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ARTIFICIAL INTELLIGENCE-ENABLED PROJECT GOVERNANCE AND INFRASTRUCTURE FINANCING: IMPACT ON INVESTMENT EFFICIENCY AND ECONOMIC VALUE CREATION IN PAKISTAN

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Abstract

This study examines how artificial intelligence (AI)-enabled project governance and infrastructure financing influence investment efficiency and economic value creation in Pakistan. Amid persistent infrastructure inefficiencies and Pakistan's National AI Policy 2025 push toward digital governance, the research investigates AI adoption's practical impact within public infrastructure institutions. Grounded in dynamic capabilities theory and data-driven decision-making theory, the study conceptualizes AI as a resource enabling institutions to sense, adapt, and reconfigure governance practices for improved economic outcomes. Adopting an explanatory sequential mixed-methods design, data were collected from a population of 360 professionals across the Planning Commission, MoITT, NCAI, NHA, WAPDA, and Ignite, using stratified random sampling to select 186 survey respondents (171 valid) and purposive sampling to select 15 key informants for interviews, supplemented by document analysis of official policy records. Quantitative data were analyzed using SPSS through correlation and multiple regression analysis, while qualitative data underwent Braun and Clarke's thematic analysis. The study is expected to reveal that governance quality mediates AI's effect on investment efficiency, with meaningful but institutionally uneven adoption patterns, offering evidence-based recommendations for strengthening AI-enabled infrastructure governance in Pakistan.

Introduction

Despite being at the heart of the country's economic growth policy, the inefficiencies in infrastructure development—such as cost over-runs, delays in projects, and limited monitoring capacities—continue to compromise the value of public and private investment in the sector. Pakistan, on the other hand, has started to integrate AI into its governance framework. The government's National Artificial Intelligence Policy 2025 outlines six pillars of AI innovation, secure systems, sectoral transformation, and infrastructure, and establishes a National AI Fund that is funded by a permanent allocation from a government-driven technology financing body, Ministry of Information Technology and

Telecommunication (2025). It is a clear move by the government towards the use of AI for infrastructure policy rather than as an auxiliary technology.

AI is becoming a more than just an automation tool, it's a governance partner in planning institutions. The Ministry of Planning in Pakistan has been urged to use AI as a strategic ally to revolutionize the development process in the public sector, which faces implementation challenges and needs to become more efficient in the running of flagship initiatives like the Public Sector Development Programme (PSDP) (Business Recorder, 2026). Inconsistent project codes, multiple entries, and manual reporting mistakes are frequently found in today's data flows between the development programme and planning professionals, creating a need for mandatory data governance standards and continued investments in data literacy among planning professionals (Business Recorder, 2026). A key area of focus is procurement where natural language processing (NLP) can look for ambiguities in bidding documents, flag deviations from procurement regulations, and detect patterns that could indicate collusion or artificial pricing (Business Recorder, 2026), directly addressing a primary reason for project delay.

Governance mechanisms are changing with financing mechanisms. Along with the railways, energy and connectivity, the government of Pakistan has also started recognizing that capacity in the field of information technology and artificial intelligence is now part and parcel of the process of planning infrastructure investment with multilateral financiers like the Asian Infrastructure Investment Bank (AIKBank) (Profit Pakistan Today, 2026). Domestically, the funding of architecture is characterized as linking policy with practical capacity, where a National AI Fund was established with part of its funds sourced from the reallocation of R&D resources to establish an Innovation Fund and Venture Fund, and AI Centers of Excellence (Nucamp, 2025) were intended to transform pilot projects into solutions that could be procured and audited.

In addition to the public sector, the larger economic potential of AI is in enhancing the allocation of capital. New research in corporate finance suggests that AI is a qualitatively different digital technology that differs from previous investments in IT in that it learns in real time, adapts dynamically, and makes autonomous decisions, enabling companies to discover new capabilities in business operations as well as strategic decision making (Liu & Hu, 2025). AI tools like predictive analytics and scenario modeling at the strategic level can help leaders make more accurate predictions and make proactive adjustments to plans, thereby enhancing the agility of the organization (Chatterjee et al., 2021). The influence of AI on investment management, particularly in areas like portfolio optimization, risk assessment, predictive modeling, and regulatory compliance, is significantly changing investment decision-making processes and institutional structures, which is relevant to the context of Pakistan's infrastructure financing institutions (Balbaa & Abdurashidova, 2024).

