The Impact of Artificial Intelligence Capabilities on E-Governance Excellence within the Saudi Ministry of Health

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Abstract: *This study examined the impact of Artificial Intelligence Capabilities on E-Governance Excellence within the Saudi Ministry of Health. The study was motivated by the growing importance of AI in improving public-sector performance, digital service delivery, decision-making, and healthcare governance under Saudi Arabia's digital transformation agenda. A quantitative research design was adopted using a structured questionnaire distributed to employees involved in digital transformation, information technology, healthcare administration, and e-governance-related activities within the Ministry. A total of 384 usable responses were analyzed using SPSS and SmartPLS. The analysis included normality testing, descriptive analysis, measurement model assessment, discriminant validity, coefficient of determination, and direct hypothesis testing through PLS-SEM. The findings confirmed that Artificial Intelligence Capabilities have a positive and significant impact on E-Governance Excellence. This indicates that AI-related infrastructure, employee skills, data readiness, technological resources, and organizational willingness to adopt AI contribute to better digital governance performance. The results suggest that strengthening AI capabilities can help the Saudi Ministry of Health improve service efficiency, transparency, accessibility, responsiveness, decision-making, and overall digital healthcare governance. The study contributes to the literature by providing empirical evidence on the role of AI capabilities in enhancing e-governance excellence in a Saudi public healthcare context. Practically, it highlights the need for continued investment in AI infrastructure, workforce training, data management, and organizational readiness to support effective AI-enabled governance.*

Keywords: Artificial Intelligence Capabilities; E-Governance Excellence; Saudi Ministry of Health; Public Sector; Digital Governance.

1. Introduction

Artificial intelligence has become an important driver of public-sector transformation because it enables government institutions to improve decision-making, automate administrative processes, analyze large volumes of data, and deliver services more efficiently. In the context of digital government, AI is increasingly used to strengthen service quality, transparency, responsiveness, and institutional performance. This is particularly relevant to healthcare governance, where public institutions manage complex service systems, sensitive data, and high public expectations. AI capabilities are therefore not limited to technical tools; they also include the availability of digital infrastructure, data resources, skilled employees, organizational readiness, and the ability to use intelligent systems to support better governance outcomes. Recent studies emphasize that AI can enhance data-driven decision-making and governance in public affairs by improving the way public organizations collect, process, and apply information for policy and service decisions (Charles et al.,

2022). Similarly, AI capabilities have been linked to stronger organizational performance when they are supported by dynamic capabilities, creativity, and institutional readiness (Almheiri et al., 2024).

In Saudi Arabia, the importance of AI in governance is strongly connected to the national transformation agenda under Vision 2030. The Kingdom has invested heavily in healthcare transformation, digital government, smart services, and AI-supported public-sector modernization. The Saudi Ministry of Health is one of the most important contexts for studying this transformation because it plays a central role in healthcare service delivery, digital health initiatives, administrative coordination, and public health governance. Vision 2030 has encouraged greater investment in healthcare infrastructure, innovation, and digital transformation, creating opportunities for AI to improve service accessibility, operational efficiency, and institutional effectiveness (Alfahad et al., 2024). In addition, Saudi Arabia's governance model increasingly recognizes AI as a strategic tool for public-sector modernization, regulatory development, and national competitiveness (Ibrahim, 2024). This makes the Ministry of Health a relevant setting for examining whether AI capabilities contribute to higher levels of e-governance excellence.

E-governance excellence refers to the ability of public institutions to use digital technologies to deliver efficient, transparent, reliable, accessible, and citizen-centered services. It reflects not only the availability of online platforms but also the quality of governance outcomes produced through digital systems. These outcomes include improved service delivery, administrative effectiveness, accountability, responsiveness, public trust, and organizational efficiency. Prior research shows that e-government can enhance organizational effectiveness by improving administrative empowerment, simplifying procedures, and supporting better institutional performance (Alkhawaldah et al., 2025). In the Saudi public-sector context, e-governance has also been connected with knowledge management and business performance efficiency, suggesting that digital governance can support better coordination, decision-making, and service outcomes in government institutions (Alruwaili et al., 2024). Therefore, achieving e-governance excellence requires more than digital adoption; it requires the effective use of technological capabilities to create measurable improvements in public service performance.

The relationship between AI capabilities and e-governance excellence can be explained through the Resource-Based View, which argues that valuable organizational resources can improve performance when they are effectively developed and used. AI capabilities can be considered strategic resources because they combine technology, data, human skills, analytical capacity, and organizational readiness. Research based on the Resource-Based View indicates that AI can contribute to firm and organizational performance when it is treated as a capability rather than a standalone technology (Chen et al., 2022). In the public sector, organizational resources and capabilities are also important for improving public service performance and institutional outcomes (Khalifa et al., 2025). Accordingly, when the Saudi Ministry of Health develops strong AI capabilities, it is expected to be better able to improve e-governance excellence through faster decision-making, improved service quality, greater efficiency, and more responsive digital services.

