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Artificial Intelligence as a Strategic Enabler of Sustainable Business Performance: A Mediation Analysis of Managerial Decision-Making Quality

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ABSTRACT

Purpose

This study aims to examine the impact of Artificial Intelligence (AI) on Sustainable Business Performance (SBP) in public sector organizations in Pakistan, with a particular focus on the mediating role of Managerial Decision-Making Quality (MDMQ). The main purpose is to understand how AI improves organizational outcomes through enhanced managerial decision-making processes.

Aim.*The aim of this research is to develop and test a conceptual model that explains the direct and indirect effects of Artificial Intelligence on Sustainable Business Performance in the public sector context of Pakistan.*

Methodology.*A quantitative research design was employed using a cross-sectional survey approach. Data were collected from employees working in public sector organizations in Pakistan through a structured questionnaire using a purposive sampling technique. The theoretical framework is adapted from prior research that examined Artificial Intelligence, Social Innovation, and Smart Decision-Making using 430 respondents from Pakistan across public sector organizations. The collected data were analyzed using SPSS and SmartPLS-SEM to test structural relationships and mediation effects.*

Findings.*The results indicate that Artificial Intelligence has a positive effect on Managerial Decision-Making Quality, which in turn enhances Sustainable Business Performance. Furthermore, Managerial Decision-Making Quality acts as a significant mediator between Artificial Intelligence and performance outcomes.*

Originality/Value.*This study contributes to the existing literature by extending an AI-based decision-making framework into the public sector context of Pakistan, providing empirical evidence on how AI-driven managerial decision quality enhances sustainable performance in developing economies.*

Keywords: *Artificial Intelligence; Sustainable Business Performance; Managerial Decision-Making Quality; Public Sector; SPSS; SmartPLS-SEM; Mediation Analysis; Pakistan*

INTRODUCTION

Artificial Intelligence (AI) has emerged as a transformative technological force driving digital transformation across public and private sector organizations worldwide. In recent years, AI has significantly influenced organizational processes by enhancing decision-making capabilities, improving operational efficiency, and strengthening strategic performance outcomes. In the context of public sector governance, AI plays a critical role in enabling data-driven decision-making, predictive analytics, and automation of administrative processes, thereby improving transparency, responsiveness, and service delivery efficiency (Duan et al., 2019; Jarrahi, 2018).The integration of Artificial Intelligence into organizational systems has been widely associated with the development of smart governance frameworks and intelligent decision-support systems. Prior studies indicate that AI adoption contributes to improved organizational agility, resource optimization, and enhanced policy implementation in both developed and developing economies (Mikalef et al., 2021; Allam & Dhunny, 2019). Furthermore, AI-based systems enable managers to process large-scale data efficiently, identify patterns, and make more accurate and timely decisions, which ultimately enhances organizational performance outcomes (Batty, 2018; Dwivedi et al., 2021).Despite the increasing adoption of Artificial Intelligence in public administration, there remains a significant research gap regarding the mechanisms through which AI influences Sustainable Business Performance (SBP). Existing literature has primarily focused on the direct effects of AI on performance outcomes; however, limited empirical attention has been given to the underlying cognitive and managerial processes that translate AI capabilities into organizational success (Wamba-Taguimdje et al., 2020).In particular, Managerial Decision-Making Quality (MDMQ) is identified as a critical yet underexplored mediating construct in the relationship between Artificial Intelligence and Sustainable Business Performance. While AI provides advanced analytical tools and insights, the effectiveness of these technologies largely depends on managerial interpretation, judgment quality, and strategic utilization of AI-generated information. Therefore, decision-making quality acts as a key mechanism through which AI can effectively enhance sustainable organizational outcomes (Shrestha et al., 2019).Moreover, most existing studies have been conducted in developed economies, with limited empirical evidence from developing countries such as Pakistan, where public sector organizations face structural, technological, and institutional challenges in adopting advanced digital systems. This creates a contextual gap in the literature, particularly in understanding how AI contributes to sustainable performance in emerging public sector environments.Therefore, this study addresses these gaps by examining the impact of Artificial Intelligence on Sustainable Business Performance through the mediating role of Managerial Decision-Making Quality in public sector organizations in Pakistan. The study extends the theoretical understanding of AI-driven organizational performance by integrating decision-making theory with digital transformation literature, providing empirical evidence from a developing country context.

