

Does Intellectual Capital mediate the relationship of Artificial Intelligence Investment, and Firm Value in Pakistani Non-Financial Firms?

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ABSTRACT

Purpose- Pakistan's economy is experiencing challenges such as reduced business productivity, low resource efficiency, low digitization, and diminishing firm value (FV). The role of artificial intelligence (AI) and business resources is critical to solve these challenges. Therefore, the objective of this research questions whether Intellectual Capital (IC) mediates the relationship between AI investment and FV in Pakistani non-financial firms. This study uses intellectual capital theory (ICT) and resource-based view (RBV) theories.

Study Design/Methodology/Approach - Secondary data was collected from the annual reports of 80 non-financial enterprises listed on the Pakistan Stock Exchange (PSX) from 2015 to 2023. The Generalized Method of Moments (GMM) model, is used to investigate the relationship between these variables.

Findings- The findings reveal that AI investment positively affects FV. IC which consists of these components human capital (HC), structural capital (SC), and relational capital (RC) mediates the relationship between AI and FV by transforming AI-driven investments into increased organizational knowledge, innovation, and efficiency, which in turn improves FV and market perception. RBV and ICT support these findings.

Research Implications- SMEs in emerging markets like Pakistan can improve their FV by investing in AI-related projects and training their employees to operate these projects, upgrade their internal structure/software, and build relations with society. Furthermore, this study has both practical and societal implications for all stakeholders in businesses. Firm managers and policymakers can understand the importance of AI and IC in enhancing FV.

Originality/Novelty - This study differs from earlier ones in that it uses the modified value-added intellectual coefficient (MVAIC) model to measure IC and investigate its impact on FV. Furthermore, to the best of the researcher's knowledge, this is the first study to look at IC as a mediator of AI and FV.

Keywords: Artificial intelligence, intellectual capital, firm value, GMM.

1 | INTRODUCTION

AI, blockchain, cloud computing, and big data are just a few of the technologies that are growing at a rapid pace and propelling modern society into the digital economy. Market uncertainty has increased as a result of significant changes in the external environment ([Abualoush et al., 2018](#)). In the contemporary business

environment, AI has become a widely recognized tool for companies to thrive and obtain long-term competitive advantages. AI is crucial to the achievement of goals for businesses that have made relevant resource investments, which manifest as AI investments. The direct investments made by businesses to implement AI are the main kind of these investments ([Naeem, Khan, et al., 2025](#); [Naeem et al., 2024](#); [Naeem, Siraj, et al., 2025](#)). Traditional businesses have increased their investments in AI to take advantage of AI investment opportunities and create fresh momentum for advanced development in the face of inflation and the pressures of global financial crises. However, in real life, there are concerns about AI's return on investment. Many businesses have obstacles when attempting to use AI because of their limited capabilities, expensive tool expenses, and extended implementation times, which frequently result in hesitation to begin using AI. Turning an AI investment into revenue benefits is difficult, and the "AI dividend" has not yet reached its full potential. Does AI investment affect the FV of Pakistani firms? Undertaking a thorough study on this topic is essential to unlock the "black box" of AI in the value creation of non-financial firms of Pakistan.

Although the relationship between AI and business value has been studied in the literature, no clear consensus has been achieved. According to some researchers ([Ghosh & Mondal, 2009](#); [Naeem, Khan, et al., 2025](#); [Naeem et al., 2024](#); [Naeem, Siraj, et al., 2025](#)), AI not only improves organizational performance and profitability but also significantly contributes to efficiency, value creation, and long-term growth of businesses. According to research by [Matarazzo et al. \(2021\)](#), the application of AI can increase FV by fostering innovation in technology and business models. Conversely, several studies indicate that even when businesses invest in AI, they frequently do not see the anticipated increase in revenue ([Egorenkov, 2024](#)). There are two causes for this. First, the high cost and prolonged duration of AI investment in businesses may cause an imbalance in the distribution of scarce resources, which could have the impact of crowding out the primary business and reducing rather than increasing the FV ([Wang et al., 2024](#)). Second, there is minimal value creation because the firm management mechanism is incompatible with AI and the costs associated with managing its derivatives outweigh the benefits of investing in AI ([Guo & Xu, 2021](#)). Some businesses can't invest in AI because the aforementioned research shows how AI affects value output from two distinct angles and the industry has not produced consistently conclusive results. Previous studies collect data on AI through questionnaires from employees. Data collected through questionnaires depends on the mood of employees. Therefore, it is critical to perform a more in-depth theoretical and practical examination of the influence of AI investment on FV and also data collection of AI investment through content analysis.