Despite the growing attention to AI in public administration, more empirical evidence is still needed on how AI capabilities affect e-governance excellence in public healthcare institutions. Many studies discuss AI adoption, public service delivery, or digital government in broad terms, but fewer studies examine the direct impact of AI capabilities on e-governance excellence within the Saudi healthcare context. Studies on AI and e-government integration in developing countries show that public institutions still face challenges related to readiness, implementation capacity, infrastructure, and governance frameworks (Kampira & Mukonza, 2025). Other research also suggests that AI-enabled public services require effective human–AI collaboration and strong public value orientation to achieve meaningful service improvements (Rulandari & Silalahi, 2025). Based on this gap, this paper aims to examine the impact of Artificial Intelligence Capabilities on E-Governance Excellence within the Saudi Ministry of Health. The study contributes to the literature by providing empirical evidence from a Saudi public healthcare setting and contributes practically by highlighting the importance of strengthening AI infrastructure, employee AI skills, data readiness, and organizational willingness to adopt intelligent technologies.

2. Literature Review

2.1 Theoretical Discussion

The relationship between Artificial Intelligence Capabilities and E-Governance Excellence can be explained through several theoretical perspectives that connect technological resources, institutional readiness, public-sector performance, and service quality. In this paper, the Resource-Based View is particularly relevant because it explains how internal organizational resources can create performance advantages when they are valuable, difficult to imitate, and effectively deployed. Artificial intelligence capabilities can be understood as strategic organizational resources because they include technological infrastructure, data systems, analytical tools, employee skills, and organizational readiness. These capabilities allow public institutions to process information more effectively, automate administrative tasks, improve service quality, and support evidence-based decisions. From this perspective, AI is not merely a technological application but a strategic capability that can enhance organizational performance when it is aligned with institutional goals and operational processes. Prior research supports this view by showing that AI capabilities can improve organizational outcomes when they are integrated with broader organizational and dynamic capabilities (Almheiri et al., 2024). Similarly, AI has been examined through the Resource-Based View as a capability that contributes to performance by improving information processing, decision-making, and digital value creation (Chen et al., 2022).

The Resource-Based View is also useful in public-sector research because government institutions increasingly depend on internal capabilities to improve efficiency, responsiveness, and service delivery. In public service organizations, performance is not only measured through financial outcomes but also through effectiveness, service quality, transparency, citizen satisfaction, and public value. Therefore, AI capabilities can become an important source of institutional performance when they enable government organizations to redesign services, reduce administrative delays, and improve the accuracy of decisions. This is especially relevant in healthcare governance, where public institutions manage large volumes of data, complex service networks, and high levels of public demand. Research on public service organizations confirms that internal resources and organizational capabilities are important for explaining public-sector performance and institutional effectiveness (Khalifa et al., 2025). In the Saudi context, the interaction between knowledge management, e-governance, and business performance efficiency also indicates that technological and knowledge-based capabilities are essential for improving public-sector outcomes (Alruwaili et al., 2024).

The Technology Acceptance Model also supports the discussion because e-governance excellence depends partly on the acceptance and effective use of digital systems by employees and users. AI capabilities may exist within an institution, but their contribution to governance excellence depends on whether employees perceive digital systems as useful, usable, and supportive of their work. In e-government contexts, user acceptance influences the successful adoption of digital services and affects the extent to which digital platforms can improve government performance. The extended Technology Acceptance Model has been used to explain e-government adoption by showing that acceptance factors shape users' willingness to engage with digital government systems (Anityasari et al., 2024). For the Saudi Ministry of Health, this means that AI capabilities should be supported by employee readiness, training, trust in digital systems, and practical usefulness. Without acceptance and readiness, AI tools may remain underused, limiting their impact on e-governance excellence.

The discussion is also supported by excellence-model thinking, particularly because the dependent variable in this paper is E-Governance Excellence. Excellence models focus on leadership, strategy, processes, people, partnerships, performance results, and continuous improvement. These dimensions are closely related to e-governance because digital government excellence requires more than online service availability; it requires strategic alignment, quality management, service responsiveness, user satisfaction, transparency, and institutional learning. Public-sector excellence models provide a useful foundation for understanding how technological capabilities can be translated into better governance outcomes. Recent research shows that excellence models remain important for improving public-

sector performance because they provide structured approaches for evaluating service quality, institutional effectiveness, and continuous improvement (Bolboceanu, 2025). In addition, an optimal organizational excellence model for the public sector emphasizes the need to align processes, resources, leadership, and service outcomes in order to achieve sustainable institutional excellence (Rahmati & Jalilvand, 2024).

Based on these theoretical foundations, this study views Artificial Intelligence Capabilities as strategic resources that can improve E-Governance Excellence when they are effectively adopted, accepted, and integrated into public-sector processes. The Resource-Based View explains why AI capabilities can strengthen institutional performance. The Technology Acceptance Model explains why the usefulness and acceptance of digital technologies matter for successful e-government implementation. Excellence-model thinking explains how technological resources can contribute to broader outcomes such as efficiency, service quality, responsiveness, transparency, and public value. Together, these perspectives provide a strong theoretical basis for examining the impact of Artificial Intelligence Capabilities on E-Governance Excellence within the Saudi Ministry of Health.

