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The Impact of Human-AI Collaboration on Project Success in the IT Sector of Pakistan: A Sequential Mediation Study

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ABSTRACT

Purpose—As AI systems are increasingly being adopted in the project workflow, the acquisition of an AI system, without the proper workflow, has not served as a panacea to improved project outcomes for IT (Information Technology) organizations. This study investigates how Human-AI Collaboration (HAIC) influences Project Success (PS) in IT industry in Pakistan, by modeling the same relationship in a dynamic framework and deeper exploration of two sequential individual Mediation variables, namely Digital Literacy (DL) and Digital Readiness (DR), both based on Dynamic Capabilities Theory (DCT).

Design/methodology/approach—A quantitative, cross-sectional survey design was adopted. Data were collected from 235 employees of software houses and IT service organizations in the Rawalpindi–Islamabad region who regularly work with AI-enabled project tools, using a purposive sampling technique with convenience access. Validated multi-item scales were used for all four constructs, and the sequential mediation model was tested using Hayes' PROCESS Macro Model 6 with 5,000 bootstrap resamples in SPSS.

Findings—Human-AI Collaboration had a significant positive direct effect on Project Success (β = .2549, p < .001 Both the single-step indirect between Human-AI Collaboration and Digital Readiness (β = .1507, 95% CI [.0923, .2134]) and Human-AI Collaboration and Project Success (β = .1003, 95% CI [.0429, .1647]) were significant. All five of the hypotheses were confirmed.

Research limitations/implications—The present study has a cross sectional, single source, and self-reported design that restricts causal inferences, and increases the potential for common method variance. The sample has been restricted to Rawalpindi- Islamabad IT Cluster, this may restrict generalizability to the other parts of the country to other regions or sectors, or to other organizational levels.

Practical implications—The sequence of interventions get employees digital literate, then get your organization ready to use AI, then get ready for AI to perform well is crucial for managers looking to try and derive value from an AI investment. These concrete steps involve getting workers up to speed on digital literacy before AI workflows start to incorporate AI technology, digital-readiness pulse-checks at a project start, and managing AI-tools proficiency as an analog to budget and schedule.

Keywords: Human-AI Collaboration, Digital Literacy, Digital Readiness, Project Success, Dynamic Capabilities Theory, Pakistan, IT sector

1 | INTRODUCTION

Artificial Intelligence (AI) has emerged as one of the most significant capacities of an organization for this decade, transforming the way companies are creating jobs, organizing teams and execute projects. In

project environments, where work is formulated within certain scopes, budgets and timelines, the division of tasks, decisions and information between the AI systems and the employees, have a direct impact on successful projects delivered on time, within budget and according to the client's expectations, especially in the IT industry. In Pakistan, the momentum in digital transformation continues to gain momentum, with IT companies quickly implementing an AI solution without equal investments in employee digital capabilities and in building digital readiness within the organization for sustainable project outcome.

While AI has revolutionized project management, having AI on its own is not enough to ensure project success; the importance of the human factor is underscored (Tyagi et al., 2026; Wang et al., 2026). The study examines the effect of Human-AI collaboration on the Project Success with a focus on the mediating variables of individual Digital Literacy and Digital Readiness. The integration of generative AI and predictive analytics into project processes is becoming commonplace in organizations around the globe (Adamantiadou and Tsironis, 2025), raising critical challenges for the employee. To achieve a successful Human-AI Collaboration, both the algorithm and the user must work together. This is because the algorithm does not work as a "tool" for the user, but instead acts as a partner, performing tasks with him or her (Sowa et al., 2021; Ayeni et al., 2026). Collaboration is best realized in a digitally educated culture, where staff members are not only technically proficient and proficient in using technology in their roles (technical literacy) but are also culturally equipped and ready to embrace technological advancements (cultural readiness) (Ben Ghrbeia and Alzubi, 2024; Kaur, 2025). In contrast to Conventional automation, which was based on human-to-machine substitution, Human-AI Collaboration (HAIC) was based on augmentation. In addition to providing computational speed, pattern recognition and predictive analytics, AI systems complement employees with their creativity, contextual judgement and strategic and ethical reasoning (Jarrahi, 2018; Raisch and Krakowski, 2021). It results directly in project success (Dellermann et al., 2021) in project organizations in terms of timely completion, cost control and the satisfaction of the client's requirements.

