

Assessing The Influence of Information Technology Investments on Firm Efficiency and Financial Performance in Kurdistan's Manufacturing Companies: The Sem Analysis

Mohammed Ahmed Mahmood

Sulaimani Polytechnic University, Darbandikan Technical Institute, Department of Accounting, Darbandikan, Kurdistan Region of Iraq.

Email: mohammad.mahmood@spu.edu.iq

Kadhim Kamal Ahmad

Sulaimani Polytechnic University, Darbandikan Technical Institute, Department of Accounting, Darbandikan, Kurdistan Region of Iraq.

Email: Kadhim.kamal@spu.edu.iq

Kaiwan Hassan Salih

Sulaimani Polytechnic University, Darbandikan Technical Institute, Department of Accounting, Darbandikan, Kurdistan Region of Iraq.

Email: kaiwan.hassan@spu.edu.iq

Sardar Jalal Braim

Department of Accounting and Finance, College of Administration and Economics, Lebanese French University, Erbil, Kurdistan Region Iraq.

Email: Sardar.jalal@lfu.edu.krd

ARTICLE INFO

Article History:

Received:8/2/2024

Accepted:7/3/2024

Published:Autumn2025

Keywords: IT

investment, financial performance, firm efficiency, Kurdistan, mediating effect, structural equation modelling.

ABSTRACT

This journal article aims to investigate the impact of Information Technology investments on the efficiency and financial performance of manufacturing companies in the Kurdistan region. 382 questionnaire responses were drawn from the industrious zones of Erbil namely; Qushtapa Industrial Area, Sheikh Choly Industrial Area, Erbil Free Zone and Erbil Industrial Zone and analysed using a Structural Equation Modeling approach. The findings revealed that manufacturing companies that strategically invest in information technology will experience higher levels of operational efficiency and financial performance compared to those with limited IT investments. It was also revealed that firms with higher operational efficiency will exhibit

Doi:

10.25212/lfu.qzj.10.3.31

superior financial performance compared to those with lower operational efficiency. The findings suggest a dynamic and multifaceted relationship between IT investments and overall firm performance in manufacturing companies in Kurdistan. Manufacturing companies can use these findings to inform their strategic IT planning. Understanding that strategic IT investments positively impact operational efficiency emphasizes the need for careful planning and alignment of IT initiatives with overall business goals.

1. Introduction

In today's dynamic business environment, the role of Information Technology (IT) investments has become increasingly pivotal for organizations striving to maintain a competitive edge. As globalization intensifies and markets become more interconnected, the manufacturing sector faces unprecedented challenges that demand innovative solutions. In the unique context of Kurdistan, where the business landscape is marked by distinct economic and socio-political factors, understanding the impact of IT investments on manufacturing firms' efficiency and financial performance is of paramount importance. While extensive research has explored the relationship between IT investments and firm performance in various global contexts (Ghasemaghaei, Ebrahimi & Hassanein, 2018; Schweikl & Obermaier, 2020; Volberda et al., 2021), there is a notable gap in the literature concerning the specific dynamics of Kurdistan's manufacturing sector. This study aims to fill this gap by undertaking a comprehensive analysis of how IT investments influence the operational efficiency and financial outcomes of manufacturing companies in the region.

The Kurdistan region, characterized by its rich cultural heritage and diverse economic landscape (Abdulrahman, Kholodenko & Ivantsova, 2020), presents a compelling backdrop for this investigation. As the manufacturing sector in Kurdistan strives to adapt to rapid technological advancements (Making, 2020), exploring the strategic implications of IT investments becomes imperative. As such, the research addresses a significant gap in the existing literature concerning the influence of information technology (IT) investments on the efficiency and financial performance of

manufacturing companies in Kurdistan. Despite the increasing importance of IT in the business landscape, there is a noticeable dearth of studies focusing on this relationship within the specific context of Kurdistan. Existing academic literature lacks consensus on the direct and indirect effects of IT investments on both operational efficiency and financial outcomes in this region. The scarcity of empirical research exploring these dynamics, particularly through the lens of Structural Equation Modeling (SEM), creates a research gap that this study seeks to address. The unique economic, cultural, and business environment of Kurdistan adds further complexity, highlighting the need for region-specific insights. This study seeks to fill the void in existing knowledge by providing insights tailored to the unique challenges and opportunities faced by manufacturing companies operating in Kurdistan. The objectives of this research are twofold:

- 1) First, to examine the relationship between IT investments and firm efficiency in the manufacturing sector of Kurdistan and,
- 2) Second, to assess how these IT investments translate into tangible financial performance outcomes for companies in the region.

By investigating these research gaps, the study aims to contribute to a more nuanced understanding of the role of IT investments in shaping the operational and financial aspects of manufacturing companies in Kurdistan, thereby advancing both regional and broader academic knowledge. The research can contribute to a more comprehensive understanding of the dynamics shaping the manufacturing sector in this specific geographic and cultural setting. As the manufacturing landscape continues to evolve, the findings of this research contribute not only to the academic discourse but also offer practical insights for industry practitioners and policymakers. By delineating the specific pathways through which IT investments influence efficiency and financial performance, this study aims to empower manufacturing companies in Kurdistan to make informed decisions regarding their IT investment strategies, ultimately fostering sustainable growth and competitiveness in the regional market.