2.2 Hypothesis Development

Artificial Intelligence Capabilities refer to an organization's ability to use AI-related resources, technologies, skills, and systems to improve decision-making, service delivery, and operational performance. In public-sector institutions, these capabilities include data infrastructure, automation tools, predictive analytics, employee AI skills, and organizational readiness to adopt intelligent technologies. AI has become increasingly important in public administration because it supports data-driven decision-making, improves information processing, and enhances the quality of governance decisions (Charles et al., 2022). AI capabilities also contribute to organizational performance when they are integrated with broader institutional capabilities and strategic objectives (Almheiri et al., 2024). E-Governance Excellence refers to the ability of public institutions to provide digital services that are efficient, transparent, accessible, reliable, and responsive. In government organizations, e-governance can improve administrative effectiveness, simplify service procedures, strengthen accountability, and support better public service outcomes (Alkhawaldah et al., 2025). E-governance effectiveness is also associated with higher levels of public trust when digital systems are perceived as useful, transparent, and reliable (Hartanto et al., 2021). Therefore, achieving e-governance excellence requires not only digital platforms but also strong technological and organizational capabilities that support service quality and institutional performance.

AI capabilities are expected to improve e-governance excellence because they enable public institutions to automate routine tasks, analyze complex data, improve service responsiveness, and support more accurate decisions. In healthcare governance, these capabilities are especially important because the Ministry of Health manages large amounts of health data, administrative processes, and public service demands. AI can support healthcare transformation by improving planning, service efficiency, and future health-system readiness (Saeed et al., 2023). In Saudi Arabia, this relationship is also relevant to Vision 2030, which emphasizes healthcare investment, digital transformation, and public-sector modernization (Alfahad et al., 2024). Previous studies support the positive role of AI in public-sector and e-government performance. AI can improve public service delivery and support more efficient e-governance when it is supported by institutional readiness, infrastructure, and governance capacity (Kampira & Mukonza, 2025). AI-enabled public services can also improve service effectiveness when human–AI collaboration is properly managed (Rulandari & Silalahi, 2025). Accordingly, this study assumes that stronger Artificial Intelligence Capabilities will lead to higher E-Governance Excellence within the Saudi Ministry of Health. Therefore, the following hypothesis is proposed:

H1: Artificial Intelligence Capabilities have a positive significant impact on E-Governance Excellence within the Saudi Ministry of Health.

3. Methodology

This study adopted a quantitative research design to examine the impact of Artificial Intelligence Capabilities on E-Governance Excellence within the Saudi Ministry of Health. The quantitative approach was appropriate because the study focused on testing a direct relationship between two measurable constructs using statistical analysis. The study followed a positivist research orientation and a deductive logic because the hypothesis was developed from previous literature and tested empirically through survey data. A cross-sectional design was used, as the data were collected from respondents at one point in time. This design was suitable for capturing employees' current perceptions of AI capabilities and e-governance excellence within the Saudi Ministry of Health, especially in light of Saudi Arabia's continuing digital transformation and healthcare modernization under Vision 2030. The use of AI in public administration has been increasingly linked to data-driven decision-making, service improvement, and governance modernization, which supports the relevance of a quantitative approach for testing the proposed relationship in the public healthcare context (Charles et al., 2022). The focus on the Saudi Ministry of Health is also justified because healthcare investment and digital transformation are central elements of Saudi Vision 2030, making the sector an appropriate context for examining AI-enabled governance excellence (Alfahad et al., 2024).

The target population consisted of employees working in the Saudi Ministry of Health who were involved in digital transformation initiatives, information technology, e-health services, healthcare administration, digital innovation, and e-governance-related activities. The exact total population size was not specified; therefore, Cochran's formula for large or unknown populations was used to determine the required sample size. Based on the formula, the minimum required sample was 384 respondents. A purposive sampling technique was adopted because the study required respondents who had relevant knowledge of, or exposure to, AI applications, digital systems, and governance practices within the Ministry. This technique was appropriate because the study did not aim to collect responses from all employees generally, but from those who could provide informed views about AI capabilities and digital governance performance. In the main data collection, 500 questionnaires were distributed, and 384 usable responses were retained after excluding incomplete questionnaires, which provided a sufficient sample for the statistical analysis. The selected population and sampling approach were consistent with the aim of examining technology-driven governance within the Saudi Ministry of Health, where AI and digital transformation are increasingly important for improving healthcare service delivery and administrative performance (Saeed et al., 2023).