Openness to the "black box" of integrating AI and organizational elements is necessary because the empowerment impact is linked to a firm's ability to undergo an adaptive transformation in the AI process. Nonetheless, prior research has mostly examined organizational competence [Matarazzo et al. \(2021\)](#), with little examination of knowledge aspects. IC is the "key" to revealing the transmission mechanism between AI investment and FV since it is a knowledge-based strategic production factor ([Wang et al., 2021](#)). To fully realize the AI driving effect, businesses must optimize IC on a timely basis. On the other hand, AI-driven investment has increased demand for IC ([Pradhan et al., 2019](#)). However, IC is an important factor that propels the production of value for the firm ([Ali et al., 2022](#); [Farooq & Ahmad, 2023](#)). Employing IC in company operations allows firms to effectively accomplish value appreciation. According to [Khin and Ho \(2019\)](#), the use of AI has significantly increased the need for IC in businesses, and the role that IC plays in the production of AI value

is only growing. So, is it possible for IC to act as a mediator between AI and FV? Unfortunately, there isn't any relevant literature to respond to. To further our comprehension of the value output process of AI investment, we must therefore include IC in the analytical framework.

To better understand the relationship between these three and the "black box" mechanism of company AI value creation, the article focuses on this understudied topic and constructs a research chain of "AI investment, IC, and FV" in Pakistan. This research is important to non-financial enterprises in Pakistan, which confront issues such as restricted innovation, poor resource usage, and weak competitive positioning. Using AI through IC can address these difficulties, increasing FV and sustainability. To achieve the research objective, this study collected secondary data from the annual reports of 80 non-financial firms listed on the PSX between 2015 and 2023. The GMM model is used to look into the relationship between these variables. In numerous ways, this study adds to the body of current literature. First, to evaluate the influence of AI investment on FV, this study uses content analysis to measure AI investment. This study contributes to the body of knowledge on the perks of investing in AI and provides a theoretical framework for pursuing a scientific assessment of the optimum level of AI spending. Second, this study examined how IC and its components HC, SC, RC, and CE mediate the relationship between AI investment and FV. It adds greater depth to the study of IC by widening the application scenarios for IC theory and improving the path of AI investment in organizations to create value. Third, this study used the MVAIC model to measure IC while previous studies used this method when they checked the impact of IC on firm performance rather than FV. The article is organized as follows. Section 2 presents the theoretical framework. The literature review is presented in Section 3. In Section 4, the methodology is provided. In Section 5, the results are presented. Section 6 consists of a discussion while section 7 contains the conclusion of the study.

1.1 | Theoretical Framework

Resource-based theory

The literature has made considerable use of the RBV to understand the significance of a firm's resources and how they affect competitive performance. RBV highlights that the company is made up of a variety of resources. One of the main causes of the variations in profitability between firms is their disparate resource sets. [Barney \(1991\)](#), developed the VRIN framework, which stands for valuable, rare, imitable, and non-substitutable resources. Having these diverse resources is essential to a company's competitive advantage. Resources with VRIN features are heterogeneous resources for creating value for firms in this period. To properly comprehend AI and firm-level results, previous researchers have mostly employed RBV ([Ali et al., 2022](#); [Anser et al., 2024](#); [Naeem et al., 2024](#)). As a result, we also utilize this theory to show how AI investment and business value are related.

Intellectual Capital Theory

The goal of IC theory is to explain how an organization's resources might be used to FV. According to [Edvinsson and Malone \(1997\)](#), the majority of the literature assumes that IC exists and develops dynamically in the form of knowledge, allowing firms to deploy resources in line with the market environment to produce value and maintain a competitive edge. As a result, we employ this theory to examine IC dynamics in value creation. [Mention and Bontis \(2013\)](#), claim that IC consists of HC, SC, RC, and CE. HC is the totality of employees' knowledge and abilities that have a monetary worth ([Edvinsson & Malone, 1997](#)). According to

[Farooq and Ahmad \(2023\)](#), SC is the framework that permits HC to be expressed and empowered, as well as the structure and culture that promote information sharing inside a business. RC is mainly concerned with the people and networks that build connections with businesses, and it encompasses the importance of knowledge ingrained in organizational relationships ([Anser et al., 2024](#)).