2. Literature review

The integration of Information Technology (IT) into business operations has been a transformative force globally, offering companies the potential to enhance efficiency, streamline processes, and ultimately improve financial performance. While numerous studies have delved into the impact of IT investments on firm outcomes, the specific dynamics within the manufacturing sector in Kurdistan remain underexplored. This literature review seeks to contextualize the current study within the broader research landscape and identify key gaps that warrant investigation.

Schweikl and Obermaier (2020): In their research, Schweikl and Obermaier emphasize the transformative impact of IT investments on productivity within organizations. They argue that by automating routine tasks, reducing errors, and improving internal communication, IT investments contribute to enhanced operational efficiency, setting the stage for potential improvements in financial performance.

Volberda et al. (2021): Volberda and colleagues focus on the strategic implications of robust IT infrastructures. Their study suggests that organizations with well-established IT foundations are better prepared to adapt to changes in the business environment. This adaptability, facilitated by IT investments, is considered a key factor influencing both firm efficiency and financial performance.

Brynjolfsson and Hitt (2003) and Melville et al. (2004): The studies by Brynjolfsson and Hitt, as well as Melville et al., contribute to the understanding of IT's role in boosting productivity and operational efficiency. Their findings suggest that investments in IT can have a positive impact on the efficiency of manufacturing processes, potentially influencing financial performance.

Nguyen et al. (2020): Nguyen et al. delve into the specific realm of manufacturing, examining the relationship between IT investments and manufacturing flexibility. Their study underscores the importance of aligning IT strategies with the operational needs of manufacturing firms. This alignment is crucial for achieving efficiency gains and, consequently, improvements in financial performance.

Maudos and Pastor's (2003) study in the banking sector reveals a positive relationship between cost efficiency and profitability. While specific to the banking industry, their findings suggest that efficient resource utilization, facilitated by IT investments, can lead to improved financial outcomes.

Loong and Chong (2019): In the manufacturing sector, Loong and Chong's study provides insights into the connection between operational efficiency and financial performance. Their findings indicate that firms with higher operational efficiency, measured by factors such as inventory turnover and asset utilization, tend to achieve superior returns on assets. This suggests that efficiency considerations are not only associated with current financial performance but also impact market valuation.

In summary, the collective literature reviewed underscores the diverse ways in which IT investments can influence firm efficiency and financial performance, providing a foundation for the proposed SEM analysis in the context of Kurdistan's manufacturing companies.

3. Research methodology

3.1 Theoretical Foundation

The Strategic Alignment Theory (SAT) serves as a guiding theory to elucidate the intricate relationship between Information Technology (IT) investments, firm efficiency, and financial performance. It emphasizes the importance of aligning IT strategies with broader organizational objectives to maximize the positive impact on both operational efficiency and financial outcomes. SAT provides a theoretical framework to understand the link between IT, firm efficiency, and financial performance. According to SAT, organizations achieve optimal performance when there is alignment or congruence between their IT strategy, business strategy, and organizational structure (Shamekh, 2008, Braim & Mohammed, 2022).. In the context of the study on the influence of IT investments on firm efficiency and financial performance in Kurdistan's manufacturing companies, SAT suggests that the strategic alignment of IT with overall business goals is crucial.

The independent variable of information technology, when strategically aligned with the organization's objectives, is expected to enhance firm efficiency. For instance, well-integrated IT systems can streamline operations, improve communication, and optimize processes, ultimately leading to increased operational efficiency. SAT posits that the effectiveness of IT investments in improving firm efficiency depends on how well these investments are aligned with the strategic goals and structure of the organization. Furthermore, the strategic alignment of IT with firm efficiency is hypothesized to positively impact financial performance. A strategic alignment ensures that IT investments contribute directly to achieving organizational goals, which can translate into improved financial outcomes. For example, if IT investments are geared towards supporting revenue-generating activities, cost reduction, or enhancing customer satisfaction, the financial performance of the manufacturing companies is expected to show positive results.

According to Ferreira et al. (2016), the Resource-Based View (RBV) theory provides a valuable perspective on how the allocation and utilization of resources, particularly IT, can influence firm efficiency and financial performance in Kurdistan's manufacturing companies. RBV posits that a firm's competitive advantage stems from its unique and valuable resources (Ferreira et al., 2016). In the context of IT investments, RBV suggests that the strategic utilization of information and technology resources can be a source of sustained competitive advantage.

Regarding the independent variable of information technology, RBV emphasizes that the nature and strategic deployment of IT resources play a crucial role in shaping firm efficiency (Ferreira et al., 2016). For example, having exclusive access to advanced IT capabilities or proprietary software can set a manufacturing company apart from its competitors, leading to enhanced operational efficiency. RBV suggests that IT resources, when rare, valuable, and difficult to imitate, contribute significantly to achieving operational excellence (Ferreira et al., 2016). Furthermore, RBV postulates that the strategic deployment of IT resources, when aligned with the firm's unique capabilities and strategic objectives, can positively impact financial performance. For

instance, if IT investments are tailored to exploit specific market opportunities, enhance core competencies, or improve customer relationships, the financial performance of manufacturing companies is expected to reflect these competitive advantages.