Beyond improving employee engagement and increasing employee behaviors, AI can make decision making become more transparent and less biased (Hughes et al., 2019; Ali et al., 2025). The two individual capacities shape employees' capacity for meaningful participation in this collaboration. Digital Literacy refers to the knowledge, skills and critical awareness necessary to access, interpret and operate digital technologies as well as the outputs produced by them, in the context of everyday work (Van Laar et al., 2017; Polomoshnov et al., 2026).

Digital Readiness is the ability of staff and institutions to integrate and effectively work with digital technologies in their project and working environment (Holmström, 2022; Jöhnk et al., 2021). Digital readiness has been linked to digital literacy, as learning the digital tools should lead to employee's trust in the tool and therefore exhibit high digital readiness (Khin and Ho, 2020). The Dynamic Capabilities Theory (DCT) of the organization is theory used for this study, which says that dynamic environments are related to organizational performance regarding the ability to sense opportunities, seize them and reconfigure resources (Teece et al., 1997).

In this lens, Human-AI Collaboration is viewed as the creation of a “capability-generating” dynamic capability, then the mechanisms of digital literacy and digital readiness are viewed as sequential capabilities that can be built that convert that “capability-generating” dynamic into project outcomes, but that are not considered fixed or inherent employee characteristics (Wang et al., 2026). Despite the increasing volume of literature on AI adoption and experiences with digital transformation, recent literature largely considers digital literacy as a one-size-fits-all, demographic-based characteristic and mostly focuses on organizational, rather than individual AI readiness (Wang et al., 2026; Mokoena and Seeletse, 2025).

There is little empirical research that establishes digital literacy and digital readiness as a mediator between the human-AI collaboration–project success relationship and few that ends with a developing economy information technology (IT) environment like Pakistan. This study tackles that issue head on. This inquiry is important, as an increasing number of people have identified that in addition to technological barriers, human-centric barriers have emerged as the primary challenge to digitalization, making up approximately 30 percent of the reported obstacles to the introduction of digital technologies (Ben Ghrbeia and Alzubi, 2024). Unaddressed, this disconnect can create a scenario where organizations invest significant resources in AI tools like machine learning, intelligent automation and predictive analytics without reaping the benefits that they are supposed to deliver (Vial, 2019); or, not implementing these tools because they lack the digital literacy of their staff, organizational culture to support that, or a strong organization structure to keep them accountable is destroying the value of these investments. (Jöhnk et al., 2021) In the IT sector, this risk is further exacerbated in Pakistan because of the digital inequalities experienced by the organizations, least or none proficiency in advanced AI and data analytics skills, and lack of institutional investment in resolving staff training deficits (Memarian and Doleck, 2026). Beyond the contribution to the theoretical literature on dynamic capabilities, clarifying the mechanism of translation of collaboration into performance has concrete importance for practitioners when deciding on directions of the scarce resource of training and change management.

Based on this, this study aims at identifying five unique effects: (1) the influence of Human-AI Collaboration on Project Success; (2) the impact of Human-AI Collaboration on Digital Literacy; (3) the influence of Digital Literacy on Digital Readiness; (4) the influence of Digital Readiness on Project Success; and (5) to find that within the IT sector of Pakistan Digital Literacy and Digital Readiness sequentially mediate the effect of Human-AI Collaboration on Project Success.

2 | LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 | Human-AI Collaboration

AI has evolved from a passive, directive, limited scope decision support tool to a fully-fledged collaborator that is woven across all aspects of an organisation's process of planning, staffing, and delivering projects (Jarrahi, 2018). Human-AI interaction is “the integration between the human intelligence and AI systems for a common organization's or a project goal; the interaction shouldn't replace human decision making, problem solving, or judgement; AI should aid the task and its completion, and by extension, the goal

or health of the organization, without taking it over" (Jarrahi 2018; Raisch and Krakowski 2021). Beretta et al. (2023) label it teaming a dynamic interdependent, and Dellermann et al. (2021) refer to it as hybrid intelligence, which is greater than the sum of its parts. While a decrease in scheduling errors and greater efficiency in resource utilization and real-time project visibility have been found as indicators of successful HAIC, both employees and AI tools need to be equipped with a strategy for utilizing AI suggestions along with their own discretion and critical thinking (Lee, 2026). Yoo et al. (2023) propose four competencies that are essential for successful interactions with artificial intelligence: Technical understanding of AI systems, Communications with AI systems, Co-ordinated task regulation and Ethical awareness. Human-AI Collaboration is the independent variable in this study which is expected to impact Project Success directly and indirectly, as well as through Digital Literacy and Digital Readiness.