2 | LITERATURE REVIEW

2.1 | Artificial Intelligence Investment and Firm Value

Businesses are progressively boosting their AI expenditures in reaction to the current wave of digital revolution. The integration of AI resources into production, organization, and operation can improve businesses' capacity to gather and utilize information, lower operating expenses, and allocate resources optimally, all of which can lead to a rise in competitive advantages and exceptional value. First, the movement of information, cash, people, and logistics may all be connected by incorporating AI. According to [Guo and Xu \(2021\)](#), intelligence analysis can be used to accomplish this low-cost, high-efficiency configuration, which will greatly improve asset utilization and support company value maximization. Second, by making it easier to implement changes in organizational structure, business processes, and other areas, the development of AI infrastructure can aid businesses in their transformation and advancement ([Nambisan et al., 2019](#)). This increases information transparency and lessens managers' irrational decision-making. These two elements have the potential to improve corporate governance and offer a strong basis for the creation and realization of wealth. Thirdly, by enabling real-time contact with stakeholders and bridging the "data island" with AI platforms, businesses can cut expenses associated with information gathering, contract signing, negotiation, and post-contract supervision, thus lowering overall value chain costs. Data elements may also penetrate every link in the value chain, assisting businesses in creating a supply chain system that is more focused on the market and minimizing duplication in both production and circulation all of which contribute to a firm's increased value ([Naeem et al., 2025](#)). By utilizing these three categories of digital resources, it is possible to upend corporate governance, the business model, organizational structure, and other elements, giving the process of building company value a boost. We put out the following hypothesis in light of the analysis above:

H₁. *Artificial Intelligence investment affects firm value.*

2.2 | Intellectual Capital and Firm Value

Numerous studies have looked into how IC affects business performance in recent years. For instance, [Farooq and Ahmad \(2023\)](#) note that over time, a higher return on assets is linked to an increase in IC. [Zhang et al. \(2023\)](#) find that the company's financial and economic performance is positively impacted by IC. Furthermore, [Ali et al. \(2022\)](#) discover that IC has a positive relationship with Tobin's Q and can therefore be taken into account to enhance the performance of businesses. Furthermore, the performance of the organization and the knowledge management process are linked to IC. All things considered, IC, also known as intangible capital, is acknowledged as a potent generator of company value and has a high and positive correlation with a company's financial success ([Anser et al., 2024](#)).

While numerous studies, like the ones listed above, indicate that IC increases business value, some researchers present differing findings. The idea is that businesses with more IC would have higher rates of market value on book value. According to [Javaherizadeh \(2021\)](#), there is insufficient data to establish a clear correlation between IC and financial performance for the Hong Kong-based enterprises that were examined. According to [Ghosh and Mondal \(2009\)](#), there is no correlation between productivity and IC performance, and Indian investors are unaffected by a company's IC performance. Furthermore, [Van de Vrande et al. \(2011\)](#) discovered that there is no direct correlation between HC and business performance. We use some unique proxies to obtain more conclusive evidence for the links between IC elements and FV because the literature currently in publication does not reach a consistent conclusion. As a result, we put out the hypothesis listed below.

H₂. *Intellectual Capital affects firm value.*

2.3 | Artificial Intelligence Investment and Intellectual Capital

This study aims to investigate the effect of AI investment on IC as well. It is driven by the increasing realization that AI today determines a company's competitiveness by drastically altering its business models, strategies, and knowledge management ([Pradhan et al., 2019](#)). As a result, AI has a significant impact on a firm's ability to succeed economically ([Haini, 2021](#)). This establishes the notion that the IC, a nation's hidden intangible asset that mobilizes total resources, is crucial to the success of AI investments. As a result, the premise behind this research is that investments in AI affect and influence IC.