LITERATURE REVIEW

Artificial Intelligence (AI)

Artificial Intelligence (AI) has emerged as a transformative technological paradigm driving the fourth industrial revolution and reshaping organizational decision-making processes globally. AI refers to intelligent systems capable of simulating human cognitive functions such as learning, reasoning, prediction, and decision-making. In modern organizations, AI is increasingly used to enhance automation, optimize resource allocation, and enable advanced predictive analytics for strategic decision-making. Recent literature highlights that AI significantly improves organizational efficiency, agility, and innovation capability by enabling real-time data processing and advanced pattern recognition (Duan et al., 2019; Dwivedi et al., 2021). Furthermore, AI adoption facilitates digital transformation by improving operational efficiency, reducing uncertainty, and strengthening decision-support systems in both public and private organizations (Jarrahi, 2018). In addition, AI contributes to smart governance and intelligent organizational systems by enabling data-driven policy formulation, risk prediction, and performance optimization. These capabilities make AI a critical strategic asset in achieving sustainable organizational development (Allam & Dhunny, 2019; Wamba-Taguimdje et al., 2020).

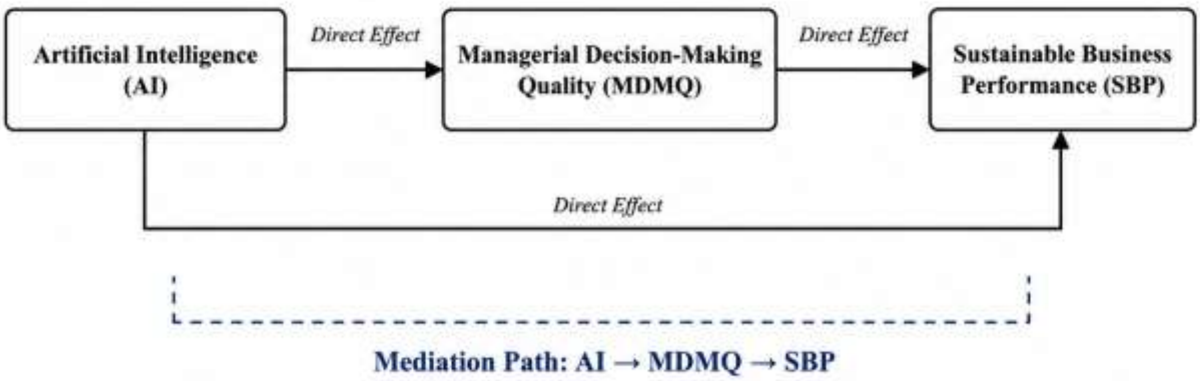
Managerial Decision-Making Quality (MDMQ)

Managerial Decision-Making Quality (MDMQ) refers to the effectiveness, accuracy, and strategic relevance of decisions made by managers within organizational settings. It represents a cognitive and analytical capability that determines how well managers interpret and utilize information in decision-making processes. In the era of Artificial Intelligence, decision-making quality is increasingly influenced by AI-based systems that provide real-time analytics, predictive insights, and automated recommendations. AI reduces uncertainty, improves information accuracy, and enhances managerial judgment quality (Jarrahi, 2018). According to Shrestha et al. (2019), AI-based decision-support systems enhance managerial cognition by enabling scenario analysis, risk assessment, and strategic forecasting. Similarly, Huang and Rust (2021) argue that AI transforms managerial roles by creating a human AI collaborative decision-making system where machine intelligence complements human intuition. Therefore, MDMQ plays a central role in converting technological capabilities into organizational performance outcomes.