2.2 | Digital Literacy

While organizational technology adoption is making in-roads, focus has now turned from the adoption of the technology itself towards the capability of individuals to understand and engage with it (Van Laar et al., 2017). According to Van Laar et al. (2017) and Polomoshnov et al. (2026), Digital Literacy can be defined as: Digital Literacy is the knowledge, enabling skills and critical awareness that are needed to access, interpret and use digital technologies, digital information and output when using artificial intelligence in workplace practice. Digital Literacy is therefore regarded as a foundational prerequisite for related competencies like Artificial Intelligence (AI) Literacy and Data Literacy (DL) (Polomoshnov et al., 2026). Without understanding how to leverage digital tools, a lack of digital literacy among employees can lead to misusing AI-generated content or not using collaborative tools, ultimately compromising individual productivity and collaboration efficiency. Increase employees' digital readiness by collaboration through the use of AI; improvement of their digital literacy: expected to lead to an increase in their digital readiness, which will ultimately be linked to project success.

2.3 | Digital Readiness

Digital Readiness developed from the analyses of digital transformation and Industry 4.0 to record the capacity of businesses to embrace new technology (Soomro et al., 2023). It is the ability of people and organizations to approach, adopt and apply digital technologies in their work and project relevant environments - the infrastructure, leadership provision and workforce readiness (Khin and Ho, 2020). Employees who are trained to be 'digitally ready' are more likely to embrace AI-based solutions and cope with technology change, while those who are less 'digitally ready' are more likely to be resistant and experience 'technology anxiety' (Holmström, 2022). Based on their research, Soomro et al., (2023) note there are four underlying dimensions, ones that include technology readiness, organizational culture, employee skills and leadership support for innovation. This model suggests that the practice of collaborative AI implementation is a pathway to project execution that can be accelerated with digital readiness, which in this context is believed to be bolstered by digital literacy.

2.4 | Project Success

The perception of a successful project has changed from the traditional "iron triangle" of time, cost and quality to organizational and stakeholder value (Marnewick and Marnewick, 2019). For software projects, other factors such as software quality, organization usability, and responsiveness to changing user requirements are relevant, and in terms of organizational benefits and future readiness AI's role in project management has been demonstrated by its ability to improve forecasting, decision-making, risk management, and collaboration among team members (Wang et al., 2026) Project Success is the dependent variable, and according to the hypothesized pathway of this study, HAIC, if applied properly, will help to increase digital readiness of employees, and digital readiness within the organization, and ultimately help improve the probability of successful project delivery effectiveness, coordination and resources.

2.5 | Theoretical Foundation: Dynamic Capabilities Theory

The study is based on the theory created by Teece, Pisano and Shuen (1997) on Dynamic Capabilities that delves into the capacity of organizations to sense, seize and finally reconcile the internal and external competencies and adjust them according to the changes and competition in the environment. This is where DCT is given a first choice over 2 other options of lenses. RQ is a more static approach, yet does not permit a lot of space for problematizing the ongoing, iterative learning process of engaging with an AI system to gain these skills - the Resource Based View deals with the values, scarcity and immobility of resources. The Technology Acceptance Model (TAM) describes initial adoption in terms of perceived usefulness and ease of use but little is known as to what happens after adoption and once competence has been gained (Venkatesh and Bala, 2008). Whereas DCT may explicitly lay out sensing, seizing and reconfiguring as a continual process in a natural progression of the imagined digital literacy, digital readiness, and then project success. In this context, Human-AI Collaboration is a strategic (as opposed to hardcoded, or ca. learned at the task augmentation level) dynamic capability, while digital literacy and digital readiness are sequential, learnable mechanisms of capability reconfiguration that transform that capability into improved project performance.

2.6 | Hypotheses Development

Human-AI Collaboration and Project Success: In the field of Information Technology, AI can assist in making intelligent decisions, predictive analytics, automation, optimizing resources, and monitoring in real-time, whereas the human workforce brings a sense of creativity, strategic thinking, ethical consideration, and contextual thinking to the project team. By combining organizational technological and human capacities into a single system, DCT recommends that adaptive capacity is improved, thereby improving performance outcomes. It is expected that co-creation will improve communication, problem-solving, innovation and decision quality in project-based IT settings with the support from AI systems to strengthen project outcomes.

H1. *Human-AI Collaboration has a significant positive impact on Project Success in the IT sector of Pakistan.*

Human-AI Collaboration and Digital Literacy: The staff which work regularly with smart systems and digital instruments are supposed to gain technological sense and digital competency from actual experience

of digital applications and systems, analytics systems, tools for automation and Ai-aided apps. The importance of organizational learning and competency development are identified as key mechanisms of adaptation. Hence, in general, it is expected that one's interaction with AI technologies will make employees more digital.