While the national pace of acceptance and application of AI technologies varies significantly across the nation, Pakistan is still trailing behind its competitors in AI, despite the increasing expansion and uptake of these technologies. In Pakistan, the connection between AI and IC has not yet been thoroughly investigated. But comparing the degree of AI and IC both evaluated by a plethora of international studies and rankings, as well as by their respective fields of expertise indicates that AI can help IC. Even Nevertheless, the entire IC is anticipated to gain from AI's beneficial effects. Consequently, the following hypotheses have been put forth:

H₃. *Artificial Intelligence affects Intellectual Capital.*

2.4 | Mediating Effect of Intellectual Capital

Businesses engage in AI by IC theory, which causes dynamic shifts in IC stock and structure. Firms can recognize and develop IC's capacity for long-term value development as a result. We investigate the potential indirect effects of AI on business value from the IC based on this premise.

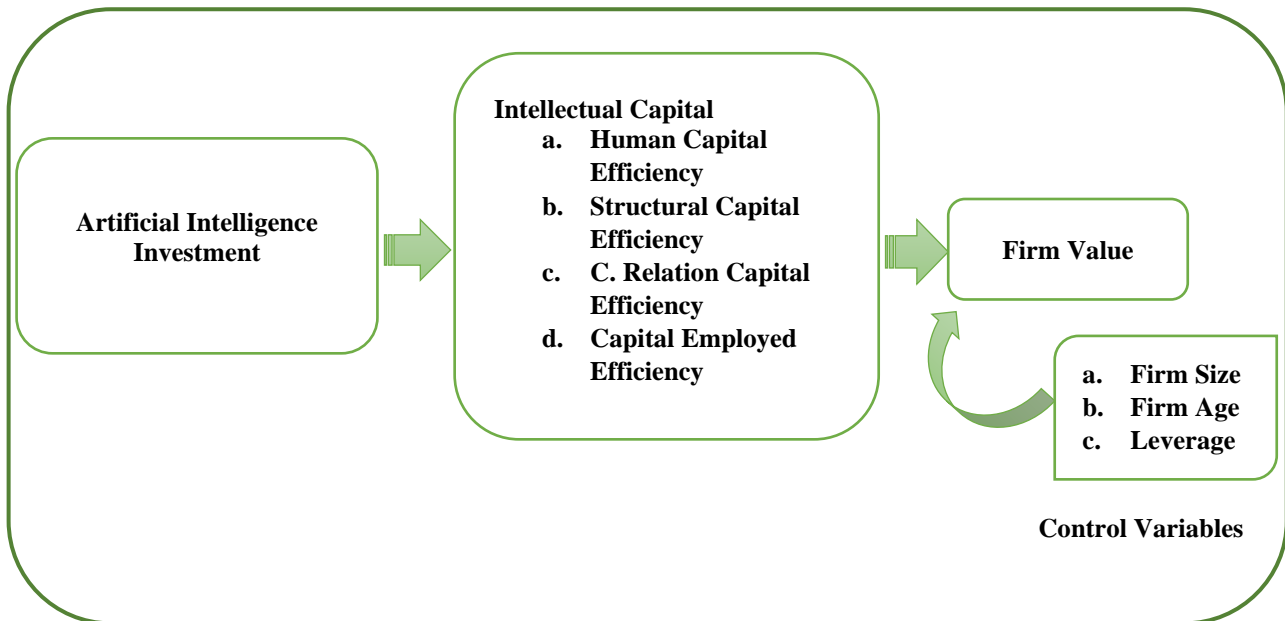
Firstly, by optimizing HC, AI investment can increase business value. AI provides intellectual support for value development by optimizing the structure and accelerating the accumulation of HC ([Haini, 2021](#)). On the one hand, employees may create low-cost connections with other subjects, access vast volumes of information, and share and exchange knowledge more easily thanks to technology breakthroughs like the Internet and cloud. Consequently, investing in AI increases employees' ability to absorb new information and develop new abilities constantly, thereby increasing the value of HC. Businesses can achieve precise adaption and dynamic matching of employees with work responsibilities. It aids businesses in achieving maximum potential and best allocation. In addition, the digital economy's excellent growth has resulted in notable shifts

in the modes of production and management, with AI taking the place of lower-class workers and the need for highly qualified workers rising. It improves the HC structure to some degree. Employees, who are the main providers of HC, efficiently adopt AI and unleash creativity after improving their skills and knowledge, which raises productivity and increases the value of the company.