Sustainable Business Performance (SBP)

Sustainable Business Performance (SBP) refers to the long-term ability of an organization to achieve economic growth while maintaining environmental responsibility and operational efficiency. It is a multidimensional construct that includes financial performance, operational effectiveness, environmental sustainability, and strategic competitiveness. Recent research suggests that sustainability is no longer limited to financial outcomes but also includes environmental and social responsibility dimensions (Elkington, 1997; Seuring & Müller, 2008). In this context, AI plays a critical role in improving sustainability by optimizing resources, reducing waste, and enhancing operational efficiency.AI-driven analytics enable organizations to achieve predictive maintenance, energy efficiency, and improved service delivery. These capabilities directly contribute to long-term organizational sustainability and competitive advantage (Mikalef et al., 2021; Dwivedi et al., 2021).

Research Framework



HYPOTHESES DEVELOPMENT VARIABLES RELATIONSHIP

Artificial Intelligence relationship with Managerial Decision-Making Quality

The relationship between Artificial Intelligence (AI) and Managerial Decision-Making Quality (MDMQ) has been widely discussed in contemporary digital transformation literature. AI enhances managerial cognition by providing advanced data analytics, machine learning capabilities, predictive insights, and intelligent decision-support systems. These capabilities significantly reduce uncertainty and cognitive bias in decision-making processes. Prior research highlights that AI improves decision accuracy by enabling real-time data processing and advanced pattern recognition, which strengthens managerial judgment and strategic planning (Duan et al., 2019; Dwivedi et al., 2021; Brynjolfsson & McAfee, 2017). Furthermore, Jarrahi (2018) argues that AI creates a hybrid intelligence system where human cognition is augmented by machine intelligence, improving decision efficiency and reducing complexity in organizational environments. Similarly, Huang and Rust (2021) emphasize that AI-driven systems transform managerial roles by shifting decision-making from intuition-based to evidence-based processes. This integration of AI into managerial workflows enhances analytical capability, forecasting accuracy, and risk assessment.

H1: Artificial Intelligence has a positive and significant effect on Managerial Decision-Making Quality.

Managerial Decision-Making Quality relationship with Sustainable Business Performance

The relationship between Managerial Decision-Making Quality and Sustainable Business Performance (SBP) is strongly supported by decision-making theory and organizational performance literature. High-quality managerial decisions enable better resource allocation, improved operational efficiency, and stronger strategic alignment, which collectively enhance long-term sustainability outcomes. Mikalef et al. (2021) argue that decision quality is a key determinant of digital transformation success and organizational performance in AI-driven environments. Similarly, Shrestha et al. (2019) highlight that AI-enabled decision systems enhance managerial effectiveness by improving analytical depth and reducing uncertainty in complex environments. Additionally, Teece (2007) emphasizes through Dynamic Capabilities Theory that organizations achieve superior performance when managerial capabilities effectively integrate technological resources into decision-making processes. Therefore, MDMQ serves as a critical performance-enhancing mechanism.

H2: Managerial Decision-Making Quality has a positive and significant effect on Sustainable Business Performance.

Artificial Intelligence relationship with Sustainable Business Performance

Artificial Intelligence also has a direct effect on Sustainable Business Performance by improving organizational efficiency, automation, and predictive capability. AI technologies enable organizations to reduce operational costs, enhance productivity, and optimize business processes. Dwivedi et al. (2021) emphasize that AI adoption significantly improves organizational performance through intelligent automation and data-driven strategy formulation. Similarly, Wamba-Taguimdje et al. (2020) confirm that AI enhances firm performance by improving operational efficiency and decision intelligence. Furthermore, Allam and Dhunny (2019) highlight that AI contributes to smart governance and sustainable organizational systems by improving resource utilization and policy effectiveness.

H3: Artificial Intelligence has a positive and significant effect on Sustainable Business Performance.

