerged as a transformative force in project management, influencing various aspects of decision-making, operational efficiency, and strategic planning (Alrashedi & Abbod, 2021). Organizations increasingly integrate AI-driven tools to enhance project performance by automating processes, analyzing vast datasets, and improving predictive accuracy. AI applications in project management extend beyond simple task automation to sophisticated analytics that assist in resource allocation, risk assessment, and performance tracking (Alsharidah & Alazzawi, 2020). As organizations leverage AI, understanding its influence on key performance determinants becomes crucial.

2.1 AI and Top Management Support

Top management support plays a critical role in successful project implementation, ensuring that necessary resources, strategic alignment, and organizational commitment are in place. AI contributes to this by providing data-driven insights that enhance managerial decision-making (Alrubaidi, 2024). AI-driven analytics enable top management to monitor project performance effectively, allocate resources more efficiently, and mitigate risks proactively. With AI-driven decision support systems, managers can identify potential issues in real-time, leading to better governance and control over project execution (Alghuried, 2025). The integration of AI into project management systems fosters transparency and enhances the responsiveness of top management, strengthening organizational commitment to project success (Chatterjee et al., 2024). AI tools such as predictive analytics, machine learning algorithms, and intelligent dashboards provide leaders with actionable insights, helping them make informed decisions (Jorzik et al., 2023). Additionally, AI-powered automation reduces manual workload, allowing top executives to focus on strategic planning and critical business objectives (Alateeg et al., 2024). The ability of AI to provide scenario analysis and real-time forecasting further enhances the decision-making capacity of top management (Bevilacqua et al., 2025). Moreover, AI-driven communication platforms facilitate seamless interaction between top management and project teams, ensuring that essential directives and feedback are conveyed effectively. Through AI-enabled collaboration tools, managers can track progress, assess bottlenecks, and ensure alignment with organizational goals (Korzyński et al., 2024). The enhancement of decision-making and managerial effectiveness through AI integration leads to increased top management support for projects. Thus, AI is expected to have a significant influence on top management support, leading to the following hypothesis:

H_1: *AI influences top management support.*

2.2 AI and Project Management Competence Retention

Project management competence retention is essential for maintaining a skilled workforce capable of handling complex project challenges. AI-driven learning systems, knowledge management platforms, and decision-support mechanisms aid in competence retention by providing continuous learning opportunities and personalized recommendations (Seixas et al., 2023). AI enhances knowledge retention through automated documentation, experience-based learning modules, and intelligent knowledge-sharing systems. These capabilities ensure that project teams retain critical skills and best practices, fostering long-term competence retention. One of the key advantages of AI in competence retention is its ability to personalize learning experiences. AI-driven training programs adapt to individual learning styles and provide targeted recommendations, ensuring that employees continuously develop relevant skills (Liu et al., 2024). Moreover, AI enables real-time performance tracking, identifying areas where employees require additional training and providing customized learning pathways. By using machine learning algorithms, AI can predict skill gaps and suggest appropriate upskilling opportunities to enhance competence retention (Faqihi & Miah, 2023). Furthermore, AI facilitates knowledge transfer by creating digital repositories of best practices, project documentation, and expert insights. These repositories allow project teams to access valuable information whenever required, reducing the dependency on specific individuals and mitigating knowledge loss due to employee turnover (Borg et al., 2021). AI-powered chatbots and virtual assistants further enhance knowledge sharing by providing instant

responses to project-related queries, ensuring that team members have the necessary information at their disposal. Given AI's ability to improve learning efficiency and knowledge transfer, the following hypothesis is proposed:

H_2: *AI influences project management competence retention.*

2.3 Top Management Support and Project Management Performance

Top management support is a key determinant of project success. Strong managerial backing ensures that projects receive adequate funding, human resources, and strategic direction. By fostering a culture of commitment and collaboration, top management enhances project efficiency and minimizes execution risks (Ahmed et al., 2016). Additionally, when leadership actively supports project teams, it creates an environment that promotes innovation, accountability, and motivation (Ali et al., 2021). Organizations that experience high levels of top management support tend to witness improved project performance outcomes. One of the primary ways top management influences project performance is by ensuring proper resource allocation. When executives prioritize project success, they allocate sufficient financial and human capital, leading to smoother project execution. AI tools further enhance this process by providing data-driven insights into resource utilization and budget allocation, helping leaders make informed decisions that optimize efficiency and cost-effectiveness (Kemei et al., 2018). Moreover, strong managerial support fosters a culture of continuous improvement and learning within project teams (Al-Ayed & Al-Tit, 2024). When leadership actively engages with project teams and provides strategic direction, employees feel more motivated and aligned with organizational goals. AI-driven analytics and performance monitoring tools help managers track employee engagement levels, identify areas of improvement, and implement corrective actions to enhance productivity (Zwikael, 2008). Additionally, top management plays a critical role in risk management. AI-powered risk assessment tools provide executives with real-time insights into potential project risks, allowing them to take proactive measures to mitigate challenges. By leveraging AI-driven predictive modeling, managers can anticipate project delays, resource shortages, and other obstacles, ensuring timely intervention to prevent performance decline (Elbanna, 2013). AI's impact on project management performance may not always be direct but can be mediated through managerial support. AI-enabled decision systems improve communication between project teams and executives, leading to better alignment between strategic objectives and project execution (Fareed et al., 2023). Enhanced top management support, facilitated by AI insights, strengthens the link between AI adoption and improved project outcomes. AI-driven dashboards and performance tracking systems provide executives with real-time project updates, enabling them to make proactive decisions that align with corporate objectives (Javed et al., 2018). When AI enhances visibility and transparency in project execution, it fosters greater managerial involvement and ensures that projects receive the necessary oversight and support. Therefore, the following hypotheses are suggested:

H_3: *Top management support influences project management performance.*
H_4: *Top management support mediates the relationship between AI and project management performance.*

2.4 Project Management Competence Retention and Project Management Performance

Competence retention in project teams is crucial for maintaining consistent performance levels. When organizations invest in continuous learning and knowledge-sharing, employees develop specialized skills that contribute to project success (Ekrot et al., 2016). AI-driven tools enhance competence retention by providing personalized learning experiences, reducing knowledge loss due to employee turnover, and improving task efficiency through intelligent automation. These capabilities result in better project performance. AI-powered knowledge management systems ensure that critical project-related information is preserved and easily accessible, reducing disruptions caused by personnel changes. Intelligent automation and workflow optimization tools also contribute to enhanced efficiency by streamlining repetitive tasks and allowing employees to focus on high-value activities (Mainga, 2017). As AI facilitates knowledge retention and skill development, organizations benefit from improved project execution and operational excellence. AI adoption fosters knowledge accumulation and skills retention, which in turn enhance project outcomes (Ahmed & Anantatmula, 2017). AI-driven analytics and learning platforms enable employees to develop advanced competencies that drive efficiency and innovation in project execution. This suggests that competence retention serves as a mediator in the relationship between AI and project management performance (Ahadzie et al., 2014). Through AI-driven recommendations, project teams continuously improve their skills, leading to sustained performance improvements. Automated training programs ensure that employees remain updated with the latest industry trends and best practices, minimizing skill gaps. As AI enhances workforce capabilities, the direct and indirect benefits contribute to overall project success. Hence, the final hypotheses are proposed:

H_5: *Project management competence retention influences project management performance*.
H_6: *Project management competence retention mediates the relationship between AI and project management performance.*

Fig. 1 presents the research model.

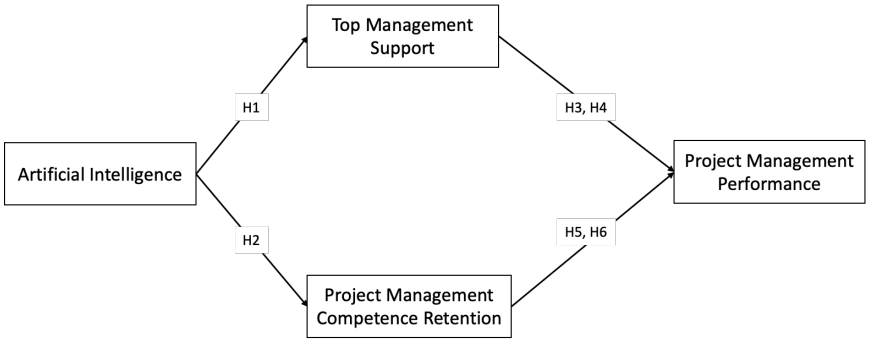

Fig. 1. Research Model

3. Methodology

This study employed a cross-sectional research design to investigate the relationships between AI, top management support, project management competence retention, and project management performance. Data were collected from employees working in the manufacturing sector in Saudi Arabia during February 2025. A total of 309 responses were gathered using convenience sampling, a non-probability sampling technique suitable for exploratory research where accessibility and willingness to participate are prioritized. The selection of the manufacturing sector is justified by its critical role in Saudi Arabia's Vision 2030, which aims to diversify the economy and reduce dependence on oil. By focusing on this sector, the study provides insights into how AI can enhance project management practices in an industry central to the nation's economic transformation. The survey instrument utilized a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree," to measure respondents' perceptions. The constructs were operationalized using validated scales from prior studies. Specifically, seven items for AI were adapted from Paschen et al. (2019) and Wijayati et al. (2022), eight items for Top Management Support were adapted from Ong and Bahar (2019), five items for Project Management Competence Retention were adapted from Ekrot et al. (2016), and five items for Project Management Performance were adapted from Demirkesen and Ozorhon (2017). These scales ensured the reliability and validity of the measurement model. Data analysis was conducted using structural equation modeling (SEM), a robust statistical technique that allows for the examination of complex relationships between multiple constructs. SEM was chosen for its ability to simultaneously assess measurement models (validity and reliability of constructs) and structural models (path analysis and hypothesis testing). The analysis involved evaluating factor loadings, Cronbach's alpha, composite reliability, and average variance extracted (AVE) to ensure the constructs' reliability and validity. Additionally, the Fornell-Larcker criterion was used to assess discriminant validity. The use of SEM provided a comprehensive understanding of the direct and indirect effects of AI on project management performance, mediated by top management support and competence retention. This methodological approach ensured rigorous testing of the hypothesized relationships, contributing to the study's robustness and reliability.