Data were collected using a structured questionnaire adapted from validated measurement scales. The questionnaire included demographic information and two main constructs: Artificial Intelligence Capabilities and E-Governance Excellence. Artificial Intelligence Capabilities were measured using 15 items adapted from Chen et al. (2022). These items covered three dimensions: AI Basic Knowledge, AI Skills and Competencies, and AI Proclivity, with five items for each dimension. AI Basic Knowledge measured the availability of AI-related infrastructure, software, data, technical resources, and funding. AI Skills and Competencies measured the organization's understanding of AI applications, ability to plan AI use, employee AI skills, training access, and capability to manage AI technologies. AI Proclivity measured the organization's willingness to adopt innovation, introduce new technologies, and pursue opportunities for technological improvement. E-Governance Excellence was measured using 12 items adapted from Hartanto et al. (2021) and aligned with public-sector excellence perspectives. These items covered accessibility, transparency, responsiveness, efficiency, engagement, service quality, reliability, decision-making, integration, and overall digital governance performance. All items were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. The use of these measures was suitable because AI capabilities can be understood as strategic organizational resources that contribute to performance and digital value creation (Chen et al., 2022), while e-governance effectiveness reflects the ability of digital governance systems to enhance public service outcomes and trust (Hartanto et al., 2021).

Before conducting the main data collection, a pilot test was carried out to assess the clarity, relevance, and suitability of the questionnaire. The purpose of the pilot test was to ensure that the measurement items were understandable, contextually appropriate, and aligned with the Saudi Ministry of Health

environment. Feedback from the pilot stage was used to refine wording, improve item clarity, and ensure consistency in terminology across the questionnaire. Reliability and validity were then assessed as part of the main analysis to confirm that the constructs were measured accurately. Reliability was examined using Cronbach's alpha and composite reliability, while convergent validity was assessed through the Average Variance Extracted. Discriminant validity was evaluated using the HTMT ratio and Fornell-Larcker criterion. This process was important because AI capabilities and e-governance excellence are latent constructs that cannot be measured directly and therefore require multiple indicators to capture their meaning. The emphasis on valid and reliable measurement is also consistent with the Resource-Based View logic, where AI capabilities are treated as organizational resources that must be measured through infrastructure, human skills, readiness, and strategic use (Khalifa et al., 2025). In addition, public-sector excellence requires reliable measurement of service quality, efficiency, transparency, and responsiveness, which are central elements in evaluating governance performance (Rahmati & Jalilvand, 2024).

The collected data were analyzed using SPSS and Partial Least Squares Structural Equation Modeling through SmartPLS. SPSS was used for preliminary statistical analysis, including data screening, normality testing, descriptive statistics, and preparation of the dataset for further analysis. After the preliminary analysis, SmartPLS was used to assess the measurement model and structural model. The measurement model evaluation included the examination of outer loadings, Cronbach's alpha, composite reliability, Average Variance Extracted, HTMT, and Fornell-Larcker criteria to confirm indicator reliability, internal consistency, convergent validity, and discriminant validity. The structural model was then assessed using the coefficient of determination and path coefficient analysis. Finally, bootstrapping was applied to test the direct hypothesis between Artificial Intelligence Capabilities and E-Governance Excellence. Using both SPSS and SmartPLS allowed the study to combine basic statistical analysis with advanced latent variable modeling. This was appropriate because AI capabilities are multidimensional and are expected to influence governance performance through improved decision-making, automation, service quality, and organizational efficiency. Prior studies have similarly emphasized that AI can improve public-sector performance when it is supported by institutional readiness, technological capacity, and effective governance systems (Cao et al., 2025). Therefore, the selected analytical approach was suitable for examining whether Artificial Intelligence Capabilities contribute to E-Governance Excellence within the Saudi Ministry of Health.

4. Findings

This section presents the findings of the study on the impact of Artificial Intelligence Capabilities on E-Governance Excellence within the Saudi Ministry of Health. The analysis was conducted using SPSS and SmartPLS to examine the quality of the data, describe the main study variables, assess the measurement model, and test the proposed direct hypothesis. The section begins with the normality and descriptive results, followed by the assessment of construct reliability and validity. It then presents discriminant validity results and the structural model assessment. Finally, the hypothesis testing results are reported to determine whether Artificial Intelligence Capabilities have a significant positive effect on E-Governance Excellence. These findings provide the empirical basis for evaluating the proposed relationship and for discussing the role of AI capabilities in strengthening digital governance performance within the Saudi public healthcare context.

As presented in Table 1, the normality test was conducted using skewness and kurtosis values for Artificial Intelligence Capabilities (AIC) and E-Governance Excellence (EGE). The results show that AIC recorded a skewness value of -0.212 and a kurtosis value of -0.781, while EGE recorded a skewness value of -0.157 and a kurtosis value of -0.761. These values fall within the commonly accepted range of ±1, indicating that the data were approximately normally distributed and did not show serious deviation from normality. Therefore, the distribution of responses for both constructs was considered acceptable for further statistical analysis. This result suggests that the dataset was

suitable for proceeding with descriptive analysis, measurement model assessment, and structural model testing.