3.2 Hypothesis development

3.2.1 The impact of IT Investments on firm efficiency

IT investments have become integral to modern business operations, with organizations leveraging technology to enhance efficiency, streamline processes, and gain a competitive edge. The impact of IT investments on firm efficiency has been a subject of extensive research, exploring how technological advancements contribute to organizational performance. This literature review examines key findings in this domain and formulates a hypothesis to guide further investigation. Numerous studies highlight the positive relationship between IT investments and operational efficiency (Melville et al., 2004; Rigby et al., 2002; Schweikl & Obermaier, 2020; Volberda et al., 2021). Schweikl and Obermaier (2020) argue that investments in IT can lead to improvements in productivity by automating routine tasks, reducing errors, and facilitating better communication within the organization. Organizations that strategically deploy IT systems often experience streamlined workflows and reduced operational costs (Melville et al., 2004).

The integration of IT systems into decision-making processes is another dimension explored in the literature. Ghasemaghahi, Ebrahimi, and Hassanein (2018) suggest that IT investments enable organizations to access real-time data, enhancing the quality of decision-making. The ability to analyze large datasets efficiently and derive actionable insights contributes to strategic decision-making and overall efficiency gains. IT investments also play a crucial role in enhancing organizational flexibility and adaptability. Volberda et al. (2021), Braim & Mohammed, (2022). argue that organizations with robust IT infrastructures are better equipped to respond to changes in the business environment. The flexibility to adapt quickly to market demands and emerging trends contributes to overall operational efficiency. The literature emphasizes the impact of IT investments on customer relationship

management. Rigby et al. (2002) suggest that IT-enabled CRM systems contribute to improved customer satisfaction and loyalty. Effective use of IT in managing customer interactions can lead to increased efficiency in marketing, sales, and customer service processes. Amid such observations, it is, therefore, profound to acknowledge that manufacturing companies that invest in IT will experience higher levels of operational efficiency compared to those with limited IT investments. As a result, the following hypothesis was formulated to cater for such propositions:

- **Hypothesis 1:** IT investments have a significant and positive impact on firm efficiency.

3.2.2 The impact of IT Investments and financial performance

A plethora of research conducted globally has highlighted the positive correlation between IT investments and firm performance. Studies by Brynjolfsson and Hitt (2003) and Melville et al. (2004) emphasize the role of IT in boosting productivity and operational efficiency. However, the applicability of these findings to Kurdistan's manufacturing context remains uncertain, given the unique challenges and opportunities presented by the region's economic and political landscape. Within the manufacturing sector, prior research has underscored the sector-specific nuances that influence the relationship between IT investments and performance. For example, Nguyen et al. (2020) examined the impact of IT investments on manufacturing flexibility, stressing the importance of aligning IT strategies with the operational needs of manufacturing firms. Drawing parallels to Kurdistan, where manufacturing faces distinct challenges such as infrastructural limitations and geopolitical influences, these insights necessitate further exploration. Thus, to fill this gap, the following hypotheses were suggested:

- **Hypothesis 2:** IT investments have a significant and positive impact on financial performance.

3.2.3 The impact of firm efficiency on financial performance

The relationship between firm efficiency and financial performance has been a subject of considerable interest in the field of corporate finance and management.

This literature review explores key findings on how operational efficiency influences financial performance and formulates a hypothesis to guide further investigation. Numerous studies have investigated the impact of cost efficiency on financial performance. Maudos and Pastor (2003) found a positive relationship between cost efficiency and profitability in the banking sector. Efficient management of resources and processes leads to cost savings, contributing to improved profit margins. Operational efficiency is often linked to better utilization of assets and, subsequently, higher returns. A study by Loong and Chong (2019) in the manufacturing sector demonstrated that firms with higher operational efficiency, measured by factors such as inventory turnover and asset utilization, tend to achieve superior returns on assets. Efficiency is not only associated with current financial performance but also with market valuation. Demirgüç-Kunt and Huizinga (2011) found that banks with higher cost efficiency are more highly valued by the market. Investors tend to reward firms that demonstrate effective resource allocation and cost management. Efficiency is also linked to innovation, which, in turn, impacts financial performance. Zhu et al. (2019) argued that firms with efficient innovation processes are more likely to introduce successful products and services, positively affecting financial performance metrics such as return on equity (ROE) and shareholder value.

- **Hypothesis 3:** Operational efficiency has a significant and positive impact on financial performance.

3.2.4 The mediating impact of firm efficiency on IT investments' impact on firm performance

The interaction between IT investments, firm efficiency, and overall firm performance has been a subject of significant research interest. This literature review explores relevant findings regarding how firm efficiency may mediate the impact of IT investments on firm performance and formulates a hypothesis to guide further investigation. Numerous studies have established a positive link between IT investments and firm performance. Sobhani, Shokoohyar and Sobhani (2021) found that investments in IT can enhance productivity and overall firm performance. IT investments contribute to improvements in business processes, decision-making, and

customer relationship management. Several researchers argue that firm efficiency acts as a mediator between IT investments and firm performance. Zhu et al. (2019) proposed that efficient use of IT resources, including effective implementation and management, is crucial for realizing the full benefits of IT investments. A study by Bharadwaj, Chauhan and Raman (2015) emphasized the mediating role of organizational capabilities, including efficiency, in translating IT investments into improved performance. Efficiency gains, particularly in cost management, are often cited as a key mediating factor. Melville et al. (2004) and Sultan et al's (2020) found that organizations achieving cost efficiency through IT investments experience positive impacts on financial performance. Efficient use of IT resources reduces operational costs and enhances overall profitability. Operational efficiency is closely tied to the strategic alignment of IT investments. Pesce and Neirotti (2023) highlighted the importance of aligning IT investments with business strategy for achieving efficiency gains. Efficient utilization of IT in alignment with strategic goals contributes to enhanced overall firm performance. Amid such discoveries, we proposed the following hypothesis:

- **Hypothesis 4:** Firm efficiency mediates the positive impact of IT investments on overall firm performance.