Second, by encouraging SC, AI investment can raise FV. Businesses are becoming more and more digital as a result of the development of technology like artificial intelligence. The effectiveness of information transmission, the caliber of information processing, and the management of firm decision-making have all been significantly impacted by this shift. Applying AI can, on the one hand, increase a company's efficiency ([Pradhan et al., 2019](#)). Additionally, the data pieces can transcend temporal and spatial boundaries, flattening and networking organizational structures and increasing businesses' capacity for strategic flexibility. AI investment has the potential to increase corporate value via promoting SC. Technology advancements like AI are causing businesses to become more and more digital. This change has had a substantial impact on the efficiency of information transmission, the standard of information processing, and the management of firm decision-making. One way that applying AI can benefit a business is by making it more efficient. Furthermore, the data fragments can cross geographical and temporal barriers, networking and flattening organizational hierarchies and enhancing firms' ability to respond strategically.

Finally, by increasing RC, AI investment can raise business value. Firm connectivity has significantly improved in the technological environment ([Nambisan et al., 2019](#)). It indicates that the people engaging with the companies are now more affluent and diversified. In addition to users and organizations, an increasing number of stakeholders are joining the value network and participating in the value-creation process ([Javaherizadeh, 2021](#)). As a result, the relationship network's scale grows. Furthermore, the importance of customized user groups is growing, and the user experience is taking center stage. Technology has made it possible for organizations and customers to communicate with each other on an infinite and irregular basis. Businesses can connect with consumers via a variety of channels, including AI-powered agents and algorithms, to accurately ascertain their unique needs. Technologies are traceable and remembered at the same time, allowing the company to incorporate them into the knowledge system and break down individual demands into invaluable knowledge resources. Because of this, businesses can increase and augment their resources and competencies in this process more effectively, leading to value enhancement ([Forman & Van Zeebroeck, 2019](#)). To put it briefly, companies that invest in AI re-define RC, winning over stakeholders and creating new avenues for value creation in the process. We put out the following hypothesis in light of the literature presented above:

H₄. *Intellectual Capital mediates the relationship between Artificial Intelligence and Firm Value.*

Figure 1*Conceptual Framework*

3 | METHODOLOGY & DESIGN

3.1 | Data

The research sample for this study consists of 80 non-financial firms that were listed between 2015 and 2023 on the PSX. For sample companies selected that had not undergone any mergers or acquisitions throughout the study period, made sure that data was available in annual reports, and required evidence of AI investment. These strict requirements led to a lower sample size. We used a quantitative technique. Independent variable AI investment is measured through event study methodology. The dependent variable FV is measured through Tobin's Q. The Mediator is IC which consists of four elements HCE, SCE, RCE, and CEE. Control variables used in this study are FS, Fage, and Lev.

3.2 | Model Specification

AI and FV relationship are measured through the following model:

$$FV_{it} = \beta_0 + \beta_1 FV_{it-1} + \beta_2 AI_{it} + \beta_3 FS_{it} + \beta_4 Fage_{it} + \beta_5 Lev_{it} + \epsilon_{it} \dots \dots \dots (1)$$

IC and FV relationship are measured through the following model:

$$FV_{it} = \beta_0 + \beta_1 FV_{it-1} + \beta_2 IC_{it} + \beta_3 HCE_{it} + \beta_4 SCE_{it} + \beta_5 RCE_{it} + \beta_6 CEE_{it} + \beta_7 FS_{it} + \beta_8 Fage_{it} + \beta_9 Lev_{it} + \epsilon_{it} \dots \dots \dots (2)$$

AI and IC are measured through the following model:

$$AI_{it} = \beta_0 + \beta_1 AI_{it-1} + \beta_2 IC_{it} + \beta_3 HCE_{it} + \beta_4 SCE_{it} + \beta_5 RCE_{it} + \beta_6 CEE_{it} + \beta_7 FS_{it} + \beta_8 Fage_{it} + \beta_9 Lev_{it} + \epsilon_{it} \dots \dots \dots (3)$$