Table 1: Normality test

	N	Skewness	Kurtosis
AIC	384	-0.212	-0.781
EGE	384	-0.157	-0.761

4.1 AIC = Artificial Intelligence Capabilities; EGE = E-Governance Excellence

As presented in Table 2, the descriptive analysis summarizes the overall levels of Artificial Intelligence Capabilities (AIC) and E-Governance Excellence (EGE) among the 384 respondents. The results show that AIC recorded a mean value of 3.257 with a standard deviation of 0.921, while EGE recorded a mean value of 3.197 with a standard deviation of 0.920. These mean values indicate that respondents generally perceived both AI capabilities and e-governance excellence at a moderate level. The slightly higher mean score for AIC suggests that respondents perceived the Ministry's AI-related capabilities, such as infrastructure, skills, and organizational readiness, somewhat more positively than the current level of e-governance excellence. The standard deviation values indicate a moderate level of variation in respondents' answers, suggesting that perceptions were not completely uniform but remained reasonably consistent across the sample. Overall, the descriptive results provide an initial indication that AI capabilities and e-governance excellence are present within the Saudi Ministry of Health, while also suggesting that further improvement may still be needed to strengthen digital governance performance.

Table 2: Summary of Descriptive Analysis

	N	Mean	Std. Deviation
AIC	384	3.257	0.921
EGE	384	3.197	0.920

4.2 AIC = Artificial Intelligence Capabilities; EGE = E-Governance Excellence

Figure 1 presents the initial measurement model for Artificial Intelligence Capabilities (AIC) and E-Governance Excellence (EGE). The figure shows the outer loadings of the measurement items before model refinement. For AIC, most indicators showed acceptable loadings; however, AIBK2 and AISK4 recorded weak loadings below the acceptable threshold. Similarly, for EGE, most indicators demonstrated acceptable loadings, while EGE4 and EGE8 showed weak loadings. These low-loading items indicated that they did not adequately represent their respective constructs in the initial model. Therefore, the initial measurement model required refinement by removing the weak indicators before proceeding to the final measurement model assessment. This step helped improve the quality of the measurement model and ensured that the retained items better represented Artificial Intelligence Capabilities and E-Governance Excellence.

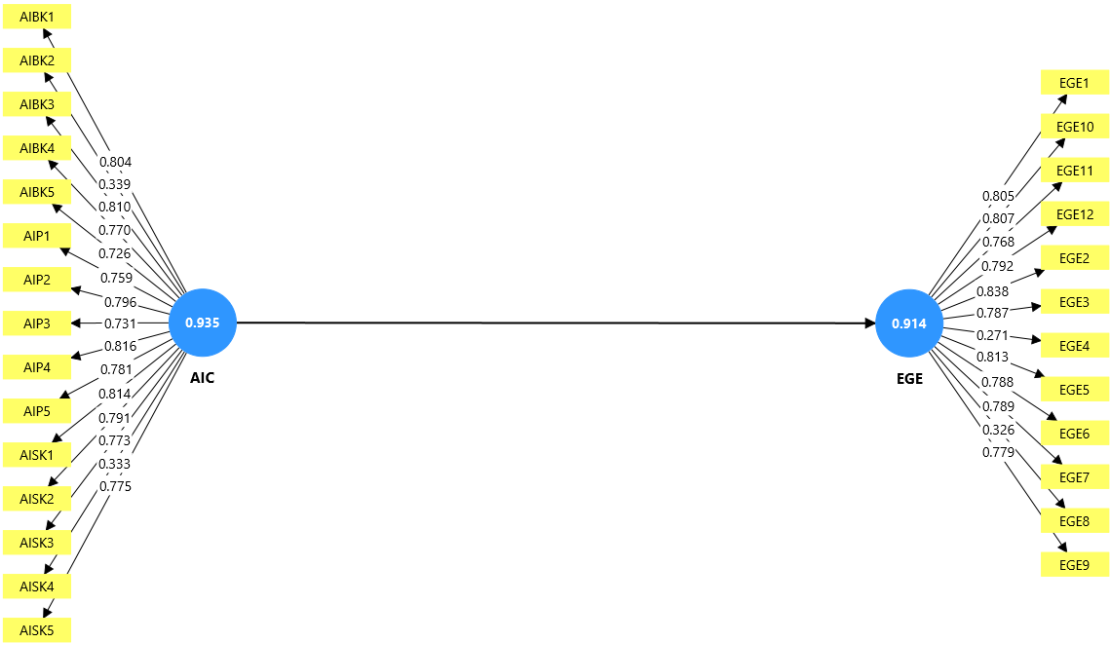

Figure 1: Evaluation of Measurement Model (Initial Model)

As presented in Table 3, the initial measurement model was assessed using item loadings, Cronbach's alpha, composite reliability, and Average Variance Extracted (AVE) for Artificial Intelligence Capabilities (AIC) and E-Governance Excellence (EGE). The results show that both constructs achieved acceptable internal consistency reliability at the initial stage, as AIC recorded Cronbach's alpha of 0.935 and composite reliability of 0.945, while EGE recorded Cronbach's alpha of 0.914 and composite reliability of 0.931. These values were above the recommended threshold of 0.70, indicating that the items generally demonstrated strong reliability. In addition, the AVE values for both AIC and EGE were 0.544, which exceeded the minimum acceptable value of 0.50. This suggests that, at the construct level, both variables achieved acceptable convergent validity in the initial model.