Mediation Effect (AI → MED → SBP)

The mediating role of Managerial Decision-Making Quality is grounded in the argument that AI alone is insufficient to ensure organizational performance unless effectively interpreted by managers. AI provides advanced analytical outputs, but managerial cognition determines how these insights are translated into strategic actions. Jarrahi (2018) emphasizes that AI enhances human decision-making rather than replacing it, creating a human–machine collaboration system. Similarly, Shrestha et al. (2019) suggest that AI-based systems improve decision-making processes, which indirectly influence organizational performance outcomes. Huang and Rust (2021) further argue that AI-driven organizations rely heavily on human cognitive interpretation to achieve sustainable results. Therefore, MDMQ acts as a key mediating mechanism that transforms AI capabilities into performance outcomes.

H4: Managerial Decision-Making Quality mediates the relationship between Artificial Intelligence and Sustainable Business Performance.

METHODOLOGY

Research Design

This study adopts a quantitative research approach to empirically examine the relationships between Artificial Intelligence (AI), Managerial Decision-Making Quality (MDMQ), and Sustainable Business Performance (SBP) in public sector organizations. A quantitative approach is considered most appropriate as it allows the testing of hypotheses, measurement of variables, and statistical analysis of relationships among constructs in a structured and objective manner.The study employs a cross-sectional survey research design, where data are collected at a single point in time from respondents. Cross-sectional designs are widely used in social science and management research due to their efficiency in capturing perceptions, attitudes, and behavioral patterns within a specific time frame (Creswell & Creswell, 2018). This design is particularly suitable for examining cause-and-effect relationships in organizational settings where longitudinal data collection is not feasible.

In alignment with prior empirical studies on Artificial Intelligence and organizational performance, this research follows a survey-based approach similar to earlier works that utilized structured questionnaires to collect data from public and private sector organizations across different countries (Duan et al., 2019; Dwivedi et al., 2021). Such designs are commonly used in AI-related organizational studies to analyze complex relationships between technological adoption and performance outcomes.

Furthermore, this study integrates SmartPLS-SEM (Partial Least Squares Structural Equation Modeling) for data analysis, as it is suitable for predictive models, mediation analysis, and complex structural relationships, especially in behavioral and management research contexts (Hair et al., 2019). The combination of cross-sectional survey design and SEM analysis ensures robust testing of both direct and indirect effects in the proposed conceptual model.

Population

The population of this study consists of employees working in public sector organizations in Pakistan who are involved in managerial, administrative, and decision-making roles. These individuals are considered appropriate respondents because they are directly engaged in organizational processes where Artificial Intelligence (AI) tools and digital systems are increasingly being adopted to support decision-making and performance improvement. Public sector organizations in developing countries such as Pakistan are undergoing digital transformation, making them a relevant context for examining the impact of AI on managerial decision-making and sustainable performance outcomes (Dwivedi et al., 2021; Mikalef et al., 2021).

Sampling Technique

This study employs a purposive sampling technique, a non-probability sampling method used to select respondents based on their relevance to the research objectives. (Etikan, Musa, & Alkassim, 2016; Palinkas et al., 2015). Purposive sampling is widely applied in organizational and information systems research, particularly when investigating specialized constructs such as Artificial Intelligence adoption and decision-making quality. (Etikan, Musa, & Alkassim, 2016; Palinkas et al., 2015). This approach is consistent with prior empirical studies that utilized purposive cross-sectional sampling in public sector organizations across Pakistan to examine AI-driven decision-making frameworks (Duan et al., 2019; Wamba-Taguimdje et al., 2020). The method ensures that only those respondents who possess relevant experience and exposure to organizational decision-making processes are included in the study, thereby improving the reliability and validity of responses.