To test the hypotheses, the following conceptual framework will be used as guiding concept:

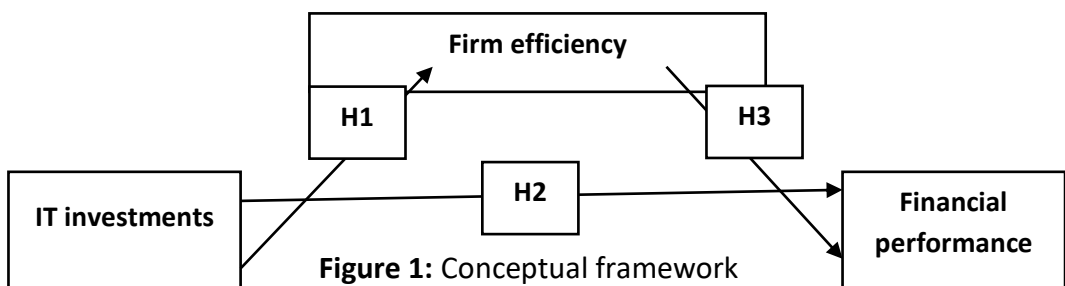


Figure 1: Conceptual framework

3.3 Method

The study is conducted specifically in Kurdistan manufacturing companies, adding a valuable contextual dimension to the research. Studying manufacturing companies in Erbil, Kurdistan, aligns with broader economic development goals, provides insights into the unique regional context, and offers practical implications for both local businesses and policymakers. A significant number of research investigations on these constructs have been conducted in economic contexts such as Kenya (Chege, Wang, & Suntu, 2020) and the United States of America (Okafor, Adeleye, & Adusei, 2021), which may limit the applicability and generalizability of findings to diverse settings like Kurdistan manufacturing companies. As such, this study adopted a quantitative research design to assess the relationships between information technology investments, firm efficiency, and financial performance in manufacturing companies in Kurdistan. Kline (2023) defines structural equation modelling as an approach that is used to analyse complex interdependencies among the variables. The importance of applying SEM to analyse the collected data is considered to be instrumental in analysing mediating and moderating influences and providing insights into the model's fitness (Kline, 2023), and in this context, the latter was of huge importance.

3.4 Reliability and validity tests

In this context, we applied Cronbach's alpha test to determine the reliability of the variables IT investments, firm efficiency and financial performance by considering alpha values of at least 0.7 as reflecting a higher internal consistency. A composite reliability test was also applied using the same criteria. To test the variables' discriminant validity the multigroup heterotrait-monotrait (HTMT) test was applied. Convergent validity was on the other hand tested using the Average Variance Explained (AVE) test requiring a cut-off point of at least 0.5 (Kline, 2023).

3.5 Model fitness tests

Model tests were deployed to determine the predicted SEM's fit. Among the applied tests is SRMR (Standardized Root Mean Square Residual) test, which assesses the

model's absolute fit. As such, values less than 0.08 indicated a suitable fit (Kline, 2023). Similarly, Kline (2023) recommends that NFI (Normed Fit Index) values above 0.90 and a significant Chi-square value. The D_G and D_ULS criteria was also deployed, in accordance with Ringle, Da Silva, and Bido (2015), to have a better understanding of the model's fitness.

3.6 Population and sampling procedures

Meanwhile, Erbil, as a key city in the Kurdistan Region, has experienced significant economic growth and development in recent years. The study of manufacturing companies can shed light on the extent to which industrial diversification has occurred, the sectors that have seen growth, and the overall trajectory of the manufacturing industry in the region. The study draws its focus on three major types of manufacturing companies in Erbil namely; high-tech manufacturing companies, traditional manufacturing companies and construction materials manufacturing companies. Studying high-tech manufacturing companies would provide insights into the region's technological capabilities, innovation practices, and their impact on efficiency and financial performance. On the other hand, exploring traditional manufacturing companies can reveal how traditional manufacturing adapts to modern challenges, including technology adoption, global competition, and market dynamics. Given the development and construction activities in the region, studying companies involved in manufacturing construction materials (e.g., cement, steel) can offer insights into the role of construction materials manufacturing companies in supporting infrastructure growth, the demand for construction materials, and their impact on the overall economy.

In order to determine the sample size, the industrial companies were drawn from the industrious zones of Erbil namely; Qushtapa Industrial Area, Sheikh Choly Industrial Area, Erbil Free Zone and Erbil Industrial Zone. The exact number of study participants was determined using a convenience sampling approach determined using the following formula:

$$\text{Sampling individuals} = \frac{z^2 \sigma^2}{e^2} \dots\dots\dots (1).$$

Where $z = 95\%$ confidence level (1.96), $\sigma = 0.5$ and $e =$ the margin of error (0.05). Consequently, a sample size of 384 participants comprising employees involved in IT implementation, IT managers, financial managers, production managers and CEOs was approached face-to-face and hand-given questionnaires to complete from the 13th of November 2023 to the 21st of December 2023. The next section of the study provides the study's data collection details.