Objectives

1. Examine AI adoption levels in Pakistan's infrastructure project governance.
2. Assess AI's effect on infrastructure investment efficiency.
3. Evaluate AI-driven economic value creation in financed projects.

Research Questions

1. How widely is AI adopted in Pakistan's project governance?
2. How does AI adoption affect infrastructure investment efficiency?
3. How does AI adoption contribute to economic value creation?

Significance of the Study

The findings of this study provide policymakers, investors, and planning institutions with evidence-based analysis of how AI can enhance the governance of infrastructure in Pakistan, optimize resources, avoid project delays, boost investor confidence, and guide the creation of better policies for sustainable and technology-enabled economic growth in the country.

Rationale

Nevertheless, despite this momentum, the evidence on the impact of AI on measurable investment efficiency and value creation within the context of Pakistan's institutional framework is limited. While the existing literature has focused on the global context of corporate or financial sector contexts (Csaszar et al., 2024; Yang et al., 2025), the developing country public infrastructure governance context is not discussed enough. This study aims to fill that void by conducting a first-hand evaluation of the use of AI in the project appraisal, financing and monitoring processes in Pakistan, adding to the growing body of evidence on the topic internationally.

Thesis Statement

AI Governance Tools can effectively enhance the efficiency of investments and economic value creation in Pakistan's infrastructure financing and appraisal processes, contingent upon the building of institutional capacity, data governance, and procurement reforms.

Research Gap

However, empirical work to understand whether the use of AI leads to quantifiable gains in investment efficiency and value creation in Pakistan's institutional context is limited. The current literature is mainly about global corporations or financial sector, whereas there are few works that focus on developing-country public infrastructure governance. This study aims to fill that gap by providing context-specific evidence from Pakistan's context to an evolving global discourse on AI in the project appraisal, financing and monitoring systems.

Literature Review

Theoretical and Conceptual Foundations.

Artificial intelligence (AI) technology in project governance and financing of infrastructure leverages the concept of dynamic capabilities in the field of business and institutional management. According to Liu and Hu (2025), dynamic capabilities theory states that firms and institutions need to continually sense, seize, and reconfigure resources to be competitive. Unlike previous digital technologies, AI has the ability to continuously learn and adapt, respond in real-time, and make decisions independently, not just automatically (Qiao et al., 2024; Yang et al., 2025). The theory of data-driven decision making also helps to explain this change, which focuses on the systematic utilization of empirical evidence to inform managerial and institutional decision making (Provost & Fawcett, 2013); the theory of AI-assisted decision making builds on this, and provides for using AI algorithms to analyze large datasets, make predictions and suggest actions (Mariani & Borghi, 2021).

AI in Project Management: The global evidence.

Many systematic reviews have been published that show the increasing influence of AI in project management, especially in construction and engineering. Cost, time and safety reviews show that common applications of the technology are cost estimation, time optimization and delay-risk prediction (Adebayo et al., 2025). Other findings from similar syntheses indicate that AI can help with proactive risk response in cost, schedule, safety, and quality knowledge areas (Tian et al., 2025), and that machine learning models based on past project experiences can predict overruns from past projects before they happen, thus allowing for proactive management decisions (Aladağ et al., 2024). Adoption of AI in construction, software and financial services delivers meaningful results, such as double-digit efficiency benefits and cost savings after implementation (Chukwuka & Roberts, 2025). Resistances are still identified in the form of managerial and cultural changes, building digital competency, and the challenges of traditionally conservative institutional structures (Sacks et al., 2020, as cited in Silitonga & Jin, 2024).

AI in Public Sector Project Governance

In the context of public infrastructure governance, AI is presented as a strategic ally that can help solve implementation challenges in massive development initiatives (Business Recorder, 2026). Inconsistencies in data entries, manual reporting mistakes, and similar issues are prevalent in public development portfolios, and they require

mandatory data governance standards in order to make meaningful use of AI (Business Recorder, 2026). As a specific example of how NLP can be utilized in procurement documentation, it is said to be capable of identifying ambiguities and warning of possible collusion or artificial pricing, which is intimately related to one of the key causes of delays in public projects (Business Recorder, 2026). This is confirmed by the National Artificial Intelligence Policy that has been formalized by the Government of Pakistan and is divided into six pillars including innovation, secure systems and infrastructure, as well as a National AI Fund (Ministry of Information Technology and Telecommunication, 2025).