4. Results

Table 1 provides a detailed breakdown of the demographics of the study participants, totaling 309 individuals. In terms of gender distribution, the majority of participants were male, accounting for 62% (192 individuals), while females made up 38% (117 individuals).

Table 1
Demographics of Study Participants (n=309)

Category	Subcategory	Frequency	Percentage
Gender	Male	192	62%
	Female	117	38%
Age	Below 25	31	10%
	25–34	93	30%
	35–44	93	30%
	45–54	59	19%
	55 and above	33	11%
Highest Education Level	Associate degree	62	20%
	Bachelor's degree	161	52%
	Master's degree	86	28%
Current Job Position	Mid-level manager	139	45%
	Senior manager	111	36%
	Executive/Director	59	19%
Years of Experience	Less than 2 years	62	20%
	2–5 years	93	30%
	6–10 years	77	25%
	More than 10 years	77	25%

Regarding age, the largest proportion of participants fell within the 25–34 and 35–44 age groups, each representing 30% (93 individuals). The 45–54 age group comprised 19% (59 individuals), followed by those aged 55 and above at 11% (33 individuals). The youngest group, those below 25 years old, represented the smallest proportion at 10% (31 individuals). When examining the highest education level attained, over half of the participants held a bachelor's degree (52%, 161 individuals), while 28% (86 individuals) had a master's degree, and 20% (62 individuals) held an associate degree. In terms of current job positions, mid-level managers constituted the largest group at 45% (139 individuals), followed by senior managers at 36% (111 individuals), and executives or directors at 19% (59 individuals). Finally, the participants' years of experience were relatively evenly distributed. The largest group, representing 30% (93 individuals), had 2–5 years of experience, while 25% (77 individuals) had 6–10 years of experience, and another 25% (77 individuals) had more than 10 years of experience. The smallest group, with less than 2 years of experience, accounted for 20% (62 individuals).

Table 2
Measurement Model

Items with Constructs	Loadings	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Artificial Intelligence		0.89	0.716	0.619
AI1: "Artificial intelligence can help me find lost data"	0.706			
AI2: "Artificial intelligence provides accurate data and information"	0.708			
AI3: "Artificial intelligence can help me in making important decisions in the	0.882			
AI4: "Artificial intelligence can help display hard-to-measure data"	0.779			
AI5: "Artificial intelligence can protect the privacy of yourself and others"	0.88			
AI6: "Artificial intelligence can help me in getting the job done"	0.884			
AI7: "The authorities can easily audit artificial intelligence"	0.854			
Top Management Support		0.835	0.847	0.694
TMS1: "There is direct upper management involvement in project	0.905			
TMS2: "Early involvement of upper management is evidence in project	0.812			
TMS3: "Upper management shared responsibilities with project team for	0.869			
TMS4: "I agreed with upper management on the degree of my authority and	0.791			
TMS5: "Upper management supported in a project crisis"	0.871			
TMS6: "Upper management has granted the necessary authority and has	0.831			
TMS7: "Upper management responsive to the requests for additional resources,	0.791			
TMS8: "More responsibilities should be given to every level of management or	0.85			
Project Management Competence Retention		0.818	0.739	0.756
CR1: "The available project management competence in our company is	0.896			
CR2: "We are compromised by a lack of project management skills"	0.896			
CR3: "Retaining project management skills is not seen as a problem in our	0.837			
CR4: "Our organization is constrained by our inability to retain project	0.83			
CR5: "We have continuous access to all project management skills we need"	0.779			
Project Management Performance		0.876	0.811	0.671
PMP1: "Our company complete the project within schedule"	0.847			
PMP2: "Our company complete the project within budget"	0.852			
PMP3: "Our company achieve required quality"	0.707			
PMP4: "Our company achieve required safety"	0.849			
PMP5: "Our company satisfy the client"	0.832			