3.7 Data collection

Questionnaires were distributed and collected by hand to each of the selected 384 participants drawn from 48 companies. For each company, 8 questionnaires were distributed to 4 employees involved in IT implementation, an IT manager, a financial manager, a production manager and a CEO of the manufacturing companies in Erbil. In order to collect the required, questionnaires were distributed to a cluster sample of the study participants in Erbil, Kurdistan. Apart from cost efficiency, geographic distribution, increased representativeness and improved logistical coordination advantages, cluster sampling was beneficial in catering for variations in how the companies in different areas of Erbil implement information technology investments. The questions were developed using the information provided in prior related studies on leadership styles and employee engagement (Talab & Flayyih, 2023). Improvements were made to the questionnaire to avoid a Likert scale crash and this was accompanied by a pilot testing involving 3 study participants. As part of the study's pretesting, we conducted a debriefing session with the participants to gather their feedback and reviewed the time participants took to complete the questionnaire and checked the completion rates to identify questions that participants may have skipped. The outcome was successful and hence, we proceeded to distribute the questionnaires. Ultimately, 12 IT investment, 10 firm efficiency and 16 financial performance constructs measured on a scale of 1 (strongly disagree) to 5 (strongly agree) were developed.

4. Results and Discussion

4.1 Demographic analysis

The study results were derived from an examination of 362 questionnaire responses equating to a response rate of 94.27%, which is a high reflection of the situation under study. Among the study participants were 196 male and 166 female respondents, indicating that Kurdistan's manufacturing sector has gender-specific patterns in occupational roles.

Table 1: Demographic details

Variable	Description	Frequency	Percentage
Gender	Male	196	54.14
	Female	166	45.86
	Total	362	100
Academic qualification	Diploma	54	14.92
	Bachelor's degree	107	29.56
	Master's degree	199	54.97
	PhD degree	2	0.55
	Total	362	100
Years of experience	Less than 1 year	39	10.77
	1-3 years	102	28.18
	4-6 years	52	14.36
	7-9 years	91	25.14
	10 years and above	78	21.55
	Total	362	100
Employment position	IT-related employees	100	27.62
	IT managers	72	19.89
	Financial managers	70	19.34
	Production managers	75	20.72
	CEOs	45	12.43
	Total	362	100
Manufacturing sector	High-tech	108	29.83
	Petroleum traditional	112	30.94
	Construction materials	142	39.23
	Total	362	100
Location	Qushtapa	90	24.86
	Sheikh Choly	90	24.86
	Erbil Free Zone	90	24.86
	Erbil Industrial Zone	92	25.42
	Total	362	100

In terms of qualifications, the respondents were well-positioned to apprehend the necessary IT investments and firm efficiency enhance financial performance precepts because of their high academic status (Diploma=14.92%; bachelor's degree=29.56%; master's degree=54.97% and PhD degree=0.55%) as shown in Table 1. Similarly, their high level of work experience also augments this notion and suggests that the respondents have accumulated a high level of experience (eg., 25.14% and 21.55% corresponding to 7-9 years and 10 years and above, respectively) to understand better how IT investments and firm efficiency enhance financial performance. A nuanced understanding of was provided as the respondents were diverse (IT-related employees=27.62%; IT managers=19.89%; Financial managers=19.34%; Production managers=20.72% and CEOs=12.43%). Additionally, such diversity was further by manufacturing sector and location as projected in Table 1.

4.2 Factor analysis

Having provided insights into the study's demographic details, we proceeded to determine which of the IT investments and firm efficiency enhance financial performance variable constructs were related using factor analysis. Only constructs with factor loadings of at least 0.7 were selected (Kline, 2023).

Table 2: Factor analysis

Constructs	Loadings		Constructs	Loadings
8 IT investment			16 financial performance constructs	
IT2	0.817		FP1	0.806
IT3	0.814		FP2	0.815
IT5	0.786		FP3	0.798
IT6	0.812		FP5	0.801
IT7	0.802		FP7	0.766
IT8	0.799		FP8	0.801
IT10	0.800		FP9	0.800
IT11	0.801		FP8	0.801
Firm efficiency			FP9	0.746
FE4	0.820		FP10	0.723
FE5	0.816		FP11	0.820
FE6	0.812		FP12	0.840
FE8	0.822		FP13	0.734

FE9	0.817		FP14	0.797
FE10	0.809		FP15	0.891
			FP16	0.840

IT=IT investment; FE=firm efficiency; FP=financial performance.

Hence, 8 IT investment, 6 firm efficiency and 14 financial performance constructs were related as shown in Table 2. Consequently, the intended model was estimated using these selected constructs.

4.3 Validity test

Having selected the related constructs, the study went further to ascertain the variables' discriminant validity using the HTMT test. The provided outcomes shown in Table 3 reveal that the HTMT values are less than 0.90 indicating that discriminant validity was established (Kline, 2023). Convergent validity was established following the discovery that all the AVE values were above 0.50 as shown in Table 4.

Table 3: HTMT test results

	IT investment	Firm efficiency	Financial performance
IT investment	-		
Firm efficiency	0.695	-	
Financial performance	0.536	0.607	-

Both the Cronbach's alpha, rho_A and composite reliability values were less than 0.70 indicating a high level of internal consistency, which translates to high reliability (Kline, 2023). Having satisfied all the validity and reliability standards, we went on further to test the model's fit.

Table 4: Convergent validity and reliability test

	AVE	Cronbach's Alpha	rho_A	Composite Reliability
IT investment	0.831	0.840	0.850	0.852
Firm efficiency	0.804	0.820	0.832	0.846
Financial performance	0.845	0.862	0.874	0.880

4.4 Model fitness test

The estimated model can be noted to be having a satisfactory fit as evidenced by an SRMR value, which is less than 0.08, NFI value, which is greater than 0.90, a significant Chi-square value and lower D_G and D_ULS values (Kline, 2023) as presented in table 5. Amid such findings, we interpreted the path analysis results with high confidence.