H2. *Human-AI Collaboration has a significant positive impact on Digital Literacy in the IT sector of Pakistan.*

Digital Literacy and Digital Readiness: Digital literacy refers to an employee's understanding and application of digital technologies in an effective way and digital readiness refers to their readiness and capacity to undertake digital transformation efforts. DCT is focusing on employee learning as a means to enable organizational adaptability; finding employees with a higher level of digital competence is expected to make them more confident, flexible and open to digital transformation initiatives.

H3. *Digital Literacy has a significant positive impact on Digital Readiness in the IT sector of Pakistan.*

Digital Readiness and Project Success: AI-based system implementation, integration of digital tools in working actions, and staying agile in technology changes are easier to accomplish for digitally ready organizations and individuals. Digital readiness will be expected to enhance communication, coordination, technology integration and flexibility in project-based environments, thereby minimizing project risk and decision making.

H4. *Digital Readiness has a significant positive impact on Project Success in the IT sector of Pakistan.*

Sequential Mediation: DCT believes that over time, incremental improvement and enhancement are the sources of better performance. Human-AI Collaboration introduces employees to human-AI interaction, enhancing humans' digital "literacy" and thereby digital readiness, which will enable better project execution. Human-AI Collaboration will not translate itself into project success without investing in the digital competence of the employees and the capability of the organizations to use AI system and digital technologies.

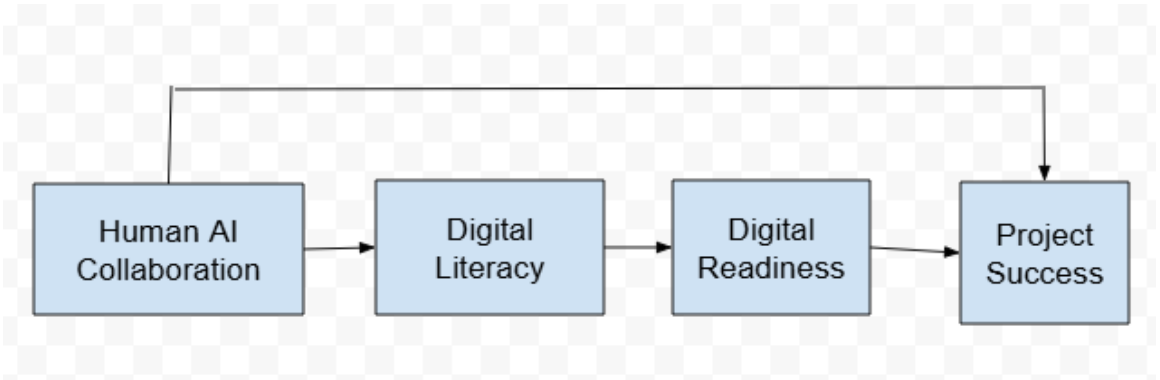
H5. *Digital Literacy and Digital Readiness sequentially mediate the relationship between Human-AI Collaboration and Project Success in the IT sector of Pakistan.*

2.7 | Conceptual Framework

The proposed model suggest that Human-AI Collaboration as the independent variable would be linked directly to Project Success as the dependent variable as well as indirectly through Digital Literacy and Digital Readiness as sequential mediators: Human-AI Collaboration → Digital Literacy → Digital Readiness → Project Success.

Figure 1

Conceptual Framework



2.8 | Synthesis of Empirical Evidence

Although few studies have integrated these individual steps in a single pathway, a body of empirical studies is beginning to support these individual links in this model. In the case of complex settings, AI systems can help reduce uncertainty when making decisions and provide data-driven insight (Jarrahi 2018), and the nature of human-AI collaboration replaces, not augments, the quality of the decisions (Raisch & Krakowski 2021), because the value of AI is not simply in speed. In the readiness dimension, Khin and Ho (2020) show that high levels of digital capability are linked to high levels of performance outcomes, which suggests that the key elements for successful organisational implementation of AI are less about AI technology than broader readiness. The authors conclude that better "digital skills" correlate with faster technological adoption and for workers in AI-based environments, which depend on frequent interaction with complex systems, with better performance on more difficult tasks. (2017) Their project management literature research specifically leads Marnewick and Marnewick (2019) to conclude that AI tools aid in the planning, risk management, and decision making process, resulting in better project outcomes, and Mikalef et al. (2020) state that data-driven organizational capabilities are a driver of innovation and performance. Vial (2019) also asserts that technological infrastructure and human capability need to be co-developed to enable successful digital transformation, demonstrating that together, digital readiness and digital literacy are more synergistic than additive.