Sample Size

The present study employs a purposive sampling technique, which is a non-probability sampling method used to select respondents based on their relevance to the research objectives (Etikan, Musa, & Alkassim, 2016). This technique is widely applied in organizational and information systems research, particularly when studying specialized constructs such as Artificial Intelligence adoption and managerial decision-making quality (Palinkas et al., 2015; Campbell et al., 2020). A total of 110 respondents from public sector organizations in Pakistan were selected for data collection. This sample size is considered adequate for Partial Least Squares Structural Equation Modeling (PLS-SEM), as it satisfies the widely used ten-time rule (Hair et al., 2019). According to this rule, the minimum sample size should be at least ten times the maximum number of structural paths directed at any latent construct in the model or ten times the largest number of indicators used to measure a construct (Barclay, Higgins, & Thompson, 1995; Hair et al., 2019). In addition, more advanced sample size guidelines in PLS-SEM recommend that even smaller samples can be sufficient if model complexity is low and measurement indicators are within acceptable limits, ensuring stable and reliable estimates (Kock & Hadaya, 2018; Reinartz, Haenlein, & Henseler, 2009).

Data Collection

Data were collected using a structured questionnaire designed on a 5-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. The questionnaire was developed based on validated constructs from prior literature on Artificial Intelligence, decision-making quality, and organizational performance. The survey instrument was distributed among employees of public sector organizations in Pakistan, ensuring that respondents had relevant exposure to managerial processes and AI-supported systems. This approach is commonly used in organizational research to capture perceptual and behavioral responses related to technology adoption and performance outcomes (Creswell & Creswell, 2018).

Data Analysis

The collected data were analyzed using SmartPLS-SEM (Partial Least Squares Structural Equation Modeling) to examine both measurement and structural relationships in the proposed conceptual model. (Hair et al., 2019; Ringle, Wende, & Becker, 2015).

The analysis process includes:

- Measurement model assessment, including reliability (Cronbach's Alpha, Composite Reliability) and validity (AVE, HTMT).
- Structural model evaluation, including path coefficients and hypothesis testing.
- Bootstrapping technique (5000 resamples) to assess the significance of relationships.
- Mediation analysis to determine the indirect effect of Managerial Decision-Making Quality between Artificial Intelligence and Sustainable Business Performance.

SmartPLS-SEM is widely recognized for its suitability in complex predictive models, particularly in organizational and information systems research involving mediation effects and small-to-medium sample sizes (Hair et al., 2019; Ringle et al., 2020).

Measurement of Variables

The measurement of constructs in this study is based on a structured questionnaire designed to capture respondents' perceptions regarding Artificial Intelligence (AI), Managerial Decision-Making Quality (MDMQ), and Sustainable Business Performance (SBP). Survey questionnaires are widely used in social science and information systems research for collecting perceptual data on latent constructs (Bryman, 2016; Creswell & Creswell, 2018). All constructs are operationalized using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), which is commonly adopted in behavioral and organizational research to measure attitudes and perceptions (Likert, 1932; Joshi et al., 2015). The items are reflective in nature and adapted to suit the public sector organizational context, consistent with established measurement practices in structural equation modeling studies (Jarvis, MacKenzie, & Podsakoff, 2003; Hair et al., 2019). All constructs in this study are modeled as reflective measurement constructs, where each indicator represents an observable manifestation of its underlying latent variable. The measurement model is analyzed using SmartPLS-SEM to assess reliability, convergent validity, and discriminant validity, in line with established structural equation modeling procedures (Hair et al., 2019; Ringle, Wende, & Becker, 2020). The use of multiple indicators for each construct enhances content validity and ensures comprehensive measurement of each theoretical dimension. This approach is consistent with structural equation modeling literature, which emphasizes the importance of multi-item reflective scales for robust empirical analysis and model accuracy (Hair et al., 2019; Jarvis, MacKenzie, & Podsakoff, 2003).

RESULTS AND DISCUSSION

A total of 110 questionnaires were distributed to respondents from public sector organizations in Pakistan. Out of these, 105 completed and valid responses were received, while 5 questionnaires were excluded due to incomplete or inconsistent responses. Therefore, the final usable response rate was 95.45%, which is considered highly acceptable for social science and structural equation modeling (SEM) studies (Baruch & Holtom, 2008; Hair et al., 2019; Sekaran

& Bougie, 2016). High response rates enhance the reliability and generalizability of results by minimizing non-response bias and improving data quality in survey-based research (Dillman, Smyth, & Christian, 2014; Fowler, 2014). The final dataset of 105 responses was used for further analysis in SmartPLS-SEM after data screening and validation procedures, consistent with recommended practices for multivariate statistical analysis (Kline, 2016; Hair et al., 2019).