Table 5: Model fitness test

	SRMR	NFI	Chi-Square	d_G	d_ULS
Saturated Model	0.060	0.977	64.190*	0.875	1.232
Estimated Model	0.060	0.977	64.190*	0.875	1.232

4.5 Path analysis

As per the path analysis results, hypotheses 1 ($\beta_1=0.187$; $p=0.000$), 2 ($\beta_2=0.560$; $p=0.000$) and 3 ($\beta_3=0.619$; $p=0.000$) were validated whilst hypothesis 4 was refuted ($\beta_4=0.187$; $p=0.078$). In light of Table 6's findings, we proceeded to discuss the study findings.

Table 6: Path analysis results

	Estimate	P Values	Impact	Hypothesis
Mediating effects				
IT -> FE-> FP	0.187	0.078	Insignificant	H ₄ : Not supported
Direct relationships				
IT -> FE	0.323	<0.001	Significant	H ₁ : Supported
IT -> FP	0.560	<0.001	Significant	H ₂ : Supported
FE -> FP	0.619	<0.001	Significant	H ₃ : Supported

IT=IT investment; FE=firm efficiency; FP=financial performance.

Discussion

Foremost, the study findings accepted hypothesis 1 ($\beta_1=0.187$; $p=0.000$), which indicates that manufacturing companies that strategically invest in information technology will experience higher levels of operational efficiency compared to those with limited IT investments. The findings are in alignment with the SAT, which posits that strategic alignment leads to improved organizational performance (Shamekh, 2008). In this case, the study findings support the idea that the alignment between IT investments and operational goals positively influences operational efficiency. The alignment is likely contributing to streamlined processes, improved decision-making, and overall efficiency gains. Concerning the RBV in this context, operational efficiency can be considered a distinctive competence that results from strategic IT investments (Ferreira et al., 2016). Manufacturing companies that strategically invest in IT are likely to develop processes and capabilities that set them apart in terms of operational efficiency. The findings also reinforce Ghasemaghahi, Ebrahimi, and Hassanein's (2018) findings denoting that IT investments enable organizations to access real-time data, enhancing the quality of decision-making. The improvement in operational efficiency compared can also be attributed to improvements in customer satisfaction and loyalty (Rigby et al., 2002), productivity by automating routine tasks, reducing errors, and facilitating better communication (Schweikl & Obermaier, 2020) and robust IT infrastructures (Volberda et al., 2021). The fact that this study is the first of its kind to establish these findings within the context of manufacturing companies in Kurdistan entails decision-makers within manufacturing firms can use these findings as guidance when making decisions about technology investments. Recognizing the positive impact on operational efficiency can help in justifying and securing resources for IT initiatives.

Secondly, hypothesis 2 ($\beta_2=0.560$; $p=0.000$) was accepted and this entails that manufacturing companies that strategically invest in information technology will experience higher levels of financial performance compared to those with limited IT investments. In the context of the study, strategic IT investments are viewed as valuable resources that contribute to a manufacturing company's competitive

advantage as suggested by the RBV (Ferreira et al., 2016). The study's acceptance of hypothesis 2 suggests that the strategic deployment of IT resources positively influences financial performance within the manufacturing sector. The RBV advocates the development of distinctive competencies (Ferreira et al., 2016), and the accepted hypothesis implies that strategic IT investments represent a distinctive competence contributing to financial success. Companies that strategically leverage IT resources gain a competitive edge in terms of financial outcomes. These results concur with studies by Brynjolfsson and Hitt (2003) and Melville et al. (2004) emphasizing the role of IT in boosting productivity and operational efficiency. As a result, the applicability of these findings to Kurdistan's manufacturing context has been validated amid the unique challenges and opportunities presented by the region's economic and political landscape. In support of this, Nguyen et al. (2020) stressed the importance of aligning IT strategies with the operational needs of manufacturing firms. The study contributes to the validation of the RBV in the manufacturing sector by demonstrating that strategic IT investments, treated as valuable resources, lead to superior financial performance. This extends the applicability of RBV to a specific industry context, providing empirical evidence for the theory.

Thirdly, through the acceptance of hypothesis 3, the findings entail that firms with higher operational efficiency will exhibit superior financial performance compared to those with lower operational efficiency. The findings are consistent with SAT which emphasizes the alignment of internal processes with strategic goals (Shamekh, 2008). Firms with higher operational efficiency are likely to align their operational strategies with broader business objectives, resulting in a positive impact on financial performance. Existing literature on operational efficiency often highlights the direct correlation between cost reduction and profitability (Loong & Chong, 2019; Maudos & Pastor, 2003). Firms that excel in operational efficiency can reduce production costs, minimize overheads, and enhance overall cost-effectiveness, leading to improved financial performance. Empirically, these findings are in support of findings by Maudos and Pastor (2003) that found a positive relationship between cost efficiency and profitability in the banking sector and findings by Loong and Chong

(2019) in the manufacturing sector, which demonstrated that firms with higher operational efficiency tend to achieve superior returns on assets. With both the banking sector (Loong & Chong, 2019) and the manufacturing sector (Maudos & Pastor, 2003) context having provided similar results with the current study, it, therefore, entails that firms with higher operational efficiency will exhibit superior financial performance compared to those with lower operational efficiency.