However, the item loading results also show that several indicators had weak loadings and therefore required further assessment before finalizing the measurement model. For AIC, most items recorded acceptable loadings above 0.70, including AIBK1, AIBK3, AIBK4, AIBK5, AIP1, AIP2, AIP3, AIP4, AIP5, AISK1, AISK2, AISK3, and AISK5. However, AIBK2 recorded a low loading of 0.343, and AISK4 recorded a low loading of 0.339, indicating that these items did not adequately represent the AIC construct. Similarly, for EGE, most items showed acceptable loadings, such as EGE1, EGE10, EGE11, EGE12, EGE2, EGE3, EGE5, EGE6, EGE7, and EGE9. Nevertheless, EGE4 recorded a weak loading of 0.270, and EGE8 recorded a weak loading of 0.325. Since these loadings were below the acceptable threshold, they were considered unsuitable for retention in the final model. Therefore, the weak indicators were removed to improve the quality, reliability, and validity of the final measurement model before proceeding to further analysis.

Table 3: Construct Reliability and Validity – Initial Model measurements

construct	Items	Loading	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
AIC	AIBK1	0.804	0.935	0.945	0.544
	AIBK2	0.343			
	AIBK3	0.809			
	AIBK4	0.769			
	AIBK5	0.726			
	AIP1	0.760			
	AIP2	0.796			
	AIP3	0.732			
	AIP4	0.817			
	AIP5	0.781			
	AISK1	0.812			

construct	Items	Loading	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
	AISK2	0.791			
	AISK3	0.773			
	AISK4	0.339			
	AISK5	0.775			
EGE	EGE1	0.805	0.914	0.931	0.544
	EGE10	0.807			
	EGE11	0.769			
	EGE12	0.793			
	EGE2	0.838			
	EGE3	0.786			
	EGE4	0.270			
	EGE5	0.812			
	EGE6	0.787			
	EGE7	0.789			
	EGE8	0.325			
	EGE9	0.780			

Figure 2 presents the final measurement model after removing the weak indicators identified in the initial model. In this final model, the low-loading indicators were deleted from both Artificial Intelligence Capabilities (AIC) and E-Governance Excellence (EGE), leaving only the indicators that adequately represented their respective constructs. The retained indicators showed acceptable measurement quality, confirming that the refined model was stronger and more suitable than the initial model. The figure also shows that both constructs achieved strong internal consistency after the refinement process. Overall, the final measurement model indicates that the retained items appropriately measured Artificial Intelligence Capabilities and E-Governance Excellence, allowing the study to proceed to discriminant validity assessment and structural model testing.

Figure 2: Evaluation of Measurement Model (Final Model)

As presented in Table 4, the final measurement model was assessed after removing the weak indicators identified in the initial model. The results show that the retained items for Artificial Intelligence Capabilities (AIC) achieved acceptable and strong outer loadings, ranging from 0.726 to 0.819. Specifically, the retained AIC items included AIBK1, AIBK3, AIBK4, AIBK5, AIP1, AIP2, AIP3, AIP4, AIP5, AISK1, AISK2, AISK3, and AISK5. This indicates that the remaining items adequately represented the AIC construct after the deletion of low-loading indicators. The construct also recorded a Cronbach's alpha value of 0.947, composite reliability of 0.953, and AVE of 0.612. Since the reliability values exceeded the recommended threshold of 0.70 and the AVE exceeded the minimum threshold of 0.50, the results confirm that Artificial Intelligence Capabilities achieved strong internal consistency reliability and acceptable convergent validity in the final model.

For E-Governance Excellence (EGE), the retained items also showed acceptable outer loadings, ranging from 0.773 to 0.835. The retained EGE items included EGE1, EGE10, EGE11, EGE12, EGE2, EGE3, EGE5, EGE6, EGE7, and EGE9. These results indicate that the final set of EGE indicators adequately measured the construct after excluding the weak indicators from the initial model. EGE recorded a Cronbach's alpha value of 0.937, composite reliability of 0.946, and AVE of 0.638. These values confirm that the EGE construct achieved strong reliability and convergent validity. Overall, the final measurement model results demonstrate that both AIC and EGE met the required reliability and validity standards, meaning that the constructs were suitable for proceeding to discriminant validity assessment and structural model testing.

Table 4: Construct Reliability and Validity – Final Model measurements

construct	Items	Loading	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
AI	AIBK1	0.807	0.947	0.953	0.612
	AIBK3	0.811			
	AIBK4	0.769			
	AIBK5	0.726			
	AIP1	0.764			
	AIP2	0.797			
	AIP3	0.733			
	AIP4	0.819			
	AIP5	0.782			
	AISK1	0.815			
	AISK2	0.792			
	AISK3	0.771			
	AISK5	0.776			
EGE	EGE1	0.808	0.937	0.946	0.638
	EGE10	0.808			
	EGE11	0.773			
	EGE12	0.790			
	EGE2	0.835			
	EGE3	0.790			
	EGE5	0.814			
	EGE6	0.789			
	EGE7	0.792			
	EGE9	0.784			

As presented in Table 5, discriminant validity was assessed using the Heterotrait-Monotrait ratio of correlations (HTMT) between Artificial Intelligence Capabilities (AIC) and E-Governance Excellence (EGE). The result shows that the HTMT value between AIC and EGE was 0.663, which is below the commonly accepted threshold of 0.85. This indicates that the two constructs are empirically distinct from each other and do not measure the same concept. Therefore, the discriminant validity requirement was achieved, confirming that Artificial Intelligence Capabilities and E-Governance Excellence are separate constructs in the measurement model. This result supports the suitability of the model for proceeding to the structural model assessment and hypothesis testing.