Table 2 presents the measurement model, which evaluates the reliability and validity of the constructs used in the study. The constructs include AI, top management support (TMS), project management competence retention (CR), and project management performance (PMP). Each construct is assessed using factor loadings, Cronbach's alpha, composite reliability, and average variance extracted (AVE), which collectively indicate the strength and consistency of the measurement model. For the AI construct, the factor loadings for all seven items (AI1 to AI7) are above the threshold of 0.7, ranging from 0.706 to 0.884, indicating strong correlations between the items and the construct. The Cronbach's alpha value of 0.89 suggests excellent internal consistency, while the composite reliability of 0.716 and AVE of 0.619 demonstrate acceptable reliability and convergent validity. This implies that the AI construct is well-measured and reliable for assessing perceptions of AI's role in data management, decision-making, and privacy protection. The top management support (TMS) construct also shows strong factor loadings for all eight items (TMS1 to TMS8), ranging from 0.791 to 0.905, indicating that the items effectively measure the construct. The Cronbach's alpha value of 0.835 and composite reliability of 0.847 further confirm high internal consistency and reliability. The AVE of 0.694, close to the recommended threshold of 0.7, suggests adequate convergent validity. This indicates that the TMS construct reliably measures the extent of upper management involvement, support, and resource allocation in project management. For the project management competence retention (CR) construct, the factor loadings for the five items (CR1 to CR5) range from 0.779 to 0.896, all exceeding the 0.7 threshold, which signifies strong item-construct relationships. The Cronbach's alpha value of 0.818 and composite reliability of 0.739 indicate good internal consistency and reliability. The AVE of 0.756, above the 0.5 threshold, demonstrates strong convergent validity. This suggests that the CR construct effectively measures the organization's ability to retain and utilize project management skills to achieve long-term objectives. Lastly, the project management performance (PMP) construct exhibits factor loadings for its five items (PMP1 to PMP5) ranging from 0.707 to 0.852, all above the 0.7 threshold, indicating strong item-construct correlations. The Cronbach's alpha value of 0.876 and composite reliability of 0.811 reflect excellent internal consistency and reliability. The

AVE of 0.671, though slightly below 0.7, is still acceptable, indicating adequate convergent validity. This implies that the PMP construct reliably measures project success in terms of schedule adherence, budget compliance, quality, safety, and client satisfaction.

Table 3
Discriminant Validity (Fornell-Larcker criterion)

	Artificial Intelligence	Project Management Competence Retention	Project Management Performance	Top Management Support
Artificial Intelligence	0.887			
Project Management Competence Retention	0.827	0.869		
Project Management Performance	0.717	0.783	0.819	
Top Management Support	0.765	0.777	0.752	0.833

Table 3 presents the discriminant validity of the constructs using the Fornell-Larcker criterion, which assesses whether each construct is distinct from the others. The diagonal values in the table represent the square root of the average variance extracted (AVE) for each construct, while the off-diagonal values represent the correlations between the constructs. For discriminant validity to be established, the diagonal values should be greater than the off-diagonal values in the corresponding rows and columns. The diagonal value for AI is 0.887, which is higher than its correlations with all other constructs (0.827 with project management competence retention (CR), 0.717 with project management performance (PMP), and 0.765 with top management support (TMS). This indicates that the AI construct is distinct and does not overlap significantly with the other constructs. Similarly, the diagonal value for project management competence retention (CR) is 0.869, which is greater than its correlations with the other constructs (0.827 with AI, 0.783 with PMP, and 0.777 with TMS). This confirms that the CR construct is unique and measures a different aspect compared to the other constructs. For project management performance (PMP), the diagonal value is 0.819, which is higher than its correlations with the other constructs (0.717 with AI, 0.783 with CR, and 0.752 with TMS). This demonstrates that the PMP construct is distinct and does not share excessive variance with the other constructs. Finally, the diagonal value for top management support (TMS) is 0.833, which exceeds its correlations with the other constructs (0.765 with AI, 0.777 with CR, and 0.752 with PMP). This confirms that the TMS construct is unique and measures a separate dimension compared to the other constructs.

Table 4
Path Coefficients

Paths	Beta	Standard deviation	T statistics	P values	Results
AI → Top Management Support	0.865	0.038	22.58	0.00	H1 supported
AI → Project Management Competence Retention	0.827	0.063	13.173	0.00	H2 supported
Top Management Support → Project Management Performance	0.771	0.151	5.118	0.00	H3 supported
AI → Top Management Support → Project Management Performance	0.666	0.136	4.893	0.00	H4 supported
Project Management Competence Retention → Project Management Performance	0.507	0.165	8.256	0.00	H5 supported
AI → Project Management Competence Retention → Project Management Performance	0.471	0.147	7.162	0.00	H6 supported

Table 4 presents the path coefficients of the structural model, which indicate the strength and significance of the relationships between the constructs. It includes the beta values, standard deviations, T statistics, P values, and the results of the hypothesis testing. The path from AI to top management support has a beta value of 0.865, a T statistic of 22.58, and a P value of 0.00, indicating a strong and statistically significant relationship. This supports Hypothesis 1 (H1), suggesting that AI has a significant positive influence on top management support. The path from AI to project management competence retention has a beta value of 0.827, a T statistic of 13.173, and a P value of 0.00, indicating a strong and statistically significant relationship. This supports Hypothesis 2 (H2), suggesting that AI positively impacts the retention of project management competence. The path from top management support to project management performance has a beta value of 0.771, a T statistic of 5.118, and a P value of 0.00, indicating a strong and statistically significant relationship. This supports Hypothesis 3 (H3), suggesting that top management support significantly enhances project management performance. The indirect path from AI to project management performance through top management support has a beta value of 0.666, a T statistic of 4.893, and a P value of 0.00, indicating a significant mediating effect. This supports Hypothesis 4 (H4), suggesting that AI indirectly improves project management performance by enhancing top management support. The path from project management competence retention to project management performance has a beta value of 0.507, a T statistic of 8.256, and a P value of 0.00, indicating a significant positive relationship. This supports Hypothesis 5 (H5), suggesting that retaining project management competence significantly improves project management performance. The indirect path from AI to project management performance through project management competence retention has a beta value of 0.471, a T statistic of 7.162, and a P value of 0.00, indicating a significant mediating effect. This supports Hypothesis 6 (H6), suggesting that AI indirectly enhances project management performance by improving the retention of project management competence.