Regardless of these points, some aspects are still lacking in the current literature. First, many studies for AI are technology-focused, prioritizing the capacity of an AI system over the human factor of the human–AI interaction and its effects on performance (Wang et al., 2026; Mokoena and Seeletse, 2025). Second, integrated models are not widely available. Digital readiness and digital literacy have normally been looked at individually, with the effect of the interaction between the two being hidden in between (Jöhnk et al., 2021). Thirdly, most of the literature reports are conceptual or qualitative with less adoption of quantitative methods like Structural Equation Modeling (SEM) that can handle meditations and complex relationships (Hair et al., 2017). Fourth, empirical evidence is limited for developed economies and the unique challenges that developing economies like Pakistan face regarding investing in unique skills and infrastructure are inadequately examined (Dwivedi et al., 2021). In turn, digital literacy has often been understood as a skill set rather than given a developing capability that changes as technological change and human-AI teaming do, see

Wang et al. (2026) and Mokoena and Seeletse (2025) respectively who report the lack of a "readiness" measure to track human-AI teaming, and Lee (2026) with the lack of "preparedness" measures that evolve with human-AI teaming while they map the outcomes differently, and Polomoshnov et al. (2026) as having measures referring to digital, data and AI literacy, but confusing with it. This study directly tackles these gaps by modelling digital literacy and digital readiness as sequential and dynamic individual-level mediators, and quantitatively testing the resulting model in an IT developing economy context.

3 | RESEARCH METHODOLOGY

3.1 | Research Design and Sample

A quantitative, explanatory research design using a cross-sectional survey was employed, suitable for testing the simultaneous statistical strength of multiple paths in a sequential mediation model (Hair et al., 2017). The population comprised employees of project-based IT organizations registered in the Rawalpindi–Islamabad region, including software houses, IT service firms and technology companies affiliated with bodies such as the Pakistan Software Export Board (PSEB) and the Pakistan Software Houses Association (P@SHA). A non-probability, purposive sampling approach and convenient access was adopted: participants were intentionally recruited based on their frequent use of AI in the context of project work, while leveraging existing contacts and professional networks within easy reach. The unit of analysis was at the level of the individual employees, project managers, software developers, system analysts and IT consultants, who have The sample size n was 235 respondents who completed data from an anonymous online survey (Google Forms) with a paper versionhad experience with tools that feature AI functionality throughout the project execution phase.

3.2 | Instrumentation

The sample size n was 235 respondents who completed data from an anonymous online survey (Google Forms) with a paper version. The questionnaire's opening section screened respondents on current, AI-supported project involvement before allowing them to proceed, and the online form accepted one response per respondent to limit duplication. The sample size of n = 235 is more than the 10 observations that are recommended in minimum for each indicator (Hair et al., 2022), and is similar to samples in other studies published in Human-AI Collaboration and Digital Transformation in South Asian IT settings with n < 100. The tools used: Human-AI Collaboration (10 items; α = .903) (Luther et al., 2024), Digital Literacy (Chang and Kuo, 2025) (5 items; α = .584; scored below .70 recommended by Hair et al., 2019 to maintain conceptual completeness and consistency with the original instrument), Digital Readiness (9 items; α = .911)(Lassnig et al., 2022), and Project Success (21 items; α = .941)(Dvir et al., 2003) were previously validated and the same as those used in the aforementioned studies.

3.3 | Data Collection and Analysis

The IT companies and professional contacts were out reached on LinkedIn and through organizational outlook, followed by contacting personnel through their professional networks within their respective organizations (where AI was used for direct projects). A pilot study was conducted prior to data collection to

assess the reliability and validity of the study. In addition to the four constructs, the questionnaire gathered information related to the demographic profile (gender, age, qualification and work experience). Analyses were done in SPSS: descriptive statistics were collected that described the sample, while Cronbach's alpha was used on measures to determine their construct reliability and Hayes PROCESS Macro Model 6, with 5,000 bootstrap resamples, tested the sequential mediating roles of Digital Literacy and Digital Readiness in the relationship between Human-AI Collaboration and Project Success.