The full mediating model is measured through the following model:

$$FV_{it} = \beta_0 + \beta_1 FV_{it-1} + \beta_2 AI_{it} + \beta_3 IC_{it} + \beta_4 HCE_{it} + \beta_5 SCE_{it} + \beta_6 RCE_{it} + \beta_7 CEE_{it} + \beta_8 FS_{it} + \beta_9 Fage_{it} + \beta_{10} Lev_{it} + \epsilon_{it} \dots \dots \dots (4)$$

Where;

FV_{it} = Firm value of firm i at time t
 FV_{it-1} = Lagged of Firm value of firm i at time t
 AI_{it} = Artificial Intelligence of firm i at time t
 AI_{it-1} = Lagged of Artificial Intelligence of firm i at time t
 IC_{it} = Intellectual Capital of firm i at time t
 HCE_{it} = Human Capital Efficiency of firm i at time t
 SCE_{it} = Structural Capital Efficiency of firm i at time t
 RCE_{it} = Relational Capital Efficiency of firm i at time t
 CEE_{it} = Capital Employed Efficiency of firm i at time t
 FS_{it} = Size of firm i at time t
 $Fage_{it}$ = Age of firm i at time t
 Lev_{it} = Leverage of firm i at time t
 ϵ_{it} = error term

3.3 | Statistics for Demographic Variables

Table 1 shows the demographic results of the students where 133 (61.6%) responses were from males and 83 (38.4%) from females. Of the 216 respondents, 79.6% were between 18 to 22 years old, 16.7% were between 23 to 26 years old, and 3.7% were between 27 to 30 years old. Regarding the Educational qualification of respondents, 146 (67.6%) respondents had bachelor's degrees, 22.7% had high school diplomas or equivalent degrees, 5.1% had Master's degrees, 3.7% respondents Less than a high school diploma, and 0.9% respondents had PhD degrees.

3.4 | Measurement of variables

The measurement of variables is given below in Table 1.

Table 1

Measurement

Name	Symbol	Description
Dependent Variable		
Firm Value	FV	Tobin's Q is measured through this formula. Market Value to Book Value.
Independent Variable		
Artificial Intelligence	AI	AI is measured through the content analysis of annual reports if the firm uses the AI investment in their reports, then assign 1 otherwise 0. Measurement in binary form makes it easier to record the occurrence of AI adoption events, providing transparency and comparability.
Mediator		
Intellectual Capital	IC	MVAIC = HCE+SCE + RCE+CEE (Modified Value-added intellectual capital, Human capital efficiency, Structural capital efficiency, Relational capital efficiency, Capital employed efficiently.
Human Capital Efficiency	HCE	VA/HC. HCE is the amount of value-added generated per employee invested in monetary units.

Value Added	VA	VA is value added to the firms, measured as; VA = OUTPUT – INPUT Output is net sales and input is total expenses Like operating profit + employee expenses + depreciation + amortization.
Human Capital	HC	HC (human capital) is employee costs.
Structural capital Efficiency	SCE	SC/VA
Structural capital	SC	SC= VA-HC
Relational capital Efficiency	RCE	RC/VA
Relational Capital	RC	RC is Marketing + Selling + Promotion + Donations.
Capital employed efficiency	CEE	VA/ CE Capital employed is the difference between total assets and intangible assets.
Control Variables		
Firm Size	FS	The natural logarithm of total assets.
Firm Age	Fage	The number of years from the year of incorporation
Leverage	Lev	Lev is calculated by dividing the total debt by the total assets of the firm.

The data analysis, which includes descriptive analysis, correlation, and regression is presented in the section that follows as a conclusion to the findings.

4 | RESULTS AND ANALYSIS

4.1 | Descriptive Result

Descriptive results are important to understand the data (Naeem et al., 2023; Farooq et al., 2023). Table 2 shows the descriptive statistics of this study. The descriptive result shows the mean, minimum, maximum, and standard deviation values of variables.