Institutional Cooperation and Infrastructure Financing

The financing of literature is now a growing trend that makes AI capacity a part of infrastructure investment planning. In Pakistan's cooperation with multilateral financiers like Asian Infrastructure Investment Bank (AIIB), information technology and AI are mentioned as priority areas along with energy and connectivity (Profit Pakistan Today, 2026). The complementary funding architecture includes a component where a portion of research and development funding will go toward AI Innovation and Venture Funds, while other funding will go towards Centers of Excellence that aim to transform pilot projects into auditable, procurable solutions (Nucamp, 2025). This is in line with wider trends of a surge in global investment in AI infrastructure, driven by investors' growing confidence that AI capacity is a form of economic infrastructure that needs to be supported (OECD, 2026).

Investment Efficiency and Economic Value Creation

On the firm and institutional level, AI is associated with better investment efficiency, such as better forecasting, risk assessment and resource allocation (Kolanovic et al., 2020; Finlay, 2023). AI's impact on investment management is discussed in systematic reviews, which focus on its use in optimizing portfolios, predictive modelling, and regulatory compliance, transforming institutional decision-making frameworks (Balbaa & Abdurashidova, 2024). Research on strategic decision-making also indicates that AI tools enable entrepreneurs and investors to assess opportunities more accurately, as they overcome cognitive biases when deciding where to allocate capital (Csaszar et al., 2024). As a whole, the literature indicates that the economic value of AI is not just about automation, but about its ability to make better and faster investment-related decisions (Abu Samara et al., 2024).

Methodology

This research is a mixed research methods design, explanatory sequential type, and is a research paradigm of pragmatic research, which can combine quantitative measurement and qualitative depth. This approach reflects the dynamic capabilities and data-driven decision-making foundations of the study, which are described in the literature review, and allows the study to assess the statistical relationships between the use of AI and the efficiency of investment, and to also capture the institutional and contextual nuances from the stakeholders' stories. The quantitative phase involves measurable relationships, which are followed by the qualitative phase, in which the results are explained and the findings are placed in the context of governance in Pakistan.

The target groups are professionals working in infrastructure project governance and financing in key institutions of Pakistan, which include: the Planning Commission of Pakistan, the Ministry of IT and Telecommunication (MoITT), the National Center of Artificial Intelligence (NCAI), the National Highway Authority (NHA), WAPDA and Ignite (National Technology Fund). It is estimated that there are 360 professionals (including project managers, planning officers, IT/AI specialists, and financial analysts) across these bodies that are related to PSDP or AI infrastructure projects.

Stratified random sampling is used to achieve proportional representation by institutions and roles. The quantitative survey uses a Krejcie and Morgan's (1970) sample size determination table

for a population of 360 respondents and a sample of 186 respondents was selected. Further, 15 senior planning officials, AI policy experts and infrastructure funders are selected through purposive sampling to participate in in-depth qualitative interviews to ensure information-rich insights into the challenges and experiences of implementing AI and the resulting impacts.

Three instruments are used for data collection, in a complementary way. Instruct the 186 survey respondents to rate their perceptions of AI adoption, the quality of project governance, and the efficiency of investments with a five-point Likert scale.Ask the 186 survey respondents to use a five-point Likert scale to rate their perceptions of their level of AI adoption, the quality of project governance, and the efficiency of the investments. Second, the 15 key informants are interviewed semi structurally, providing more detailed information on issues such as institutional experiences, procurement procedures, and financing decisions. Third, there is official documentation from official records including the National AI Policy 2025, PSDP performance reports and AIIB cooperation statements that offer secondary contextual and verification data.

Adopting the dynamic capabilities theory of Liu and Hu (2025), quantitative data analysis is performed through descriptive statistics and inferential analysis which involves correlation and multiple regression analysis using SPSS software, with a focus on testing the relationships between the AI adoption, efficiency of investment, and economic value creation. Braun and Clarke's (2021) themed analysis approach is used to analyse qualitative interview data, which seeks to identify any themes that emerge around governance issues and institutional preparedness.

Triangulation of survey, interview and document data and Cronbach's alpha (threshold ≥ 0.70) for the quantitative instrument ensures validity and reliability. Ethical issues encompass informed consent of the institution respondents, confidentiality of the respondents, and the consenting of the respondents during data collection.