4 | DATA ANALYSIS AND FINDINGS

4.1 | Sample Characteristics

Of the 235 respondents, most of them were males (124, 52.8%) and females (111, 47.2%) suggesting a reasonably even split. That meant that the 21-25 and 26-30 year age groups also represented significant numbers, with 37.0% and 24.3% respectively, while fewer people were in the 41-45 age range (17.0%) and the over-45 age group were even fewer (10.0%). The majority of those that responded had a Masters degree (56.2%) or a Graduate/Degree (30.6%). As for work experience, 49.4 % reported 1-5 years, 24.3% reported > 10 years, 17.4% reported 6-10 years and 8.9% reported < 1 year, thus suggesting the professionals having high professional experience. Table 1 shows a complete demographic profile.

Table 1

Demographic Profile of Respondents (N = 235)

Demographic Variable	Category	Frequency	Percentage
Gender	Male	124	52.8%
	Female	111	47.2%
Age	21–25 years	57	24.3%
	26–30 years	87	37.0%
	31–35 years	40	17.0%
	36–40 years	13	5.5%
	41–45 years	23	9.8%
	Above 45 years	15	6.4%
Education	Certificate	4	1.7%
	Diploma	5	2.1%
	Graduate/Degree	72	30.6%
	Master's	132	56.2%
	Above Master's	22	9.4%
Work Experience	Less than 1 year	21	8.9%
	1–5 years	116	49.4%
	6–10 years	41	17.4%
	Over 10 years	57	24.3%
Total		**235**	**100.0%**

4.2 | Descriptive Statistics

Overall, the constructs obtained mean scores greater than the scale midpoints showing fairly positive Human-AI Collaboration, Digital Literacy and Digital Readiness, Project Success perceptions. Human-AI Collaboration recorded the highest mean (M = 3.59, SD = 0.79), followed closely by Project Success (M =

3.58, SD = 0.66), Digital Literacy (M = 3.57, SD = 0.86) and Digital Readiness (M = 3.53, SD = 0.78). Digital Literacy shows a higher standard deviation than the other competences, suggesting higher variability in the competences of digital skills of the respondents. Descriptive statistics are summarized in the table below (Table 2).

Table 2

Descriptive Statistics

Variable	Mean	SD
Human-AI Collaboration (HAIC)	3.59	0.79
Digital Literacy (DL)	3.57	0.86
Digital Readiness (DR)	3.53	0.78
Project Success (PS)	3.58	0.66

4.3 | Correlation Analysis

Pearson correlations (.01 level; Table 3) indicated all four variables were positively and significantly related. The Human-AI Collaboration had highest correlation with Digital Literacy (r = .802)) and Digital Readiness (r = .835) among others, and moderately-to-strongly with Project Success (r = .742). Digital Literacy correlated strongly with Digital Readiness (r = .844) and with Project Success (r = .727), and Digital Readiness correlated strongly with Project Success (r = .751). The correlations between Digital Literacy and Digital Readiness (r = .844) and between Human-AI Collaboration and Digital Readiness (r = .835) were high enough to warrant a discriminant-validity check; both, however, remained below the .90 threshold conventionally used to flag problematic multicollinearity (Henseler et al., 2015). The constructs were retained as conceptually distinct, since they capture different levels of analysis individual competency (Digital Literacy) versus organizational and individual preparedness (Digital Readiness) although common method variance, arising from single-source, single-time-point data collection, remains a plausible contributor and is addressed as a limitation.

Table 3

Correlation Matrix

Variable	HAIC	DL	DR	PS
1. Human-AI Collaboration	1			
2. Digital Literacy	.802**	1		
3. Digital Readiness	.835**	.844**	1	
4. Project Success	.742**	.727**	.751**	1

Note.**p < .01 (two-tailed).

4.4 | Sequential Mediation Analysis

Table 4 shows the direct and indirect effects of Human-AI Collaboration on Project Success based on PROCESS Macro Model 6. There was a significant direct effect for Human-AI Collaboration on Project Success (β = .2549, SE = .0648, t = 3.94, p < .001), suggesting that higher levels of collaboration between humans and AI directly boosts project results. The two mediators also accounted for a significant indirect effect overall (β = .3604, 95% CI [.2605, .4677]). Both single-step indirect effects were significant: through

Digital Literacy alone (β = .1462, 95% CI [.0286, .2764]) and through Digital Readiness alone (β = .1139, 95% CI [.0468, .1827]). Most importantly, the hypothesized sequential indirect effect Human-AI Collaboration → Digital Literacy → Digital Readiness → Project Success was significant (β = .1003, 95% CI [.0429, .1647]); because this bootstrap confidence interval excluded zero, the sequential mediation hypothesis was supported.