Fig. 2 provides the R-square values for the dependent constructs in the study, which indicate the proportion of variance explained by the independent constructs. For top management support, the R-square value is 0.748. This means that approximately 74.8% of the variance in top management support is explained by the independent constructs in the model. The high R-square value indicates a strong explanatory power, suggesting that the predictors significantly influence top management support. For project management competence retention, the R-square value is 0.685. This indicates that around 68.5% of the variance in project management competence retention is explained by the independent constructs. The relatively high R-square value suggests that the model has a good fit and that the predictors play a significant role in explaining project management competence retention. For project management performance, the R-square value is 0.716. This means that approximately 71.6% of the variance in project management performance is explained by the independent constructs. The high R-square value suggests that the model has strong predictive power, indicating that the independent constructs significantly influence project management performance.

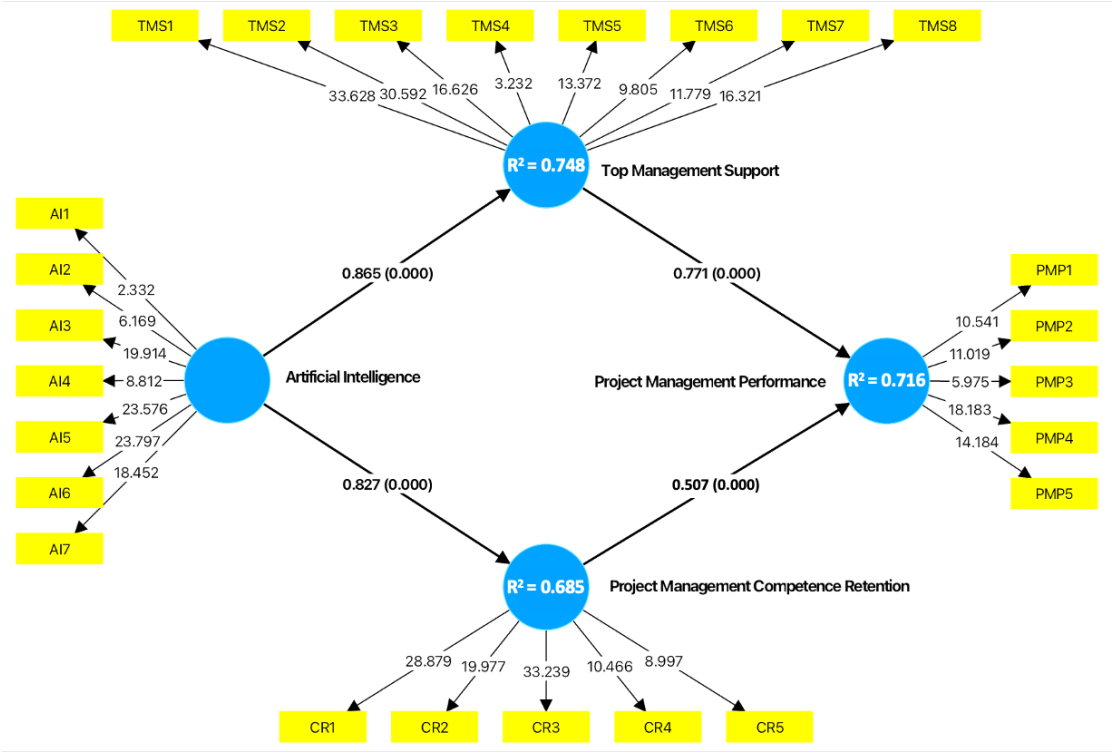

Fig. 2. Structural Model

5. Discussion

The findings of this study provide valuable insights into the relationships between AI, top management support, project management competence retention, and project management performance. The results demonstrate that AI plays a pivotal role in enhancing organizational support, competence retention, and overall project performance, as evidenced by the strong path coefficients and high explanatory power of the model. First, the study reveals that AI has a significant and direct impact on top management support, with a beta value of 0.865 ($p < 0.001$). This strong positive relationship suggests that AI capabilities, such as data management, decision-making support, and privacy protection, empower top management to provide better support for projects. This finding aligns with prior research emphasizing the role of AI in improving organizational efficiency and decision-making processes (Savio & Ali, 2023). The high R-square value of 0.748 for top management support further confirms that AI explains a substantial proportion of the variance in this construct, highlighting its importance in driving managerial engagement and resource allocation. Second, the study finds that AI significantly influences project management competence retention, with a beta value of 0.827 ($p < 0.001$). This indicates that AI tools and systems contribute to retaining and enhancing project management skills within organizations (Shoushtari et al., 2024). The R-square value of 0.685 for competence retention suggests that AI explains a considerable portion of the variance in this construct, underscoring its role in addressing skill gaps and improving organizational capabilities. This finding is consistent with literature that highlights the importance of technology in fostering skill development and retention (Bento et al., 2022; Hossain et al., 2024). Third, the study demonstrates that both top management support and project management competence retention have significant direct effects on project management performance. The beta value for the path from top management support to project management performance is 0.771 ($p < 0.001$), while the beta value for the path from competence retention to project management performance is 0.507 ($p < 0.001$). These results suggest that managerial support and skilled project teams are critical for achieving project success in terms of schedule adherence, budget compliance, quality, safety, and client satisfaction (Taboada et al., 2023; Shamim, 2024). The high R-square value of 0.716 for project management performance further validates the model's ability to explain a significant proportion of variance in this construct. Additionally, the study highlights the mediating