Table 2

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FV	720	.522	0.206	.01	.76
AI	720	.351	0.257	0	1
IC	720	5.173	2.079	0.372	20.978
HCE	720	3.781	1.862	-0.224	18.859
SCE	720	0.673	0.162	-0.369	0.947
RCE	720	0.289	0.327	-0.108	2.667
CEE	720	0.43	0.329	-0.023	4.161
FS	720	5.015	1.371	1.579	10.756
Fage	720	44.559	34.285	8	159
Lev	720	0.446	0.196	0.039	0.935

4.2 | Correlation Result

Table 3 contains the correlation statistics. All the values are less than 0.9 thresholds. It shows that there are no multicollinearity issues in this. Variance Inflation Factor (VIF) is not used because the GMM model focuses on endogeneity and dynamic relationships rather than multicollinearity, which is less significant in this case due to instrument utilization.

Table 3

Correlation Matrix

Variables	AI	IC	HCE	SCE	RCE	CEE	FS	Fage	Lev
AI	1.000								
IC	-0.081	1.000							
HCE	0.145	-0.103	1.000						
SCE	0.019	0.019	0.148	1.000					
RCE	-0.093	0.192	-0.028	-0.014	1.000				
CEE	0.070	-0.185	0.259	0.074	0.161	1.000			
FS	0.136	0.023	0.103	-0.008	0.019	0.659	1.000		
Fage	0.205	0.097	0.034	-0.026	-0.121	0.426	0.420	1.000	
Lev	0.111	0.185	-0.054	0.026	-0.164	0.204	0.305	0.729	1.000

4.3 | Regression Result

To check this association between variables, we employed GMM. GMM is better than another regression test. The GMM model is efficient because it efficiently tackles endogeneity, compensates for unobserved heterogeneity, and manages dynamic panel data by utilizing instrumental variables to provide robust estimations. Lagged of the dependent variable is added in this test to account for endogeneity and reflect the dynamic impacts of past FV on current value. GMM result is given in Table 4. The study's findings give empirical substantiation supporting that AI investment significantly affects FV (Model 1), IC significantly impacts FV (Model 2), AI investment significantly impacts IC (Model 3), and IC mediates the relationship between AI investment and FV (Model 4). These results show the significance of AI investment and IC in driving FV and emphasize the need for enterprises to strategically manage these coffers. The positive relationship between AI investment and FV aligns with the RBV, which posits that enterprises with precious, rare, incomparable, and non-substitutable coffers can achieve competitive advantages.

AI, as a critical technological resource, enhances enterprises' functional effectiveness and resource allocation, leading to advanced FV. Still, the consummation of these benefits depends on the effective integration and operation of AI within the establishment's structure and processes. The significant impact of IC on FV is aligned with ICT, and this result is consistent with (Ali et al., 2022). These findings emphasize the part of knowledge-grounded coffers in value creation. Firms that invest in HC, SC, RC, and CE are more equipped to influence their AI investments, performing in bettered firm performance. The interceding part of IC suggests that the benefits of AI investment are not automatically realized but are contingent on the establishment's capability to enhance and use its IC. These findings are supported by RBV and ICT. The

findings of model 4 show that when firms invest in AI and their resources are also aligned with this digitalization then these increase their FV and get competitive advantages.

Table 4

Regression Analysis

Variables	Model 1 DV (FV)	Model 2 DV (FV)	Model 3 DV (IC)	Model 4 DV (FV)
Lagged of DV	0.019** (0.011)	0.013*** (0.121)	0.002*** (0.031)	0.005** (0.128)
AI	0.0003*** (0.000)			0.0021** (0.003)
IC		0.0080** (0.001)	-0.937* (0.586)	0.0062** (0.002)
HCE		0.0564* (0.007)	-0.944* (0.542)	0.0342* (0.069)
SCE		0.0212** (0.013)	0.876** (0.196)	0.013** (0.010)
RCE		0.0601*** (0.010)	-0.363 (0.835)	0.0421*** (0.0001)
CEE		0.0240*** (0.005)	0.920*** (0.599)	0.0392*** (0.043)
FS	0.129** (0.046)	0.534*** (0.089)	-0.532*** (0.950)	0.217*** (0.003)
F_age	0.0227* (0.022)	0.572** (0.245)	0.791* (0.330)	0.623** (0.025)
Lev	-0.0137** (0.002)	-0.257** (0.025)	-0.625** (0.003)	0.261** (0.004)
Constant	0.0335* (0.018)	-0.241 (0.310)	-0.300*** (0.460)	-0.321 (0.021)
Year dummy	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
Observations	720	720	720	720
Wald Chi2	72.44	598.24	602.87	359.11
Hansen's test	0.49	0.43	0.443	0.81
AR(1)	0.03	0.017	0.003	0.002
AR(2)	0.61	0.43	0.49	0.72
No. of companies	80	80	80	80

