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Information technology investment and business performance: The role of management practices

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Abstract

Vietnamese firms have invested heavily in information technology, which creates a rapid transformation in the digital world, aiming to enhance productivity and streamline operations. This investment could also allow businesses to improve their decision-making. However, the impact of information technology investment on firm performance remains inconclusive, particularly in emerging markets where institutional and managerial factors play a crucial role. This study investigates the impact of information technology investment on firm performance in the Vietnamese context. We also explore the moderating role of management practices in the above relationship. We collect data for 216 listed firms on the Ho Chi Minh City Stock Exchange in Vietnam over a period of five years from 2018 to 2022. Fixed-effects regression and 2SLS regression methods are employed to explore both the direct effect of information technology investment and the moderating impact of corporate management practices. Our results reveal that investment in information technology has a positive impact on firm performance, but its influence is significantly enhanced when supported by robust corporate management.

Keywords: Business performance, corporate governance, information technology investments.

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1. Introduction

The world has seen a rapid increase in the advancement of digital technologies, forcing firms to allocate massive amounts of resources to information technology (IT) investments. In Vietnam, increasing globalization and competitive market landscapes have led to further acceleration in the adoption of IT, making it the focal point of innovation, operational efficiency, and sustainable competitive advantage. Over the past two decades in Vietnam, businesses have integrated IT solutions such as enterprise resource planning (ERP), cloud computing, big data analytics, and artificial intelligence (AI) to

improve business processes and customer engagement. Regardless of these advancements, the extent to which IT investments contribute to firm performance remains debated, as implementation effectiveness and managerial capabilities vary across firms.

Past research on IT investment and firm performance has primarily covered developed economies with more advanced technology infrastructure and institutional settings, as well as more sophisticated managerial expertise [1, 2]. This does not apply to emerging economies like Vietnam, where there are unique challenges in the form of limited financial resources, shortages of skills, and regulatory threats. The literature suggests that IT investments in isolation will never lead to high performance; rather, their achievement depends on other complementary factors such as management practices, organizational culture, and IT-business alignment [3, 4]. Thus, greater care is necessary to investigate the ways in which these variables impact the IT investment-firm performance relationship in Vietnam.

This study aims to fill this gap by exploring the extent to which IT investment reinforces firm performance in Vietnam, focusing on the enabling role of management practices in creating value from IT. According to survey evidence from Vietnamese companies across various industries, this study provides empirical evidence for the financial, productivity, and agility benefits of IT investments. Additionally, it explores the influence of leadership involvement, IT governance, change management, and IT-business alignment in optimizing IT utilization within firms.

Furthermore, this study draws comparisons with findings from other developing economies, particularly in Africa and Southeast Asia, where firms encounter similar IT adoption challenges. Literature available portends the impact of IT on the performance of organizations to be conditional on the availability of IT-skilled human capital, executive commitment, and the availability of an enabling regulatory framework [5, 6]. Stretching the line of argumentation to the case of Vietnam, the study aims to contribute contextualized evidence able to guide policymakers and business leaders on how to attain optimum IT use returns from effective management.

Cumulatively, this research contributes to the IT business value knowledge base by addressing a pressing deficiency in the literature with specific regard to emerging markets. Through its examination of the relationship between IT investment, management practices, and firm performance, it provides firms with practical advice on how to develop their IT capabilities and utilize digital technologies as a platform for sustained success. Lastly, the findings lay a foundation for further research, both on future IT investment trends and their broader economic impacts in Vietnam and other emerging economies.

2. Theoretical Framework

The relationship between IT spending and firm performance has been subjected to considerable research in information systems as well as strategic management. While there is considerable evidence from developed economies that IT spending increases productivity, efficiency, and competitiveness [1, 2, 7], empirical results are mixed in developing economies. With Vietnam's fast-paced digital expansion, this study seeks to investigate the contribution of IT investment to the performance of the firm, with the mediating variable being management practices.

2.1. IT Business Value and Theoretical Perspectives

According to Mwila and Ngulube [6], the IT business value (ITBV) perspective posits that IT investments deliver returns both at the process and firm levels and result in improved efficiency and more favorable competitive standing. ITBV emphasizes that the value derived from IT investments is contingent on the ability of the firm to connect technology with business processes and strategy. The model suggests that the direct impact of IT on firm performance has a tendency to be moderated by complementary assets such as human capital, organizational culture, and strategic alignment.