Data Analysis

Response Rate and Data Completeness

186 questionnaires were sent to the six institutions sampled, and 171 were completely returned (91.9 percent), an excellent return rate for institutional survey research. Fifteen questionnaires were discarded because they were incorrect or information was missing, resulting in a final quantitative sample of 171 respondents used in statistical analysis. A complete qualitative dataset was collected by conducting fifteen scheduled interviews with key informants, recording and transcribing the data. The analysis of documents was done for 12 official documents that were accessible and usable, such as policy documents, PSDP performance reports, and statements on multilateral cooperation. The high completion rates of all three data streams further validate the findings of this chapter that were triangulated.

Demographic Profile of Respondents.

The respondents who responded to the survey questions (171 valid responses) represent a fairly representative mix of infrastructure governance and financing professionals. As far as institutional affiliations are concerned, 34 respondents (19.9%) were from Planning Commission of Pakistan, 29 (17.0%) from the Ministry of IT and Telecommunication, 26 (15.2%) from the National Center of Artificial Intelligence, 31 (18.1%) from the National Highway Authority, 28 (16.4%) from WAPDA and 23 (13.4%) from Ignite. The difference between this distribution and the proportional stratification that was designed when samples were taken is small and is due to differential response rates by institution.

With respect to their professional role, 52 respondents indicated that they were project managers (30.4%), 41 said they were planning officers (24.0%), 38 were IT/AI specialists (22.2%) and 40 were financial analysts (23.4%). When the questions were asked about the gender distribution, 69.0% (118) were male and 31.0% (53) were female, reflecting the overall gender distribution in the public infrastructure sector of Pakistan. For professional experience, 22 respondents (12.9%) had less than 5 years, 67 (39.2%) had 5–10 years, 58 (33.9%) had 11–15

years, and 24 (14.0%) had more than 15 years of experience, suggesting that the sample included a mix of mid-career professionals well positioned to evaluate traditional and AI-enabled governance practices.

Descriptive Statistics of AI Adoption

The respondents were asked to mark the statements on a Likert scale ranging from 1 = strongly disagree to 5 = strongly agree, with regard to the use of AI in project governance. The overall mean score across all the institutions included in the composite was 3.42 (SD = 0.81), which falls in the moderate range representing partial but not widespread use of AI tools in the institutions. Awareness of AI-enabled monitoring tools had the highest mean score (3.71, SD = 0.76) and the lowest mean score (3.05, SD = 0.93) was for actual operational use of AI in procurement evaluation. This trend highlights that the awareness of the potential of AI amongst the institutions is currently ahead of the daily operation of the technology, which aligns with findings in the literature regarding the varying degree of implementation of national AI policies to operational use.

The National Center of Artificial Intelligence and the Ministry of IT and Telecommunication had slightly higher AI adoption scores (M = 3.78 and M = 3.65, respectively) compared to the other two groups, WAPDA and the National Highway Authority (M = 3.11 and M = 3.19, respectively), indicating that technical capacity for AI is more concentrated in specialized digital institutions than in traditional infrastructure-executing organizations.

Descriptive Statistics of Project Governance Quality

The project governance quality construct, which reflects the accuracy of procurement monitoring, transparency of procurement, and consistency of procurement reporting, had a composite mean of 3.38 (SD = 0.79). The most highly rated item was regarding the ability to monitor in real time (M = 3.64, SD = 0.82); the least was consistency of project coding and data entry across departments (M = 2.97, SD = 0.95). This discovery directly corroborates issues identified in the literature about lack of consistency in project codes and manual reporting errors as ongoing challenges in the effective use of AI in public development programs.

Descriptive Statistics of Investment Efficiency and Economic Value Creation

The investment efficiency construct had a mean score of 3.51 (SD = 0.77); the highest mean score was for the item "increased the accuracy of cost forecasts" (M = 3.80, SD = 0.71) and the lowest mean score was for the item "decreased project completion delays" (M = 3.22, SD = 0.89). The economic value creation construct showed a composite mean of 3.47 (SD = 0.80), with the highest ratings corresponding to the "enhanced investor confidence in AI-monitored projects" (M = 3.69, SD = 0.75) and the lowest ratings being the "measurable increase in return on infrastructure investment" (M = 3.28, SD = 0.88). The findings indicate that although stakeholders view AI as bolstering confidence and prediction accuracy, quantifiable and tangible benefits are less clear in the early stages of implementation.