role of top management support and project management competence retention in the relationship between AI and project management performance. The indirect paths from AI to project management performance through top management support (beta = 0.666, $p < 0.001$) and competence retention (beta = 0.471, $p < 0.001$) are both significant, indicating that AI not only directly impacts project performance but also enhances it indirectly by improving managerial support and skill retention. These findings emphasize the multifaceted role of AI in driving project success through both direct and indirect mechanisms.

This study contributes to the growing body of literature on the role of AI in project management by demonstrating its significant impact on top management support, competence retention, and project performance. The strong path coefficients and high R-square values validate the robustness of the proposed model, providing empirical evidence for the importance of AI in organizational and project management contexts. Future research could explore additional mediating or moderating factors, such as organizational culture or industry-specific dynamics, to further refine our understanding of these relationships.

The findings of this study have significant implications for Saudi Arabia, particularly in the context of Vision 2030, which emphasizes technological advancement, economic diversification, and improved organizational efficiency (Mathlouthi et al., 2024). The integration of AI into project management aligns with Saudi Arabia's goals of fostering innovation and enhancing productivity across key sectors such as construction, energy, and infrastructure. By adopting AI tools, Saudi organizations can improve decision-making, reduce costs, and ensure timely project completion, contributing to the nation's economic and social transformation (Aljabri, 2024). Saudi Arabia faces challenges related to skill gaps and workforce development, especially in sectors like construction and energy. The study highlights how AI can address these issues by identifying skill shortages and providing targeted training programs, thereby improving competence retention. Additionally, the strong relationship between AI and top management support underscores the need for Saudi organizations to equip their leaders with AI-driven tools. This will enable better resource allocation, crisis management, and strategic decision-making, ensuring the success of large-scale projects. The study also supports Saudi Arabia's National Strategy for Data and AI, which aims to position the country as a global AI leader. By embracing AI technologies, Saudi organizations can streamline workflows, reduce errors, and improve efficiency, aligning with Vision 2030's objectives. Policymakers can further promote AI adoption by providing incentives and training programs. Overall, the study's findings offer valuable insights for Saudi Arabia's journey toward technological advancement and economic diversification, highlighting the transformative potential of AI in achieving long-term goals.

6. Conclusion

This study underscores the critical role of AI in transforming project management practices, particularly through its impact on top management support, competence retention, and project performance. The findings reveal that AI not only directly enhances top management support and competence retention but also indirectly improves project performance by strengthening these mediating factors. For Saudi Arabia, these findings are particularly relevant as the nation advances its Vision 2030 goals, which emphasize technological innovation, economic diversification, and improved organizational efficiency. By integrating AI into project management, Saudi organizations can address critical challenges such as skill gaps, inefficient resource allocation, and delayed project delivery. AI can enhance decision-making, streamline workflows, and improve data management, leading to better adherence to schedules, budgets, and quality standards. This is especially important for large-scale infrastructure and energy projects that are central to Vision 2030. Additionally, the study highlights the importance of equipping top management with AI-driven tools to strengthen leadership support and crisis management, ensuring the successful execution of strategic initiatives. This research offers valuable insights for academics, practitioners, and policymakers, emphasizing the transformative potential of AI in project management. As Saudi Arabia continues its journey toward achieving Vision 2030, the integration of AI into organizational practices will be crucial for driving sustainable growth and success.

Acknowledgement

The author extends her appreciation to the Arab Open University for funding this work through research fund No. (AOUKSA-524008).

References

Ahadzie, D. K., Proverbs, D. G., & Sarkodie-Poku, I. (2014). Competencies required of project managers at the design phase of mass house building projects. *International Journal of Project Management, 32*(6), 958-969. https://doi.org/10.1016/j.ijproman.2013.10.015

Ahmed, R., & Anantatmula, V. S. (2017). Empirical study of project managers leadership competence and project performance. *Engineering Management Journal, 29*(3), 189-205. https://doi.org/10.1080/10429247.2017.1343005

Ahmed, R., Mohamad, N. A. B., & Ahmad, M. S. (2016). Effect of multidimensional top management support on project success: an empirical investigation. *Quality & Quantity, 50*, 151-176. https://doi.org/10.1007/s11135-014-0142-4