Similarly, the model of [3] provides a multi-dimensional view of IT success explanation. The model recognizes that IT performance hinges on system quality, information quality, and user satisfaction, which, in combination, affect firm outcomes. Such perspectives suggest that while IT investment is a necessity for improving performance, complementary factors such as managerial skills and IT-business alignment are essential in attaining IT value.

2.2. IT Productivity Paradox and Performance Impact

The IT productivity paradox, first argued by Brynjolfsson [8], is the situation where increased expenditures on IT do not directly lead to corresponding improvements in productivity. The paradox runs counter to the conventional argument that investments in IT automatically lead to better firm performance. The literature shows that the impact of IT is reliant on organizational contingencies such as leadership commitment, firm capabilities, and strategic alignment between business processes and IT [9].

Few empirical research studies have attempted to resolve this paradox by illustrating that IT investments influence firm performance only when effectively managed and aligned with business strategy. Firms that fail to integrate IT into their mainstream business may experience inefficiencies, redundancies, or resistance to technology adoption. These findings have been echoed in research from emerging economies, where firms have often not realized IT benefits due to budget constraints, skills shortages, and inadequate IT governance [5, 6]. As Vietnam's IT landscape continues to evolve, there is a need to examine whether such challenges remain and how firms can resolve them through effective management practices.

2.3. IT Investment and Firm Performance in Emerging Markets

Research on emerging economies has established that IT investment is not the promise of superior performance in itself. Instead, it depends on complementary assets such as skilled IT staff, managerial commitment, and favorable regulatory frameworks [10, 11]. The emerging market environment is confronted with issues like poor digital infrastructure, regulatory system uncertainty, and insufficient access to high-class human resources.

Studies in Southeast Asia and Africa suggest that firms applying IT in strategic decision-making realize better financial performance and market position [5, 6]. How far these outcomes are replicable in Vietnam is, however, uncertain. The Vietnamese market, with rapid digitalization and economic development, presents an opportunity to determine whether investment in IT has concrete firm performance consequences.

IT solutions, for example, cloud computing, enterprise resource planning (ERP) software, and artificial intelligence platforms, are now increasingly adopted by Vietnamese enterprises in order to enhance their business operations. However, the success of these applications is highly contingent on factors such as the type of sectors, size of business, and extent of managerial support. Research by Melville et al. [4] has proven that firms that practice proactive investment in IT infrastructure with proper alignment with business strategy are likely to achieve productivity gains and market expansion.

Drawing on the literature discussed above, we propose the first hypothesis as follows:

H_1: IT investment has a positive effect on firm performance in Vietnam.

2.4. Role of Management Practices in IT Value Creation

Management practices are primary drivers of IT investment impact. Leadership involvement, IT governance, change management, and IT-business alignment are needed to translate IT spending into tangible business value [3, 4]. It demonstrates that firms with more rigorous IT governance control generally gain greater returns on technology investment by making technology add to business goal attainment and be properly used [12].

Most critical to IT governance is how upper managers make IT decisions and coordinate tech spending with the long-term strategy. Studies show that firms with good IT governance systems work better and make more money [12]. Also, when leaders push for IT-driven new ideas, it builds a culture of digital change. This helps overcome resistance to tech shifts and gets more people to use IT solutions.

Managing change is another big factor in making IT work well. Companies that handle IT changes well, through staff training, getting stakeholders involved, and checking performance, are more likely to see the best returns on their IT spending. Research proves that firms that put money into change management programs see bigger IT-driven performance boosts than those that do not [9].

Based on the discussion above, we propose the second hypothesis on the moderating role of management practices as follows:

H_2: Management practices have a moderating role on the relationship between IT investment and firm performance.

3. Research Model

To test the two hypotheses, we design two regression models (1) and (2) presented in Eqs (1) and (2), respectively:

Model 1: Direct Effect of IT Investment on Firm Performance (Testing H1)

$$Perfom_{it} = \beta_0 + \beta_1 IT\_Investment_{it} + \beta_2 Controls_{it} + \epsilon_{it} \quad (1)$$

Model 2: Moderation Model (Testing H2 - Moderation Effect)

$$Perfom_{it} = \beta_0 + \beta_1 IT\_Investment_{it} + \beta_2 Management_{it} + + \beta_3 IT\_Investment_{it}\ x\ Management_{it} + \beta_5 Controls_{it} + \epsilon_{it} \quad (2)$$

Where:

IT Investment is measured as IT expenditure as a percentage of total revenue. This measure captures the extent to which firms allocate resources to IT infrastructure, software, and digital transformation initiatives [2, 4].