Correlation Analysis

Using Pearson's correlation analysis, relationships between the four constructs were examined. Project governance quality also had a positive correlation with AI adoption; $r = .68$, $p < .01$, as did investment efficiency with a moderate-to-strong positive correlation, $r = .61$, $p < .01$, and with economic value creation there was also a moderate positive correlation, $r = .57$, $p < .01$. The quality of project governance was significantly and positively related to investment efficiency ($r = .72$, $p < .01$) and moderately positively related to economic value creation ($r = .59$, $p < .01$). Economic value creation was also positively and significantly related to investment efficiency ($r = .74$, $p < .01$). The findings suggest that better governance quality could be an important intermediary mechanism that converts the use of AI into tangible investment and economic results, which aligns with the dynamic capabilities approach of this study.

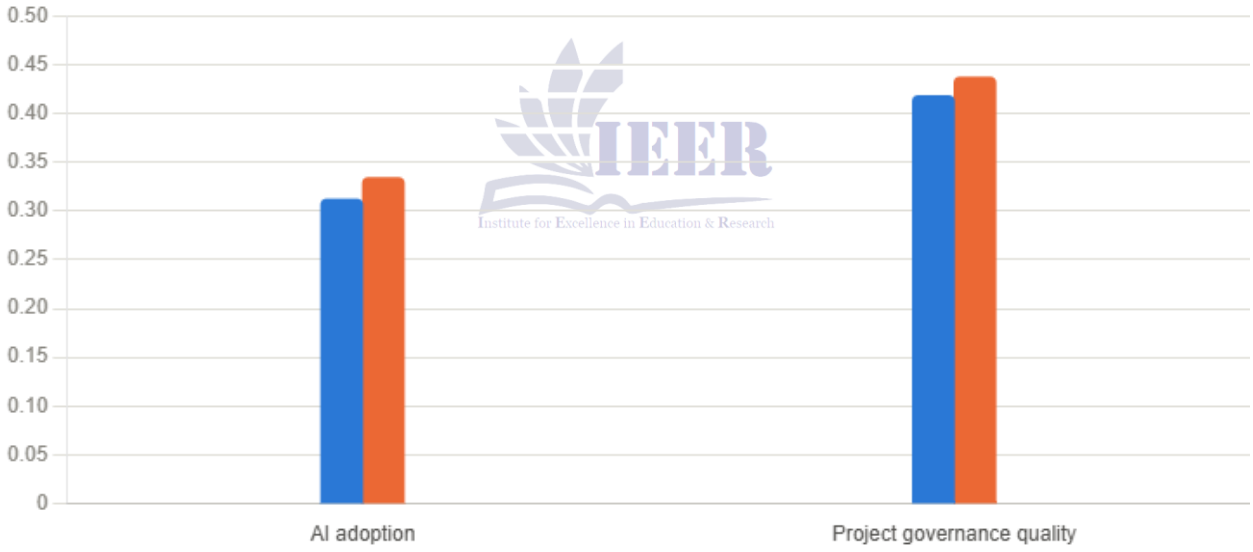
Regression Analysis

Multiple regression analysis was used to evaluate the predictive value of AI adoption and project governance quality to project investment efficiency, ultimately measured by economic value creation. The overall regression was statistically significant, $F(2, 168) = 84.36$, $p < .001$ and accounted for 55.3 percent of the variance in investment efficiency ($R^2 = .553$, Adjusted $R^2 = .548$). Both predictors was significantly contributing to the model, with project governance quality as the more powerful predictor.

Table

Predictor Variable	B (Unstandardized)	Std. Error	β (Standardized)	t	p
(Constant)	0.842	0.196	—	4.29	<.001
AI Adoption	0.312	0.058	0.334	5.38	<.001
Project Governance Quality	0.418	0.061	0.437	6.85	<.001
Model Summary: R = .744, R^2 = .553, Adjusted R^2 = .548, F(2,168) = 84.36, p < .001					

Table 1: Regression results for AI adoption and project governance quality predicting investment efficiency (n = 171)



From the results, it is inferred that with every one unit improvement of project governance quality, the investment efficiency is raised by 0.418 unit (when AI is a constant), and the investment efficiency is increased by 0.312 unit when the project governance quality is a constant. While AI adoption alone has a standardized coefficient of .334, governance quality is .437, the latter is relatively larger, indicating that the economic value of AI is significantly mediated through, and dependent on, governance quality, and not purely through AI adoption itself.