Table 5: The heterotrait-monotrait ratio of correlations (HTMT)

	AIC	EGE
AIC		
EGE	0.663	

4.3 AIC = Artificial Intelligence Capabilities; EGE = E-Governance Excellence

As presented in Table 6, discriminant validity was further assessed using the Fornell-Larcker criterion. The results show that the square root of AVE for Artificial Intelligence Capabilities (AIC) was 0.882, while the square root of AVE for E-Governance Excellence (EGE) was 0.898. These values are higher than the correlation between AIC and EGE, which was 0.627. This indicates that

each construct shares more variance with its own measurement items than with the other construct. Therefore, the Fornell-Larcker results confirm that discriminant validity was achieved. This means that Artificial Intelligence Capabilities and E-Governance Excellence are statistically distinct constructs and can be used confidently in the structural model assessment.

Table 6: Latent Variable Correlations (Fronell-Lacer criteria)

	AIC	EGE
AIC	0.882	
EGE	0.627	0.898

4.4 AIC = Artificial Intelligence Capabilities; EGE = E-Governance Excellence

Figure 3 presents the path model significance results for the direct relationship between Artificial Intelligence Capabilities (AIC) and E-Governance Excellence (EGE). The figure shows that Artificial Intelligence Capabilities have a positive effect on E-Governance Excellence within the Saudi Ministry of Health. It also illustrates that AIC serves as the predictor variable, while EGE is the outcome variable in the structural model. Overall, the figure confirms that the proposed direct relationship was supported and that AI capabilities contributed meaningfully to explaining e-governance excellence. This indicates that stronger AI-related infrastructure, skills, and organizational readiness are associated with better digital governance performance within the Ministry.

Figure 3: Path Model Significance Results

As presented in Table 7, the coefficient of determination was assessed to determine the explanatory power of the structural model. The results show that E-Governance Excellence (EGE) recorded an R-square value of 0.394 and an adjusted R-square value of 0.392. This indicates that Artificial Intelligence Capabilities (AIC) explain 39.4% of the variance in E-Governance Excellence within the Saudi Ministry of Health. The adjusted R-square value is very close to the R-square value, suggesting that the model remains stable after adjustment. Overall, the result indicates that the model has a moderate level of explanatory power, meaning that AI capabilities represent an important factor in explaining e-governance excellence, while the remaining variance may be explained by other organizational, technological, or governance-related factors not included in the current model.

Table 7: Coefficient of Determination (R^2)

	R-square	R-square adjusted
EGE	0.394	0.392

4.5 EGE = E-Governance Excellence

As presented in Table 8, the direct hypothesis was tested to examine the effect of Artificial Intelligence Capabilities (AIC) on E-Governance Excellence (EGE). The results show that AIC has a positive and statistically significant effect on EGE, with a beta value of 0.627, a standard deviation of 0.031, a t-statistic of 20.115, and a p-value of 0.000. Since the p-value is below the accepted significance level of 0.05, the result confirms that the relationship between Artificial Intelligence Capabilities and E-Governance Excellence is statistically significant. The positive beta value indicates that higher levels of AI capabilities are associated with higher levels of e-governance excellence within the Saudi Ministry of Health. Therefore, the hypothesis stating that Artificial Intelligence Capabilities have a positive significant impact on E-Governance Excellence within the Saudi Ministry of Health is supported. This finding indicates that the availability of AI infrastructure, AI-related skills, and organizational readiness to adopt intelligent technologies contributes to improving digital governance performance. In practical terms, the result suggests that strengthening AI capabilities can help the Ministry enhance service efficiency, responsiveness, transparency, decision-making, and the overall quality of digital healthcare governance.

Table 8: Direct Hypotheses

	Beta	SD	T statistics	P values
AIC -> EGE	0.627	0.031	20.115	0.000

4.6 AIC = Artificial Intelligence Capabilities; EGE = E-Governance Excellence

5. Discussion

The findings of this study confirm that Artificial Intelligence Capabilities have a positive and significant impact on E-Governance Excellence within the Saudi Ministry of Health. This means that when the Ministry strengthens its AI-related infrastructure, employee skills, data capacity, and organizational readiness, its ability to achieve better digital governance performance also improves. This result is important because e-governance excellence requires more than the presence of digital platforms; it depends on the institution's ability to use advanced technologies to improve service efficiency, responsiveness, transparency, accessibility, and decision-making. In the healthcare sector, these capabilities are especially important because the Ministry manages complex administrative systems, large volumes of health-related data, and high expectations from citizens and service users. The result is consistent with the argument that AI supports data-driven decision-making and improves governance by helping public organizations process information more effectively and make more accurate service-related decisions (Charles et al., 2022). It also supports the view that AI capabilities contribute to government organizational performance when they are supported by institutional readiness and broader organizational capabilities (Almheiri et al., 2024).