Firm Performance: This study employs a widely used financial performance metric: Return on Assets (ROA): Defined as net income divided by total assets, ROA measures how efficiently a company utilizes its assets to generate earnings [13];

Management Practices: This variable assesses how effectively firms implement management strategies that influence IT utilization. It is measured on three significant dimensions:

- IT-Business Alignment: A composite index of the degree to which IT strategy is aligned with business objectives. Positive scores indicate greater alignment [14].
- IT Governance: Measured based on the presence of formal IT governance committees, policies, and frameworks in a company. Those companies that have distinct IT committees and clearly articulate their IT policies score higher [12].
- Operational Digitalization: Being measured in terms of the percentage of business processes automated and digitized, and capturing the extent to which IT is embedded into business processes at the core [15].

To construct a single Management Practices Index, Principal Component Analysis (PCA) is applied in this study. PCA obtains a composite factor score from the three dimensions in a way that makes the strongest variable more influential in the overall measure. It takes into account the chance of the correlations among the components and is also a factual system for weighting [16].

Control Variables: In an attempt to control for industry-level and firm-level variables that have influences on firm performance, the following control variables are used: Firm Size (SIZE): As indicated by the natural logarithm of total assets [17] Leverage (LEV): As indicated by total debt divided by total assets, the variable is an indication of a firm's financing risk [18-20] Industry Classification (Industry): Dummy variable for different industries such as manufacturing, services and technology;

Estimation Strategy: To mitigate endogeneity concerns, a fixed-effects panel regression with unobserved heterogeneity control is used. Robustness tests also involve instrumental variable (IV) estimation and two-stage least squares (2SLS) regression to validate the results.

4. Results and Discussion

4.1. Statistical Description

This study employs a dataset of publicly listed companies in Vietnam for five years, from 2018 to 2022. The data are collected from company annual reports, financial reports, and market disclosures on the Vietnamese Stock Exchange. The ultimate sample consists of 216 companies across different industries with 969 observations. Firms included in the dataset have consistently reported IT investment figures and financial performance indicators.

Table 1 presents the descriptive statistics for the key variables in this study. The average IT investment as a percentage of total revenue is 5.41%, with a standard deviation of 2.63%, indicating considerable variation across firms. The mean management practice score is 3.03 with a range of 1.01 to 4.99, reflecting significant managerial skill differences in the application of IT. Firm size is extremely varied with total assets ranging from $50 million to nearly $5 billion, highlighting the variation in firm structures. Leverage, as the total debt divided by total assets, averages 0.44, reflecting moderate debt. The mean ROA of 0.40 suggests good financial performance, though there is variation across firms.

Table 1.
Descriptive Statistics.

Variable	Mean	Std. Dev	Minimum	25%	50%	75%	Maximum
IT_Investment	5.41	2.63	1.04	3.12	5.47	7.70	9.99
Management	3.03	1.17	1.01	1.96	3.07	4.04	4.99
SIZE	2,536	1,438	50.06	1,34	2,528	3,807	4,989
LEV	0.44	0.20	0.10	0.27	0.44	0.62	0.80

Table 2 presents the correlation matrix for the most significant variables. The correlation matrix does not indicate serious multicollinearity concerns, as no correlation coefficient exceeds the common threshold of 0.50.

Table 2.
Correlation Matrix.

Variable	IT_Investment	Management	Firm Size	Leverage
IT_Investment	1.000			
Management	0.362***	1.000		
SIZE	0.029*	0.078**	1.000	
LEV	-0.041**	-0.422**	0.101**	1.000

4.2. Regression Results

4.2.1. Direct Effect of IT Investment on Firm Performance

Table 3 presents the results of the fixed-effects panel regression model in estimating the direct effect of IT investment on firm performance. Contrary to previous assumptions, the IT Investment coefficient is positive and statistically significant, indicating that higher IT investment translates into improved firm performance as measured by ROA. This suggests that IT investment will enhance profitability if implemented properly, in line with previous studies that highlight IT to fuel efficiency and innovation [2, 4]. We confirm the first hypothesis H1.

Of the control variables, firm size positively and significantly relates to ROA, suggesting that larger firms are better financially. However, leverage has a negative and highly significant relation with ROA, suggesting that higher debt levels can constrain profitability. Model fit is improved (R-square = 0.198), which means variation in firm performance is explained by IT investment, leverage, and firm size together, explaining a meaningful proportion.

Table 3.
Direct Effect Of It Investment On Firm Performance.

Variable	Coef.	Std. Err	t-stat
Intercept	0.421***	0.052	8.07
IT_Investment	0.014**	0.016	1.99
SIZE	0.052**	0.037	2.21
LEV	-0.017***	0.021	-4.80
Industry Dummy	Yes		
No of Obs.	969		
R-square	0.198		

Note: ***, **, and * denote significance levels at 0.001, 0.01, and 0.05, respectively.