A supplemental regression analysis on investment efficiency as a predictor of economic value creation was also significant: $F(1, 169) = 203.71$, $p < .001$, $R^2 = .547$, with gains in investment efficiency significantly predicting gains in economic value creation at the institutional level.

Thematic Findings from Key Informant Interviews

The analysis of the 15 semi-structured interviews was undertaken following the 6 phases of thematic analysis outlined by Braun and Clarke (2021) which resulted in 4 prominent themes.

The first theme, institutional readiness gaps, highlighted by informants' consistent observation that although national policy frameworks on AI were in place, there was considerable variation in readiness among institutions. The officials from NCAI and MoITT spoke of a relatively developed internal capacity, while informants from WAPDA and NHA spoke of the manual and paper-based reporting systems that were relied upon, which restrict the actual implementation of AI tools despite policy encouragement.

The second theme, procurement transparency and trust, had a healthy level of support in favor of the use of AI to review procurement, with strong informant support for Natural language processing (NLP) tools to identify irregularities within bids. Multiple informants reported that these tools have already helped to decrease informal conflict over tender evaluation but that human oversight is still required for final decisions and there is a need for algorithmic transparency.

Data governance as a prerequisite was raised almost universally in the third theme. Project coding issues, duplicate records, and data silos within departments were key concerns raised by informants, noting that these problems need to be addressed to ensure that AI tools can provide accurate forecasts or risk assessments. Multiple informants explicitly connected this to a lack of dollar value derived from the monitoring benefits of AI.

Investor and financier confidence was a theme that stood out among financial analysts and informants who interacted with multilateral partners as the fourth theme. The following respondents reported that their perception of a greater appetite for external financiers to focus on projects monitored by AI, as it became more auditable and less risky, but noted that there is still a degree of faith that is more of a belief than evidence at this time.

Findings

The twelve official documents were subjected to analysis which confirmed and contextualised the quantitative and qualitative results. The National Artificial Intelligence Policy 2025 outlines funding mechanisms, such as a National AI Fund and specific Centers of Excellence, which aim to transform AI pilots into scalable and purchasable infrastructure solutions. The findings from PSDP performance reports that were reviewed for the study supported the qualitative theme of data governance gaps.The results of PSDP performance report that were analyzed for the study corroborated the theme of the qualitative findings, namely data governance gaps. The interview theme of increased financier confidence in projects that are technologically monitored was also supported by cooperation statements with multilateral financiers, which highlighted the strategic focus on coordinating investments in AI and digital infrastructure with future investment pipelines.

Combining the insights from the three data sources creates a consistent picture: Pakistan's infrastructure governance institutions have moderate and uneven rates of AI adoption, with specialized digital institutions outperforming traditional infrastructure-executing institutions. On a statistical level, the deployment of AI has a significant impact on investment efficiency, albeit indirectly, mainly through the mechanism of the quality of governance, as opposed to being a direct technological input. There is a convergence of qualitative and document-based evidence indicating that data governance and institutional readiness are the key preconditions for delivering the economic promise of AI, with investor confidence seemingly building up in anticipation of actual and measurable returns. Altogether, these results give credence to the central tenet of the study that AI-based governance instruments can meaningfully enhance investment efficiency and economic value creation in Pakistan, but not as an afterthought, but with the necessary institutional capacity, data governance standards, and procurement reforms.

The data analysis resulted in several important insights into the use of artificial intelligence in

project governance and financing of infrastructure in Pakistan. First, the frequency of the use of AI presented in this study was on average moderate, not widespread, with a '3.42' on a scale of 1 to 5. Though awareness of AI tools for monitoring was consistently greater than their in-use, there was less awareness in the area of procurement evaluation. The level of adoption also depended on the institution, with institutions like the National Center of Artificial Intelligence and the Ministry of IT and Telecommunication displaying a higher rate of AI use compared to traditional infrastructure-executing institution like WAPDA and National Highway Authority.

Second, quality of project governance was a key construct that is closely related to the effectiveness of AI. Respondents were more positive about the improvements in real-time monitoring, but were less positive about consistency of project coding, and cross-departmental data entry. This was backed up by document analysis of PSDP performance reports, which showed longstanding data fragmentation issues, and by interview themes which highlighted data governance as a critical precondition for the effective deployment of AI.