Fourthly, by rejecting hypothesis 4 ($\beta_4=0.187$; $p=0.078$) and this entails that firm efficiency does not mediate the positive impact of IT investments on overall firm performance. These findings are in contrast to a study by Bharadwaj, Chauhan and Raman (2015) emphasizing the mediating role of organizational capabilities, including efficiency, in translating IT investments into improved performance. This also contradicts findings by Zhu et al. (2019) denoting that efficient use of IT resources, including effective implementation and management, is crucial for realizing the full benefits of IT investments. The rejection of the mediation hypothesis indicates that the impact of IT investments on overall firm performance in Kurdistan's manufacturing companies may be diverse and operate through multiple channels beyond the improvement of firm efficiency. The direct positive impact of IT investments highlights the strategic importance of technology for manufacturing companies in Kurdistan. While efficiency gains are valuable, the study suggests that IT investments contribute directly to overall firm performance, emphasizing a broader and more comprehensive role for technology in business success. This underscores the strategic importance of technology in contributing to various aspects of business success beyond the mediation of firm efficiency.

Conclusion

The primary aim of the study was to fill the void in existing knowledge by providing insights tailored to the unique challenges and opportunities faced by manufacturing companies operating in Kurdistan. The objectives of this research are twofold: first, to examine the relationship between IT investments and firm efficiency in the manufacturing sector of Kurdistan; and second, to assess how these IT investments

translate into tangible financial performance outcomes for companies in the region. Amid such attempts, the following were established:

- Manufacturing companies that strategically invest in information technology will experience higher levels of operational efficiency and financial performance compared to those with limited IT investments.
- Firms with higher operational efficiency will exhibit superior financial performance compared to those with lower operational efficiency.
- The findings suggest a dynamic and multifaceted relationship between IT investments and overall firm performance in manufacturing companies in Kurdistan.

Practical implications

- Manufacturing companies can use these findings to inform their strategic IT planning. Understanding that strategic IT investments positively impact operational efficiency emphasizes the need for careful planning and alignment of IT initiatives with overall business goals.
- Manufacturing companies should prioritize strategic IT planning as an integral part of their overall business strategy. The study highlights the importance of aligning IT investments with financial objectives, emphasizing that strategic planning in this regard can lead to improved financial outcomes.
- Manufacturing companies are encouraged to prioritize operational excellence initiatives to enhance efficiency across various business functions. This may involve implementing process improvement methodologies, adopting technology solutions, and fostering a culture of continuous improvement.
- The mediating effect findings call for a strategic and holistic approach to technology management in manufacturing companies in Kurdistan, encouraging a thorough exploration of the multifaceted impact of IT initiatives on business success.

Constraints and Limitations Encountered:

- The findings cannot be generalised to non-manufacturing companies, areas other than Qushtapa Industrial Area, Sheikh Choly Industrial Area, Erbil Free Zone and Erbil Industrial Zone and Kurdistan.
- The study might have encountered challenges related to cross-cultural differences within Kurdistan's diverse manufacturing companies, affecting the interpretation and applicability of findings across various organizational contexts.

Areas for Future Studies:

- Future research could employ longitudinal designs to track changes in IT investments, firm efficiency and financial performance over time, providing insights into causality and dynamic relationships.
- Investigating the mediation effect of firm efficiency in various industries cities within Kurdistan could provide a nuanced understanding of how different factors interact in specific settings.
- Comparative studies between Kurdistan and other regions or countries could shed light on IT investments, firm efficiency and financial performance dynamics.

References:

- Bharadwaj, S. S., Chauhan, S., & Raman, A. (2015). Impact of knowledge management capabilities on knowledge management effectiveness in Indian organizations. *Vikalpa*, 40(4), 421-434.
- Braim, S. J., & Mohammed, R. B. (2022). The Impact of Audit Committee Composition and Performance on Financial Reporting Quality in Kurdistan's Industrial Companies. *QALAAI ZANIST JOURNAL*, 7(4), 1051-1070
- Brynjolfsson, E., & Hitt, L. M. (2003). Computing productivity: Firm-level evidence. *Review of economics and statistics*, 85(4), 793-808.
- Chege, S. M., Wang, D., & Suntutu, S. L. (2020). Impact of information technology innovation on firm performance in Kenya. *Information Technology for Development*, 26(2), 316-345.