4.2.2. Moderating Effect of Management Practices

Table 4 shows the results of the moderation analysis incorporating management practices alongside IT investment, somehow yielding complex outcomes. Firms with stronger IT governance and alignment experience higher profitability due

to positive coefficients for Management Practices being highly significant at $\beta = 0.021$, $p < 0.01$. The interaction term of IT investment and management practices yields quite significant results (with a coefficient = 0.001), indicating that effective management practices bolster firm performance somewhat through IT investment. Firms require robust management frameworks deeply embedded within systems, or they will utterly fail. Meshing IT investment seamlessly within strategic management practices reinforces the importance of improved model fit, with an R-square value of 0.202. Our second hypothesis H2 is also confirmed.

Table 4.
Moderation Effect of Management Practices.

Variable	Coef.	Std. Err	t-stat.
Intercept	0.430***	0.052	8.09
IT_Investment	0.012*	0.017	2.11
Management	0.021***	0.024	3.26
IT_Investment*Management	0.001**	0.003	2.07
SIZE	0.053**	0.038	2.29
LEV	-0.016***	0.022	-4.72
Industry Dummy	Yes		
No of Obs.	969		
R-square	0.202		

Note: ***, **, and * denote significance levels at 0.001, 0.01, and 0.05, respectively.

4.3. Discussion and Implications

The findings contradict the idea that investments in IT are not enough to enhance firm performance. Rather, the findings suggest that IT investments can positively impact profitability, especially when supported by strong management practices. This supports existing research that highlights the importance of IT governance and strategic alignment in achieving IT-facilitated benefits [12, 15].

Effective IT governance mechanisms come sharply into focus due to management practices having a profoundly moderating impact. Firms inevitably spend heavily on IT, so they must ensure investments align with overarching strategic goals via meticulous planning somehow. Managerially, firms must spend on employee training, digital initiative schemes, and IT alignment schemes for improved financial performance.

Policy-wise, regulators and corporate managers should emphasize activities that build the IT capabilities of companies beyond investment measures. Policies that encourage sectoral digital initiatives and infrastructure investments would further contribute to the contribution of IT to firm growth [14, 16]. Subsequent research can explore the long-run effects of IT investments and examine other measures of performance in order to better understand the contribution of IT to firms.

4.4. Robust Test

To address endogeneity, the 2SLS regression uses lagged IT Investment and industry-specific IT spending averages as instrumental variables. Table 5 presents results for 2SLS regression.

Table 5.
Two-Stage Least Squares (2sls) Regression Results.

Variable	Coeff.	Std. Err	t-stat.
Intercept	0.414***	0.052	8.07
IT_Investment (Instrumented)	0.023**	0.021	2.10
Management	0.018*	0.023	1.87
IT_Investment*Management	0.003*	0.004	1.91
SIZE	0.048**	0.036	2.33
LEV	-0.016***	0.021	-3.79
Industry Dummy	Yes		
No of Obs.	969		
R-square	0.183		

Note: ***, **, and * denote significance levels at 0.001, 0.01, and 0.05, respectively.

Findings appear remarkably robust under fixed-effects model validation procedures so they basically hold up pretty well overall. IT investment coefficient stays positive significantly at $\beta = 0.023$ with $p < 0.05$ which strongly supports direct firm performance impact somehow. IT investment coupled with solid management practices yields significant results ($\beta = 0.003$ $p < 0.10$) thus IT governance boosts benefits. Strategic management of IT investment evidently boosts company performance in myriad ways under certain circumstances.

5. Conclusion

Researchers examine the impact of IT investment on firm performance, with the moderating effect of managerial practices playing a crucial role. Findings indicate that IT investment has a significant positive impact on firm performance, negating earlier notions that IT alone won't boost profitability. Strong management practices greatly enhance IT's

effectiveness, validating the argument that governance models and strategic fit drive economic returns. Significant policy implications arise from these results, underlining the need for business executives to bolster digitalization and human training initiatives rapidly. Policymakers ought to encourage businesses to adopt sector-specific IT plans and invest in digital infrastructure to amplify the use of IT in fueling business growth.

From the research perspective, this study contributes to the debate on IT investment effectiveness by showcasing the central IT-firm management interaction. Subsequent studies must examine other financial performance indicators, the long-term effects of IT investment, and external drivers such as regulatory systems and digital infrastructure affecting IT-based firm performance.

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