Al-Ayed, S., & Al-Tit, A. (2024). The impact of digitized customer behaviors on performance: The mediating and the moderating role of digitized CRM. *International Journal of Data and Network Science, 8*(1), 189-194. https://doi.org/10.5267/j.ijdns.2023.10.005

Alateeg, S., & Al-Ayed, S. (2024). Exploring the role of artificial intelligence technology in empowering women-led startups. *Knowledge and Performance Management, 8*(2), 28-38. https://doi.org/10.21511/kpm.08(2).2024.03

Alateeg, S., Alhammadi, A., Al-Ayed, S. I., & Helmi, M. A. (2024). Factors Influencing on Behavioral Intention to Adopt Artificial Intelligence for Startup Sustainability. *Kurdish Studies, 12*(1), 2924-2941. https://doi.org/10.58262/ks.v12i1.209

Alghuried, A. (2025). Assessing the critical success factors for the sustainable construction project management of Saudi Arabia. *Journal of Asian Architecture and Building Engineering,* 1-19. https://doi.org/10.1080/13467581.2025.2454616

Ali, M., Zhang, L., Zhang, Z., Zada, M., Begum, A., Han, H., ... & Vega-Muñoz, A. (2021). Can leaders' humility enhance project management effectiveness? Interactive effect of top management support. *Sustainability, 13*(17), 9526. https://doi.org/10.3390/su13179526

Aljabri, B. S. (2024). Driving efficiency: The role of artificial intelligence (AI) in enhancing municipal operations in Saudi Arabia. *World Journal of Advanced Research and Reviews, 22*(2), 1936-1944. https://doi.org/10.30574/wjarr.2024.22.2.1645

Alrashedi, A., & Abbod, M. (2021). The effect of using artificial intelligence on performance of appraisal system: a case study for University of Jeddah Staff in Saudi Arabia. *In Intelligent Systems and Applications: Proceedings of the 2020 Intelligent Systems Conference (IntelliSys) Volume 1 (pp. 145-154).* Springer International Publishing. https://doi.org/10.1007/978-3-030-55180-3_11

Alrubaidi, M. (2024). Evaluating the Effects of Digital Transformation on Facilities Management Projects in Saudi Arabia: Overcoming Challenges and Seizing Opportunities. *Open Journal of Civil Engineering, 14*(4), 536-569. https://doi.org/10.4236/ojce.2024.144030

Alsharidah, Y. M. Y., & Alazzawi, A. (2020, October). Artificial intelligence and digital transformation in supply chain management A case study in Saudi companies. *In 2020 international conference on data analytics for business and industry: way towards a sustainable economy (ICDABI) (pp. 1-6).* IEEE. https://doi.org/10.1109/ICDABI51230.2020.9325616

Bakr, M. M., Farea, O. A., & Jadaa, A. (2023). The impact of using Artificial intelligence in projects management Decision-Making within private sector in the kingdom of Saudi Arabia. *IJRSP*, *4*(47), 358-379. https://doi.org/10.52133/ijrsp.v4.47.11

Bento, S., Pereira, L., Gonçalves, R., Dias, Á., & Costa, R. L. D. (2022). Artificial intelligence in project management: systematic literature review. *International Journal of Technology Intelligence and Planning, 13*(2), 143-163. https://doi.org/10.1504/IJTIP.2022.126841

Bevilacqua, S., Masárová, J., Perotti, F. A., & Ferraris, A. (2025). Enhancing top managers' leadership with artificial intelligence: insights from a systematic literature review. *Review of Managerial Science,* 1-37. https://doi.org/10.1007/s11846-025-00836-7

Borg, J., Borg, N., Scott-Young, C. M., & Naderpajouh, N. (2021). The work readiness-career resilience linkage: implications for project talent management. *International journal of managing projects in business, 14*(4), 917-935. https://doi.org/10.1108/IJMPB-04-2020-0129

Chatterjee, S., Chaudhuri, R., Vrontis, D., & Papadopoulos, T. (2024). Examining the impact of deep learning technology capability on manufacturing firms: moderating roles of technology turbulence and top management support. *Annals of Operations Research, 339*(1), 163-183. https://doi.org/10.1007/s10479-021-04505-2

Demirkesen, S., & Ozorhon, B. (2017). Impact of integration management on construction project management performance. *International Journal of Project Management, 35*(8), 1639-1654. https://doi.org/10.1016/j.ijproman.2017.09.008

Ekrot, B., Kock, A., & Gemünden, H. G. (2016). Retaining project management competence-Antecedents and consequences. *International Journal of Project Management, 34*(2), 145-157. https://doi.org/10.1016/j.ijproman.2015.10.010

Elbanna, A. (2013). Top management support in multiple-project environments: an in-practice view. *European Journal of Information Systems, 22*(3), 278-294. https://doi.org/10.1057/ejis.2012.16

Faqihi, A., & Miah, S. J. (2023). Artificial intelligence-driven talent management system: Exploring the risks and options for constructing a theoretical foundation. *Journal of Risk and Financial Management, 16*(1), 31. https://doi.org/10.3390/jrfm16010031