The finding can also be explained through the Resource-Based View, which suggests that organizational resources can improve performance when they are valuable and effectively used. In this study, Artificial Intelligence Capabilities were treated as an organizational capability composed of AI basic knowledge, AI skills, and AI proclivity. These dimensions reflect the Ministry's ability to provide the technological foundation for AI use, develop employee competence, and create an organizational orientation toward innovation and intelligent technologies. When these capabilities are available, the Ministry becomes better positioned to improve digital service delivery and governance outcomes. This interpretation is consistent with research showing that AI can enhance performance when it is viewed as a strategic capability rather than only a technical application (Chen et al., 2022). It also aligns with public-sector research showing that internal organizational capabilities are important in improving public service performance and institutional effectiveness (Khalifa et al., 2025). Therefore, the result suggests that AI capabilities can function as strategic resources that support e-governance excellence in public healthcare institutions.

The result is also highly relevant to the Saudi context because the Ministry of Health operates within the broader national transformation agenda of Saudi Vision 2030. Saudi Arabia has given strong attention to healthcare modernization, digital transformation, smart government services, and AI-supported public-sector development. The positive effect found in this study suggests that AI capabilities can support the Ministry's role in achieving national digital transformation goals by improving efficiency, service quality, and governance performance. This is consistent with evidence that Vision 2030 has contributed to healthcare investment and future-oriented transformation in Saudi Arabia (Alfahad et al., 2024). It also agrees with the view that Saudi Arabia's health system is experiencing major transformation and that AI is becoming an important tool for improving healthcare planning, service delivery, and future health-system readiness (Saeed et al., 2023). Accordingly, strengthening AI capabilities in the Ministry of Health is not only a technical priority but also a strategic requirement for achieving public-sector excellence and healthcare governance improvement.

The findings also support previous studies that connect AI and e-governance with public service improvement. E-governance excellence depends on the ability of public institutions to provide digital services that are efficient, reliable, accessible, transparent, and responsive. AI can contribute to these outcomes by automating routine work, improving the speed of service delivery, supporting predictive analysis, and enabling better coordination across departments. This agrees with research showing that e-government can improve organizational effectiveness by simplifying procedures and supporting administrative empowerment (Alkhawaldah et al., 2025). It is also consistent with Saudi public-sector evidence showing that e-governance, knowledge management, and performance efficiency are connected in improving institutional outcomes (Alruwaili et al., 2024). In addition, the result supports studies indicating that AI can improve public service quality when it is implemented within strong governance systems and supported by human–AI collaboration (Rulandari & Silalahi, 2025). Therefore, AI capabilities should be understood as a practical mechanism for improving the quality and effectiveness of digital governance in the Ministry of Health.

However, the findings also suggest that AI capabilities alone may not fully explain e-governance excellence. Although the study confirms a significant positive relationship, successful AI use in public institutions depends on several supporting conditions, including leadership commitment, employee training, data governance, cybersecurity readiness, system integration, and public trust. Prior research shows that AI adoption in public administration is influenced by institutional readiness, infrastructure, policy support, and governance capacity (Ly, 2025). Similarly, studies on AI and e-government integration in developing countries indicate that implementation challenges may arise when institutions lack adequate capacity, infrastructure, regulatory clarity, or employee readiness (Kampira & Mukonza, 2025). Therefore, the Ministry of Health should continue investing not only in AI technologies but also in the human, organizational, and regulatory conditions that allow AI to produce meaningful governance outcomes. Future studies may extend the current model by adding other variables such as digital leadership, data governance, cybersecurity, digital culture, public trust, or digital innovation to provide a broader explanation of e-governance excellence in Saudi public healthcare institutions.

6. Conclusion

This study examined the impact of Artificial Intelligence Capabilities on E-Governance Excellence within the Saudi Ministry of Health. Based on the empirical findings, the study confirmed that Artificial Intelligence Capabilities have a positive and significant effect on E-Governance Excellence. This indicates that AI-related infrastructure, employee skills, organizational readiness, data availability, and innovation orientation are important factors in strengthening digital governance performance. The findings suggest that when the Ministry develops stronger AI capabilities, it becomes better able to improve service efficiency, responsiveness, accessibility, transparency, decision-making, and overall digital healthcare governance. The study contributes to the understanding of AI-enabled public-sector transformation by showing that AI capabilities can serve

as a key driver of e-governance excellence in the Saudi healthcare context. Practically, the findings highlight the need for the Ministry of Health to continue investing in AI infrastructure, employee training, data management, system integration, and organizational readiness. Such efforts can help ensure that AI is not only adopted as a technology but also used effectively to improve governance outcomes and public service quality. However, the study was limited to one public healthcare context and focused on the direct relationship between AI capabilities and e-governance excellence. Future studies may expand the model by including additional variables such as digital innovation, digital leadership, cybersecurity readiness, public trust, or data governance to provide a broader explanation of e-governance excellence in public-sector institutions.

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