Table 4

Direct and Indirect Effects (PROCESS Macro Model 6, N = 235, 5,000 bootstrap samples)

Path	Effect	SE / BootSE	t / p	95% CI [LL, UL]
Direct effect: HAIC → PS	.2549	.0648	t=3.94, p<.001	[.1273,]
Total indirect effect	.3604	.0525		[.2605, .4677]
HAIC → DL → PS	.1462	.0633		[.0286, .2764]
HAIC → DR → PS	.1139	.0350		[.0468, .1827]
HAIC → DL → DR → PS (sequential)	.1003	.0307		[.0429, .1647]

Note.HAIC = Human-AI Collaboration; DL = Digital Literacy; DR = Digital Readiness; PS = Project Success. A mediation effect is significant when the bootstrap confidence interval does not include zero.

4.5 | Hypothesis Testing Summary

All five hypotheses were supported by the data, as summarized in Table 5.

Table 5

Summary of Hypothesis Testing

H#	Hypothesis Statement	Result
H1	Human-AI Collaboration → Project Success	Supported
H2	Human-AI Collaboration → Digital Literacy	Supported
H3	Digital Literacy → Digital Readiness	Supported
H4	Digital Readiness → Project Success	Supported
H5	Digital Literacy and Digital Readiness sequentially mediate HAIC → Project Success	Supported

5 | DISCUSSION

The current research investigated the impact of Human-AI Collaboration on Project Success in IT industry of Pakistan through sequential effect of Digital Literacy and Digital Readiness. The results are congruent with the conceptual framework originally identified with Dynamic Capabilities Theory in each of the paths tested.

This suggests that when AI and humans work well together, Project Success is positively impacted, and organizations are more efficient, coordinated and productive.The Human-AI Collaboration variable had a significant, positive direct effect on Project Success, meaning that when organizations were able to integrate into one a multiplier effect occurred, and the organization became more efficient, better coordinated and more productive. In Pakistan's IT industry, AI-driven collaboration seems to streamline decision-making, automate repetitive work, enhance communication, and bolster project execution, aligning with earlier studies that have

supported the correlation between AI-powered collaboration and positive project and organizational outcomes (Su and Ayob, 2025; Nenni et al., 2025; Tyagi et al., 2026; Wang et al., 2026).

Human-AI Collaboration also was found to positively impact Digital Literacy: Human employees who use AI systems and digital technologies regularly, have higher digital competence, technological understanding and information-processing skill. This serves as a confirmation to the Van Laar et al. (2017) who in their study conclude that continuous technological interaction contributes to gaining digital literacy and competence; find the same in Memarian and Doleck (2026) or Polomoshnov et al. (2026).

Digital Literacy, on the other hand, also had a strong positive impact on Digital Readiness, meaning that those employees with higher digital skills are more likely to adopt new technologies or be part of digital transformation initiatives. This lines up with Kane et al. (2021), Lassnig et al. (2022), Warner and Wäger (2019) and Sousa and Rocha (2019) who all attributed digital competence to organisation readiness and adaptability.

The impact of Digital Readiness showed significant positive results in relation to the Project Success: organizations and employees that are more digitally ready seem to embrace new technologies to support project tasks, manage digital workflows and overcome the technological challenges, which could improve the efficiency, innovation, communication and project decision making. This is consistent with the results of studies by Holmström (2022), Warner and Wäger (2019) and Soomro et al. (2023) which correlate digital readiness with both the organizational and project levels of performance.

Most important of all, Digital Literacy was shown to be statistically related to Digital Readiness, which is statistically related to Project Success. The sense-seize-reconfigure is the central concept driving Dynamic Capabilities Theory and is relevant to this pattern: employees first sense and embrace AI enabled ways of working (digital literacy), which then become reconfigured into organisational digital readiness which in turn leads to the performance outcome of project success. HAIC can then be considered to be one of the critical organization skills that fosters digital capacity and readiness that ultimately impact project performance in a technologically dynamic environment.

The direct and indirect effects combine to point towards Human-AI Collaboration as a minimum of three complementary processes. The direct pathway ($\beta = .2549$) suggests that companies can immediately gain a valuable portion of the value of human-AI collaboration, which comes in the form of faster information processing speed, help with routine tasks, and real-time monitoring that occurs outside of any increase in employee competence or preparedness. The two single step inadvertent paths suggest that collaboration also works as a means to increase digital literacy, both of which are equally valid and are involved in project outcomes. Although the smallest in magnitude ($\beta = .1003$), this sequential relationship may be the most theoretically significant as it illustrates that literacy and readiness are not just parallel, redundant mediators but also have a developmental sequence; that is, literacy is a prerequisite for readiness, which is a process that leads to the transformation of literacy into coordinated project-level action. This multi-layered approach aligns with the notion that organizations do not become "digital ready" overnight, but only as their employees gain competence and familiarity with the technology and its applications.