*Note: Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

5 | DISCUSSION

The findings of this study emphasize the importance of AI investment in improving FV, as it has a favorable and significant influence. This result reveals that organizations that invest in AI technology are more likely to experience increased operational efficiency, innovation, and decision-making, ultimately contributing to higher firm value. The strong impact of AI on IC highlights AI's revolutionary potential in promoting knowledge production, skill development, and improved organizational capacities. These findings are consistent with a growing body of literature emphasizing the strategic importance of AI in creating long-term

value for businesses, particularly in the non-financial sector, where innovation and competitive advantage are essential drivers of success.

Furthermore, the study discovers that IC plays an important mediating role in the relationship between AI investment and FV, supporting the notion that AI's impact on FV is mostly realized through IC expansion. AI investments boost organizational knowledge, capabilities, and human capital, allowing organizations to capitalize on new possibilities, increase efficiency, and drive innovation, all of which have a beneficial impact on firm performance. This mediating role of IC implies that simply investing in AI is insufficient; the corporation must leverage and expand its IC to truly reap the benefits of AI. As a result, non-financial organizations should focus on integrating AI with IC strategy to improve long-term performance and maintain a competitive advantage.

6 | CONCLUSION

This study explores the relationship between AI investment and FV and also explores the answer to this question does IC mediate the relationship between AI investment and FV in the non-financial sector of Pakistan? Data is collected from the annual reports of firms from 2015 to 2023 listed at PSX. RBV and ICT theory are used in this study. GMM model is applied to check the relationship between these variables. GMM model is appropriate for regression analysis as well as for mediation. [Baron and Kenny \(1986\)](#) approach is used in this. Results reveal that AI investment has a positive significant effect on FV because, in the era of digitalization, those firms who focus on AI can enhance their value. IC and its components have also a significant effect on FV. These findings are consistent with earlier studies ([Ali et al., 2022](#); [Farooq & Ahmad, 2023](#)). AI investment has also a significant effect on IC and its components. AI investment negatively affects HCE, because employees think that in the future AI will replace humans, and the unemployment level will increase. So, management should give training to their employees and try to change their mindset for positive results. IC also mediates the relationship between AI investment and FV. It's because when firms use their resources properly and these are aligned with technology, automatically their performance increases.

This study has some contributions. Firstly, this study adds to the body of current literature on the relationship between AI investment and FV as well as AI investment and IC. Secondly, to evaluate the influence of AI investment on FV, this study uses content analysis to measure AI investment. This study contributes to the body of knowledge on the perks of investing in AI and provides a theoretical framework for pursuing a scientific assessment of the optimum level of AI spending. Thirdly, this study examined how IC and its components HC, SC, RC, and CE mediate the relationship between AI investment and FV. It adds greater depth to the study of IC by widening the application scenarios for IC theory and improving the path of AI investment in organizations to create value. Fourthly, this study used the MVAIC model to measure IC while previous studies used this method when they checked the impact of IC on firm performance rather than FV.

This study has some practical and social implications for managers, policymakers, and stakeholders. Practically, managers, policymakers, and stakeholders realized the importance of AI and their firm's resources to enhance the FV. In the era of digitalization and technology firms should focus on technology and reduce manual work to increase their resources productivity and efficiency. Socially, in the era of green technology firms should focus on that technology is environment friendly and has minimum impact on the environment.

So, through AI investment firms can focus on green resources to reduce pollution and create a brand image of their firms. Through this automatically their FV increases.

This study has also some limitations. The study focuses on Pakistani-listed 80 firms as well as a quantitative study. This study ignores small and medium enterprises (SMEs) which more contribute to the economy and GDP. The study also ignores the green IC which is most important now these days. So future studies should focus on SMEs, as well as on qualitative study, and also add green IC. Future studies also used some techniques (other than GMM) to check the association between these variables and also to find the answer to this question. Future studies conduct comparative studies of different sectors as well as comparative studies of countries.

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