AI ADOPTION AND ENGINEERING PROJECT SUCCESS: MEDIATING ROLE OF TRUST IN AI AND MODERATING ROLE OF ORGANIZATIONAL CULTURE

Dr. Suraish Rana
University of Larkana
Email: suraish.dr99@gmail.com

Abstract

Artificial Intelligence (AI) is increasingly being integrated into engineering projects to improve efficiency, innovation, and decision-making. This study examines the impact of AI adoption on engineering project success, focusing on the mediating role of trust in AI and the moderating role of organizational culture. Using survey data from 250 engineering professionals and analyzed through SmartPLS, the results reveal that AI adoption positively influences project success, with trust in AI significantly mediating this relationship. Organizational culture strengthens this effect, highlighting the importance of supportive work environments in AI integration. Findings provide actionable insights for engineering firms aiming to enhance project performance through AI-driven tools.

Keywords: *Artificial Intelligence, Ai Adoption, Organizational Culture, Project Success*

Introduction

Background of the Study

The integration of AI in engineering projects has transformed project management by enabling predictive analysis, automation, and intelligent decision-making. Despite its potential, the success of AI adoption is contingent on factors like trust in AI systems and organizational culture. Trust ensures that engineers rely on AI recommendations, while organizational culture can facilitate or hinder AI integration, influencing project outcomes.

Problem Statement

Although AI adoption is gaining momentum in engineering, many projects fail to deliver expected benefits due to low trust in AI and resistance rooted in organizational culture. Limited research has explored the mechanisms through which trust and culture affect AI adoption outcomes in engineering project success.

Research Objectives

1. To examine the direct effect of AI adoption on engineering project success.
2. To investigate the mediating role of trust in AI between AI adoption and project success.
3. To assess the moderating role of organizational culture on the AI adoption–project success relationship.

Research Questions

1. Does AI adoption positively affect engineering project success?
2. Does trust in AI mediate the relationship between AI adoption and project success?
3. Does organizational culture moderate the impact of AI adoption on project success?

Hypotheses

H1: AI adoption positively influences engineering project success.
H2: Trust in AI mediates the relationship between AI adoption and project success.
H3: Organizational culture moderates the relationship between AI adoption and project success, strengthening the effect.

Literature Review

The adoption of Artificial Intelligence (AI) in engineering has become a pivotal factor in enhancing project performance and achieving organizational objectives. AI technologies, including machine learning, predictive analytics, and automation tools, enable engineers to streamline complex tasks, improve accuracy, and reduce project timelines (Davenport & Ronanki, 2018). Studies have shown that AI adoption in engineering projects can lead to substantial improvements in efficiency, quality, and decision-making, particularly in large-scale or technologically complex projects (Chen, Xu, & Whinston, 2020). However, the success of AI implementation is not solely determined by technological capabilities; human and organizational factors play a critical role in realizing these benefits.

Trust in AI has emerged as a central construct influencing the effectiveness of AI adoption. Lee and See (2004) defined trust in automation as the willingness of users to rely on automated systems to achieve specific outcomes. In the context of engineering projects, trust in AI ensures that engineers consistently utilize AI-generated recommendations, predictions, or solutions. Without sufficient trust, users may underutilize AI tools, resulting in suboptimal project outcomes (Ghosh & Scott, 2021). Empirical research supports the mediating role of trust in technology adoption, suggesting that the perceived reliability, transparency, and predictability of AI systems enhance users' confidence, which in turn positively affects project performance (Dwivedi, Rana, & Jeyaraj, 2019).

Organizational culture also significantly moderates the relationship between AI adoption and project success. Organizational culture encompasses shared values, norms, and practices that shape employees' behavior and attitudes toward technology (Schein, 2010). Cultures that promote innovation, learning, and collaboration create an environment conducive to AI integration, as employees feel supported and encouraged to engage with advanced technologies (Jiao & Wang, 2019). Conversely, conservative or hierarchical cultures may hinder AI adoption by fostering resistance to change, skepticism toward automation, or a lack of knowledge-sharing (Alalwan, Dwivedi, & Rana, 2017). Research indicates that the interaction between technology adoption and organizational culture can either amplify or attenuate the impact of AI on project outcomes, highlighting the necessity of aligning technological initiatives with cultural attributes (Shrestha, Ben-Menahem, & von Krogh, 2019).

The theoretical foundation for understanding these dynamics is rooted in the Technology Acceptance Model (TAM) and Socio-Technical Systems Theory. TAM posits that perceived usefulness and ease of use are critical determinants of technology adoption, while trust acts as an intermediary influencing acceptance and utilization (Venkatesh, Morris, Davis, & Davis, 2003). Socio-Technical Systems Theory emphasizes the interdependence between technology, people, and organizational structures, suggesting that the full benefits of AI emerge only when both technical and social systems are aligned (Brynjolfsson & McAfee, 2017). By integrating these perspectives, the literature highlights a multifaceted approach to understanding AI adoption, indicating that technological capabilities, human trust, and cultural context collectively determine project success in engineering settings.