The Digital Literacy scale was also also rather low (α = .584), which needs to be discussed. To a certain extent the reliability was left unchanged to maintain conceptual continuity with Chang and Kuo (2025), and to keep with the guidance that suggests not changing existing instruments in exploratory contexts (Hair et al., 2019), but the modest reliability may mean effect sizes involving Digital Literacy were estimated to be somewhat smaller because the true effect would be greater with a higher reliability instrument. Future replications should make efforts to extend and/or re-validate the Digital Literacy instrument for specific workplace contexts, where people's literacy is increasingly defined by the capacity to question and reflexively analyze AI-generated outputs, as well as how to navigate generic digital environments.

6 | IMPLICATIONS

6.1 | Theoretical Implications

This study generalizes Dynamic Capabilities Theory by viewing Human-AI Collaboration as a capability that is essential for the individual employee as part of an organization, and by conceptualizing Digital Literacy and Digital Readiness as mechanisms that can be sequentially learned within an organization, instead of static characteristics of the organization. It adds empirical evidence to the human-AI collaboration literature, from an IT usage perspective in a developing economy context, which has been comparatively little studied, and unravels the indirect channels of collaboration's potential impact on organizational performance.

6.2 | Practical Implications

The findings imply some concrete steps that could be taken by the managers and decision makers in IT sector of Pakistan. AI integration into project management and operations should be a top priority for organizations, alongside skill development programs, as these tools can enhance productivity and audit operations.AI adoption in project management and operations is of paramount importance for organizations, and building a workforce's capabilities should be no less important, as these tools can augment productivity and audit operations. Continuous digital-literacy training/ workshops that focus on using AI should be created and invested by managers, and digital readiness should be enhanced to develop a more positive and supportive culture at the workplace as well as through better technological infrastructure should be invested. For project managers in particular: (1) introduce AI at an appropriate pace, with a digital-literacy onboarding activity prior to full project workflows; (2) plan project timelines with online tools – just as in the past you planned budgets and schedules, (3) foresee project teams that will require additional support by flagging those teams through short digital readiness pulse-checks at the project kick-off. AI-literacy and digital competency should therefore be prioritized by teachers and policymakers to build up the broader workforce. As with the technology investment, there is a need for a prepared workforce and organizational preparedness.

7 | LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has a number of limitations. The variables cannot be linked to one another causally and future research using longitudinal designs would allow future study to look at change over time. The sample focused on particular SMEs in the IT sector in Rawalpindi–Islamabad area which may restrict the generalizability to

other sectors, regions or countries. Responses were self-reported from a questionnaire which may have contributed to common method bias and attitude toward responding. Lastly, the model only included two mediators. There can be other organizational or technological influences that define the link between Human-AI Collaboration and Project Success.

The proposed framework is expandable, it could be extended to other sectors including banking, healthcare, education, manufacturing and telecommunications, and cross-nation comparisons could be compared to shed light on cultural and technological variations in human-AI collaboration. Other variables like trust in AI, technological anxiety, organizational culture, and innovativeness and leadership support etc. should be examined and more complex structures like the relationships between constructs, such as Structural Equation Modeling (SEM), should be tested as well. The model is worth revisiting with samples taken after 2024, based on the significant changes in both AI capabilities and organizational AI governance that have taken place over the past few years, as the starting point for both employees' digital literacy and organization's AI governance maturity will change significantly in 2026, much different from the assumptions used in earlier publications in digital-transformation field (Wang et al., 2026; Lee, 2026).

8 | CONCLUSION

This research examined the mediating effect of Digital Literacy and Digital Readiness between Human-AI Collaboration and Project Success in IT sector of Pakistan. The results indicate that Human-AI Collaboration is able to positively influence the success of projects directly, but also indirectly via the development of the digital competence of employees and the technological readiness of the organisations. The results of the current study support the need for two key steps: creating digitally literate employees and technologically prepared organizations, to fully harness the potential of AI in the context of project. The results reinforce a broader message: There's an organization need to develop digital skills and competencies in addition to investing in technology to successfully integrate and implement AI, and to make workers comfortable with AI, which only about 49 percent of organizations currently prioritize.

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