- Demirgüç-Kunt, A., & Huizinga, H. (2011). *Do We Need Big Banks?: Evidence on Performance, Strategy and Market Discipline*. Centre for Economic Policy Research.
- Ferreira, M. P., Serra, F. R., Costa, B. K., & Almeida, M. (2016). A bibliometric study of the resource-based view (RBV) in international business research using barney (1991) as a key marker. *Innovar*, 26(61), 131-144.
- Ghasemaghaei, M., Ebrahimi, S., & Hassanein, K. (2018). Data analytics competency for improving firm decision making performance. *The Journal of Strategic Information Systems*, 27(1), 101-113.
- Kline, R. B. (2023). *Principles and practice of structural equation modeling*. Guilford publications.
- Loong Lee, W., & Chong, A. L. (2019). The effects of entrepreneurial orientation on the performance of the Malaysian manufacturing sector. *Asia-Pacific Journal of Business Administration*, 11(1), 30-45.
- Making, I. R. I. D. (2020). Activity based costing system and its role in decision making. A case study of cement companies in kurdistan region of iraq. *International Journal of Psychosocial Rehabilitation*, 24(06), 5915-5929.
- Maudos, J., & Pastor, J. M. (2003). Cost and profit efficiency in the Spanish banking sector (1985–1996): a non-parametric approach. *Applied Financial Economics*, 13(1), 1-12.
- Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Information technology and organizational performance: An integrative model of IT business value. *MIS quarterly*, 283-322.
- Nguyen, H., Onofrei, G., Harrison, N., & Truong, D. (2020). The influence of cultural compatibility and product complexity on manufacturing flexibility and financial performance. *Operations Management Research*, 13(3-4), 171-184.
- Okafor, A., Adeleye, B. N., & Adusei, M. (2021). Corporate social responsibility and financial performance: Evidence from US tech firms. *Journal of Cleaner Production*, 292, 126078.
- Pesce, D., & Neirotti, P. (2023). The impact of IT–business strategic alignment on firm performance: The evolving role of IT in industries. *Information & Management*, 60(5), 103800.
- Rigby DK, Reichheld FF, Schefter P. Avoid the four perils of CRM. *Harvard Bus. Rev.* (2002) 80(February):101–109

- Ringle, C., Da Silva, D., & Bido, D. (2015). Structural equation modeling with the SmartPLS. *Bido, D., da Silva, D., & Ringle, C. (2014). Structural Equation Modeling with the Smartpls. Brazilian Journal Of Marketing, 13(2).*
- Schweikl, S., & Obermaier, R. (2020). Lessons from three decades of IT productivity research: towards a better understanding of IT-induced productivity effects. *Management Review Quarterly, 70(4), 461-507.*
- Sultan, K., Ahmed, R. R., Jafar, R., Murtaza, M. M., & Gardi, B. (2020). Corporate financial policy and its impact on sustainable capital structure: empirical evidence from textile firms of pakistan. *Humanities & Social Science Review, 149-158.*
- Shamekh, F. R. (2008). *Business-IT strategic alignment concept in theory and practice* (Master's thesis).
- Sobhani, A., Shokoohyar, S., & Sobhani, A. (2021). Investigating the effects of information technology investment on the performance of telecommunication companies. *International Journal of Applied Decision Sciences, 14(3), 343-360.*
- Talab, H. R., & Flayyih, H. H. (2023). An Empirical Study to Measure the Impact of Information Technology Governance Under the Control Objectives for Information and Related Technologies on Financial Performance. *International Journal of Professional Business Review: Int. J. Prof. Bus. Rev., 8(4), 25.*
- Talab, H. R., & Flayyih, H. H. (2023). An Empirical Study to Measure the Impact of Information Technology Governance Under the Control Objectives for Information and Related Technologies on Financial Performance. *International Journal of Professional Business Review: Int. J. Prof. Bus. Rev., 8(4), 25.*
- Volberda, H. W., Khanagha, S., Baden-Fuller, C., Mihalache, O. R., & Birkinshaw, J. (2021). Strategizing in a digital world: Overcoming cognitive barriers, reconfiguring routines and introducing new organizational forms. *Long Range Planning, 54(5), 102110.*
- Zhu, X., Xiao, Z., Dong, M. C., & Gu, J. (2019). The fit between firms' open innovation and business model for new product development speed: A contingent perspective. *Technovation, 86, 75-85.*

901

تقييم تأثير استثمارات تكنولوجيا المعلومات على كفاءة الشركات والأداء المالي في شركات التصنيع في كردستان: تحليل التسويق عبر محرك البحث

ملخص:

يهدف هذا البحث إلى دراسة تأثير استثمارات تكنولوجيا المعلومات على الكفاءة والأداء المالي للشركات الصناعية في إقليم كردستان. تم استخلاص 382 إجابة على الاستبيان من المناطق الصناعية في أربيل وهي منطقة قوشنبة الصناعية ومنطقة الشيخ جولي الصناعية والمنطقة الحرة في أربيل والمنطقة الصناعية في أربيل وتم تحليلها باستخدام منهج نمذجة المعادلات الهيكلية. وكشفت النتائج أن شركات التصنيع التي تستثمر بشكل استراتيجي في تكنولوجيا المعلومات ستشهد مستويات أعلى من الكفاءة التشغيلية والأداء المالي مقارنة بتلك التي لديها استثمارات محدودة في تكنولوجيا المعلومات. كما تم الكشف عن أن الشركات ذات الكفاءة التشغيلية الأعلى ستظهر أداءً ماليًا متفوقًا مقارنة بتلك ذات الكفاءة التشغيلية المنخفضة. تشير النتائج إلى وجود علاقة ديناميكية ومتعددة الأوجه بين استثمارات تكنولوجيا المعلومات والأداء العام للشركة في شركات التصنيع في كردستان. يمكن لشركات التصنيع استخدام هذه النتائج لتوجيه تخطيطها الاستراتيجي لتكنولوجيا المعلومات إن فهم أن الاستثمارات الإستراتيجية في تكنولوجيا المعلومات تؤثر بشكل إيجابي على الكفاءة التشغيلية يؤكد على الحاجة إلى التخطيط الدقيق ومواءمة مبادرات تكنولوجيا المعلومات مع أهداف العمل الشاملة، الكلمات المفتاحية: الاستثمار في تكنولوجيا المعلومات، الأداء المالي، كفاءة الشركة كردستان، تأثير الوساطة، نمذجة المعادلة الهيكلية