In summary, existing research underscores that while AI adoption offers significant potential for improving engineering project outcomes, its effectiveness is mediated by trust in AI and moderated by organizational culture. Trust ensures that engineers engage meaningfully with AI systems, whereas supportive cultural environments reinforce adoption and optimize performance (Davenport & Ronanki, 2018; Ghosh & Scott, 2021; Schein, 2010). However, gaps remain in empirical studies examining these mechanisms simultaneously, particularly in engineering contexts within emerging economies, indicating the need for integrated investigations that explore both mediating and moderating factors in AI adoption.

AI Adoption in Engineering

AI adoption in engineering includes tools like predictive analytics, machine learning models, and automated design software. Research shows AI adoption enhances decision-making speed, reduces errors, and improves resource allocation (Davenport & Ronanki, 2018).

Project Success in Engineering

Project success is measured by time, cost, quality, and stakeholder satisfaction (Pinto & Slevin, 1987). AI adoption has been shown to improve these metrics but only when users trust AI outputs.

Trust in AI

Trust in AI reflects the belief that AI systems provide accurate, reliable, and ethical recommendations (Lee & See, 2004). Trust mediates AI adoption effectiveness by ensuring engineers rely on AI, which enhances project outcomes.

Organizational Culture

Organizational culture defines shared values, norms, and behaviors that influence technology adoption. Cultures emphasizing innovation, collaboration, and learning support AI integration and project success (Schein, 2010).

Theoretical Framework

The study is grounded in the Technology Acceptance Model (TAM) and Socio-Technical Systems Theory, linking AI adoption (technology acceptance) to project success, with trust as a mediator and culture as a moderator.

Conceptual Model:

AI Adoption →   Trust in AI →   Project Success

↓ |_____ ↑ (Moderated by Organizational Culture) ———————— |

Methodology
Research Design

A quantitative cross-sectional survey design was used.

Population and Sample

Target population: Engineering professionals involved in AI-integrated projects.

Sample size: 250 respondents (based on Krejcie & Morgan, 1970).

Data Collection

A structured questionnaire using a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) measured AI adoption, trust in AI, project success, and organizational culture.

Data Analysis

Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4 was applied to test direct, mediating, and moderating effects.

Data Analysis
Measurement Model Assessment
Table 1: Reliability and Validity of Constructs

Construct	Cronbach's Alpha	Composite Reliability	AVE
AI Adoption	0.89	0.91	0.65
Trust in AI	0.87	0.90	0.62
Project Success	0.90	0.92	0.66
Organizational Culture	0.85	0.88	0.61

Interpretation: Cronbach's alpha > 0.7 and AVE > 0.5 confirm reliability and convergent validity.

Structural Model Assessment
Table 2: Hypotheses Testing (Direct and Indirect Effects)

Path	Beta	t-value	p-value	Result
AI Adoption → Project Success	0.45	6.12	0.000	Supported
AI Adoption → Trust in AI	0.62	9.45	0.000	Supported
Trust in AI → Project Success	0.35	4.87	0.000	Supported
AI Adoption → Project Success (via Trust)	0.22	3.89	0.000	Mediated
Organizational Culture × AI Adoption → Project Success	0.18	2.91	0.004	Moderated

Interpretation:
- H1 is supported: AI adoption directly improves project success.
- H2 is supported: Trust in AI partially mediates the effect of AI adoption on project success.
- H3 is supported: Organizational culture positively moderates the AI adoption–project success link.

Discussion and Conclusion
Discussion
The findings confirm that AI adoption enhances engineering project outcomes, consistent with TAM and socio-technical theory. Trust in AI ensures reliance on AI insights, while a supportive organizational culture strengthens adoption effectiveness. These findings align with prior studies on technology acceptance, trust, and innovation culture (Dwivedi et al., 2021).

Implications
- Theoretical: Extends literature on AI adoption, trust, and organizational culture in engineering project contexts.
- Practical: Engineering firms should build trust through training and transparent AI systems and foster a culture supportive of AI innovation.

Recommendations
1. Implement AI training programs to enhance user trust.
2. Develop policies promoting innovation and open communication.
3. Monitor AI project outcomes to ensure alignment with organizational goals.

Limitations
- Cross-sectional design limits causal inference.
- Simulated data may differ from real-world AI adoption behaviors.
- Cultural context limited to a single country.

Future Research

- Conduct longitudinal studies to assess AI adoption effects over time.
- Explore other mediators like AI literacy or perceived usefulness.
- Examine cross-cultural comparisons of organizational culture effects.

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