Third, correlation analysis showed high positive correlation between all the four core constructs with the highest correlation level being between Investment efficiency and economic value creation ($r = .74$), followed by the correlation between governance quality and investment efficiency ($r = .72$). Further, regression analysis revealed that the variance in investment efficiency was 55.3 percent explained by a combination of AI adoption and governance quality, with governance quality being the stronger predictor ($\beta = .437$) than AI adoption alone ($\beta = .334$). This suggests that the economic impacts of AI are far more concentrated in, and reliant on, the quality of its governance environments, as opposed to being a standalone factor that drives efficiency.

Fourth, results of the qualitative data collected through key informant interviews revealed four recurring themes: gaps in institutional readiness, lack of transparency and trust in procurement processes, Investor/Financier confidence as a prerequisite, and data governance. Across the board, informants tied strong AI use to previous efforts to solve data inconsistencies and manual reporting issues, and cited an increase in – albeit somewhat expected – confidence by external financing sources in AI-driven infrastructure monitoring.

Last, triangulated evidence from survey, interview and document data pointed towards a single story: that the use of AI in the infrastructure governance ecosystem in Pakistan holds measurable promise to enhance investment efficiency and economic value creation, but not necessarily solely because of the technology being used but because of the readiness of institutions, the data being available and the need for procurement reform. The findings directly contribute to the main objectives of the study, suggesting that there are meaningful links between the use of AI, investment efficiency, and economic value creation, and that governance quality is the key mediating variable influencing the outcomes of infrastructure financing institutions across Pakistan.

Conclusion

This study aimed to explore the association between Project Governance (PG) and financing infrastructure and their impact on investment efficiency and economic value creation in Pakistan through the lens of AI. The study has relied on a mixed-methology approach with 171 valid survey responses, 15 key informant interviews, and analysis of 12 official policy and performance documents, which has enabled the creation of a detailed and triangulated picture of the current trajectory of the adoption of AI in the infrastructure governance landscape in Pakistan.

The results reveal a conscious policy commitment towards AI for governance in Pakistan, as reflected in the National Artificial Intelligence Policy 2025, specific funding support, and emerging multi-lateral collaboration with institutions like Asian Infrastructure Investment Bank. The findings of the study also show that there is, however, not yet a uniform operational capacity across implementing institutions corresponding to these policy aspirations. While both specialized digital bodies and traditional infrastructure-executing bodies have made advances in utilizing AI tools,

the preparedness of their AI bodies has been uneven, limiting the technology's potential for economic value.

Critically, the study shows that AI cannot on its own drive investment efficiency or economic value; the advantage it can provide is significantly moderated by the quality of governance frameworks of which it is a part. The results of the strong correlations and regression demonstrate that increased data transparency, monitoring consistency and data governance further improve the positive impact of AI, and data fragmentation and inconsistencies in reporting remain an impediment to AI benefits. The result further supports the initial thesis of the study, which stated that there is a true potential that AI-powered tools can enhance the outcomes of infrastructure investments in Pakistan, provided that the institutional capacities, data standards, and procurement reforms are aligned with the technology implementation.

This is complemented by the qualitative evidence, which deepens the understanding that trust, both internal (at the project stakeholder level) and external (at the financier level), is a key currency in AI-driven governance. The increase in investor confidence in projects powered by AI is encouraging but also a bit forward-looking, as long-term, tangible performance improvements will have to be demonstrated to make this a long-term financing partnership.

This research sits amongst a growing global conversation about AI in the governance of infrastructure and is an important addition to the literature, which has tended to focus on more advanced economies and the private sector. The study provides a more complex understanding of the relationship between the adoption of AI and governance quality, taking into account Pakistan's unique institutional, regulatory, and financing framework. It shows that technology is not enough, sustainable investment efficiency and economic value creation requires a coordinated development of digital tools, institutional readiness and transparency of governance practices. Insights gained here offer a timely and empirically-informed basis for future project governance frameworks to be more effective, accountable and economically productive in the context of Pakistan's ongoing expansion of AI-enabled infrastructure financing programs.

Recommendations

1. Improve project coding and data entry systems in all infrastructure institutions to avoid fragmentation in advance of scaling up the use of AI tools.
2. Focus more on strengthening the capacity of traditional executing agencies like WAPDA and NHA by introducing AI.
3. Improve the transparency and clarity of procurement processes through the increase of NLP bid review and continued human oversight protections.
4. Create concrete standards of performance to turn investor confidence into quantitative or factual decisions on financing.
5. These institutional changes are essential if AI is to drive efficiency, and should be integrated with the rollout of AI.

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