Fareed, M. Z., Su, Q., Abbas Naqvi, N., Batool, R., & Aslam, M. U. (2023). Transformational leadership and project success: the moderating effect of top management support. *SAGE Open, 13*(3), 21582440231195685. https://doi.org/10.1177/21582440231195685

Hossain, M. Z., Hasan, L., Dewan, M. A., & Monira, N. A. (2024). The Impact of Artificial Intelligence on Project Management Efficiency. *International Journal of Management Information Systems and Data Science, 1*(5), 1-17. https://doi.org/10.62304/ijmisds.v1i05.211

Javed, S. A., Syed, A. M., & Javed, S. (2018). Perceived organizational performance and trust in project manager and top management in project-based organizations: Comparative analysis using statistical and grey systems methods. *Grey Systems: Theory and Application, 8*(3), 230-245. https://doi.org/10.1108/GS-01-2018-0009

Jorzik, P., Yigit, A., Kanbach, D. K., Kraus, S., & Dabić, M. (2023). Artificial intelligence-enabled business model innovation: Competencies and roles of top management. *IEEE transactions on engineering management, 71*, 7044-7056. https://doi.org/10.1109/TEM.2023.3275643

Kemei, D., Oboko, R., & Kidombo, H. (2018). The influence of top management support on the relationship between project manager leadership competencies and ERP system project performance: Findings from Kenya energy sector. *International Academic Journal of Innovation, Leadership and Entrepreneurship, 2*(2), 195-210.

Korzyński, P., Silva, S. C. E., Górska, A. M., & Mazurek, G. (2024). Trust in AI and top management support in generative-AI adoption. *Journal of Computer Information Systems*, 1-15. https://doi.org/10.1080/08874417.2024.2401986

Liu, Y., Zeng, N., Papadonikolaki, E., Maritshane, K., & Chan, P. W. (2024). The future of digitalized project practices through data-savvy talent: A digital competence formation perspective. *Project Leadership and Society, 5,* 100120. https://doi.org/10.1016/j.plas.2024.100120

Mainga, W. (2017). Examining project learning, project management competencies, and project efficiency in project-based firms (PBFs). *International Journal of Managing Projects in Business, 10*(3), 454-504. https://doi.org/10.1108/IJMPB-04-2016-0035

Mathlouthi, N., Anwaar, K., & Alkhateeb, J. (2024, December). Synergies and Conflicts: Evaluating AI and 5G Technologies Role in Saudi Arabia's Drought Management Strategy. *In 2024 6th International Symposium on Advanced Electrical and Communication Technologies (ISAECT) (pp. 1-8). IEEE*. https://doi.org/10.1109/ISAECT64333.2024.10799527

Ong, C. H., & Bahar, T. (2019). Factors influencing project management effectiveness in the Malaysian local councils. *International Journal of Managing Projects in Business, 12*(4), 1146-1164. https://doi.org/10.1108/IJMPB-09-2018-0200

Paschen, J., Kietzmann, J., & Kietzmann, T. C. (2019). Artificial intelligence (AI) and its implications for market knowledge in B2B marketing. *Journal of business & industrial marketing, 34*(7), 1410-1419. https://doi.org/10.1108/JBIM-10-2018-0295

Savio, R. D., & Ali, J. M. (2023). Artificial intelligence in project management & its future. *Saudi Journal of Engineering and Technology, 8*(10), 244-248. https://doi.org/10.36348/sjet.2023.v08i10.002

Seixas, E. F. R., Viterbo, J., Bernardini, F., Seixas, F., & Pantoja, C. (2023, June). Applying artificial intelligence for talent retention: a systematic literature review. *In 2023 18th Iberian Conference on Information Systems and Technologies (CISTI) (pp. 1-6). IEEE*. https://doi.org/10.23919/CISTI58278.2023.10211299

Shamim, M. M. I. (2024). Artificial Intelligence in project management: enhancing efficiency and decision-making. *International Journal of Management Information Systems and Data Science, 1*(1), 1-6.

Shoushtari, F., Daghighi, A., & Ghafourian, E. (2024). Application of Artificial Intelligence in Project Management. *International journal of industrial engineering and operational research, 6*(2), 49-63.

Taboada, I., Daneshpajouh, A., Toledo, N., & De Vass, T. (2023). Artificial intelligence enabled project management: a systematic literature review. *Applied Sciences, 13*(8), 5014. https://doi.org/10.3390/app13085014

Wijayati, D. T., Rahman, Z., Rahman, M. F. W., Arifah, I. D. C., & Kautsar, A. (2022). A study of artificial intelligence on employee performance and work engagement: the moderating role of change leadership. *International Journal of Manpower, 43*(2), 486-512. https://doi.org/10.1108/IJM-07-2021-0423

Zwikael, O. (2008). Top management involvement in project management: Exclusive support practices for different project scenarios. *International Journal of Managing Projects in Business, 1*(3), 387-403. https://doi.org/10.1108/17538370810883837

© 2025 by the authors; licensee Growing Science, Canada. This is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (http://creativecommons.org/licenses/by/4.0/).