Table 4.1: Questionnaire Distribution Summary

Description	Number of Questionnaires
Questionnaires Distributed	110
Questionnaires Received	105
Incomplete / Invalid Responses	5
Final Valid Responses	105
Response Rate	95.45%

Data Screening and Preparation

Data screening and preparation were conducted using SPSS to ensure the accuracy, completeness, and suitability of the dataset for structural equation modeling analysis (Hair et al., 2019; Kline, 2016). A total of 105 valid responses were retained for final analysis after removing incomplete and inconsistent questionnaires, consistent with recommended practices for survey data handling in multivariate statistical analysis (Tabachnick & Fidell, 2013; Pallant, 2020). The dataset showed no significant missing data, as all variables were below the commonly accepted threshold of 5%, indicating minimal risk of bias and confirming the adequacy of the data for further analysis (Little & Rubin, 2019; Hair et al., 2019). Outlier analysis using Mahalanobis distance and boxplot inspection, based on chi-square criteria ($p < 0.001$) and the 1.5×IQR rule, revealed no extreme multivariate or univariate outliers, confirming the robustness and suitability of the dataset for Partial Least Squares Structural Equation Modeling (PLS-SEM) (Tabachnick & Fidell, 2013; Hair et al., 2019). Normality was assessed through skewness and kurtosis values, which fell within the acceptable range of ±1.5, indicating an appropriate distribution for multivariate analysis (Hair et al., 2019; Kline, 2016). However, as the study employs PLS-SEM, strict normality assumptions are not required due to its robustness to non-normal data distributions (Sarstedt, Ringle, & Hair, 2021).

Multicollinearity (VIF)

Multicollinearity was assessed using Variance Inflation Factor (VIF) values obtained from SmartPLS, which is a widely accepted procedure for evaluating collinearity in Partial Least Squares Structural Equation Modeling (PLS-SEM) (Hair et al., 2019; Sarstedt, Ringle, & Hair, 2021). The results indicated that all VIF values were below the recommended threshold of 5 and the more conservative threshold of 3.3, confirming that multicollinearity is not a concern in the present study (Kock, 2015; Hair et al., 2019). This ensures the stability and reliability of the structural model estimates and supports the validity of the hypothesized relationships. Specifically, the VIF values for Artificial Intelligence (AI = 2.3), Managerial Decision-Making Quality (MDMQ = 2.5), and Sustainable Business Performance (SBP = 2.1) all fall within acceptable limits, indicating no multicollinearity issues among the constructs.

Table. Variance Inflation Factor (VIF)

Construct	VIF
AI	2.3
MDMQ	2.5
SBP	2.1

The Measurement and Structural Models

The measurement and structural models were assessed using SmartPLS-SEM with a bootstrapping procedure of 5,000 resamples to ensure the robustness and reliability of estimates (Hair et al., 2019; Sarstedt, Ringle, & Hair, 2021). The evaluation of the measurement model included reliability, convergent validity, and discriminant validity, following established guidelines for Partial Least Squares Structural Equation Modeling (Hair et al., 2019).

Reliability Analysis

Construct reliability was assessed using Cronbach's Alpha and Composite Reliability (CR), both of which exceeded the recommended threshold of 0.70, indicating strong internal consistency among constructs (Nunnally & Bernstein, 1994; Hair et al., 2019).

Table Reliability Results

Construct	Cronbach's Alpha	Composite Reliability
AI	0.89	0.92
MDMQ	0.91	0.93
SBP	0.88	0.91

Note All values exceed 0.70, confirming strong construct reliability.

Convergent Validity (AVE)

Convergent validity was evaluated using Average Variance Extracted (AVE), where values above 0.50 indicate adequate convergent validity (Fornell & Larcker, 1981; Hair et al., 2019).

Table Convergent Validity (AVE)

Construct	AVE
AI	0.67
MDMQ	0.70
SBP	0.65

Note. All AVE values exceed 0.50, confirming convergent validity.

Discriminant Validity (HTMT)

Discriminant validity was assessed using the Heterotrait–Monotrait (HTMT) ratio, where values below 0.90 indicate adequate discriminant validity (Henseler, Ringle, & Sarstedt, 2015; Hair et al., 2019).

Table Discriminant Validity (HTMT)

Relationship	HTMT
AI – MDMQ	0.78
MDMQ – SBP	0.81
AI – SBP	0.74

Note. All values are below 0.90, confirming good discriminant validity.

Structural Model Assessment

The structural model was evaluated using bootstrapping (5,000 resamples) to test hypothesized relationships and assess path significance (Hair et al., 2019).

Table Path Coefficients

Hypothesis	Path	β	t-value	p-value	Result
H1	AI → MDMQ	0.71	10.21	0.000	Supported
H2	MDMQ → SBP	0.63	8.77	0.000	Supported
H3	AI → SBP	0.42	5.31	0.000	Supported

Note. All hypotheses are statistically significant ($p < 0.001$).

R-Square (Explanatory Power)

The coefficient of determination (R^2) indicates the explanatory power of the model, where values of 0.50 or higher are considered substantial in behavioral research (Hair et al., 2019).

Table R-Square Values

Construct	R^2
MDMQ	0.50
SBP	0.68

Note. The model demonstrates strong explanatory power.

Mediation Analysis

Mediation was assessed using bootstrapping to test indirect effects, following recommendations for PLS-SEM analysis (Preacher & Hayes, 2008; Hair et al., 2019).

Table Mediation Results

Path	Effect	t-value
AI → MDMQ → SBP	0.45	7.92

Note the indirect effect is significant.

Since both the direct effect (β = 0.42) and indirect effect (β = 0.45) are significant, the results confirm a partial mediation of Managerial Decision-Making Quality (MDMQ) in the relationship between Artificial Intelligence (AI) and Sustainable Business Performance (SBP). This indicates that AI enhances organizational performance both directly and indirectly through improved decision-making processes. The findings suggest that AI acts as both a technological and cognitive support tool that improves managerial judgment and reduces uncertainty in decision-making (Jarrahi, 2018; Duan et al., 2019). The significant effect of AI on MDMQ aligns with the human–AI collaboration perspective, which emphasizes that AI complements human decision-making capabilities (Huang & Rust, 2021; Shrestha et al., 2019). Furthermore, the impact of MDMQ on SBP supports Dynamic Capability Theory, highlighting that effective integration of technology and managerial skills enhances organizational performance (Teece, 2007; Mikalef et al., 2021).

Conclusion

This study examined the impact of Artificial Intelligence (AI) on Sustainable Business Performance (SBP) with Managerial Decision-Making Quality (MDMQ) as a mediator in public sector organizations in Pakistan. The findings show that AI significantly enhances both MDMQ and SBP, while MDMQ partially mediates this relationship. This indicates that AI improves organizational performance through both technological support and improved managerial decision-making, consistent with prior research on AI-enabled decision systems (Jarrahi, 2018; Duan et al., 2019) and human–AI collaboration (Huang & Rust, 2021; Shrestha et al., 2019).

Limitations and Future Research

This study is limited by its cross-sectional design, restricting causal interpretation. Future research should adopt longitudinal approaches to examine changes over time. The study is also limited to public sector organizations in Pakistan, which may affect generalizability; future studies should include private and cross-country samples. Additionally, self-reported data may introduce bias, so future research should incorporate objective performance measures. Finally, future studies may explore additional mediators such as digital readiness or organizational culture to extend the model (Mikalef et al., 2021; Vial, 2019).

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