2023

ORGANIZATIONAL INFORMATION SYSTEMS (IS) STRATEGY, IT GOVERNANCE, AND FIRM PERFORMANCE: TWO ESSAYS ON HOW IT FIRMS UTILIZE THE ROLES OF IS STRATEGY AND IT GOVERNANCE TO IMPROVE FIRM PERFORMANCE

Xiaqing He

ORGANIZATIONAL INFORMATION SYSTEMS (IS) STRATEGY, IT GOVERNANCE, AND FIRM PERFORMANCE: TWO ESSAYS ON HOW IT FIRMS UTILIZE THE ROLES OF IS STRATEGY AND IT GOVERNANCE TO IMPROVE FIRM PERFORMANCE

By

XIAQING HE

DISSERTATION

Submitted in partial fulfillment of the requirements

for the degree of Doctor of Philosophy in information systems at

The University of Texas at Arlington

August 2023

Arlington, Texas

Supervising Committee:

Dr. Sridhar Nerur, Supervising Professor

Dr. Jennifer Zhang

Dr. Mahmut Yasar

Dr. Ruochen Liao

ACKNOWLEDGEMENTS

I thank my Supervising Professor, Dr. Nerur, and supervising committee for their time and help.

DEDICATION

My deepest gratitude goes to my dear mentor and advisor Dr. Sridhar Nerur for being such an amazing source of guidance, wisdom, inspiration, and support throughout the process. I also want to extend my deepest gratitude and appreciation to my committee members: Dr. Jennifer Zhang, for being such an incredible source of advice and support; Dr. Mahmut Yasar, for offering ideas and suggestions on how to improve the quality and writing of this dissertation; Dr. Ruochen Liao, for believing in me and providing endless advice and encouragements academically and career-wise.

I sincerely thank all my colleagues, friends, and students at the University of Texas at Arlington. Thank you to Dr. Jingguo Wang, Dr. Jennifer Zhang, Dr. Radha Mahapatra, and Dr. Riyaz Sikora for your encouragement, support, and mentorship. I also wish to thank doctoral students in the information systems program with whom I had the privilege and honor to share a piece of this journey, including Jiang, Vidya, Mohammad, Ankit, Samaneh, Gajanan, and Albert. Thank you for being such good friends and colleagues.

Most importantly, I want to thank my family, especially my mom and dad, for supporting me from the beginning. Without their tremendous sacrifice, endless love, and dedication, I wouldn't have achieved this. Also, thanks to my husband for your love and my daughter for your sweet smile. Any accomplishments I may claim would not have been possible without your support and unconditional love during this path. Thank you.

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

ORGANIZATIONAL INFORMATION SYSTEMS (IS) STRATEGY, IT GOVERNANCE, AND FIRM PERFORMANCE: TWO ESSAYS ON HOW IT FIRMS UTILIZE THE ROLES OF IS STRATEGY AND IT GOVERNANCE TO IMPROVE FIRM PERFORMANCE

Xiaqing he, Ph.D

The University of Texas at Arlington, 2023

Supervising Professor: Sridhar Nerur

This dissertation includes two essays. For essay one, we investigate the implications of organizational wireless and mobile strategy on firm performance in the context of publicly traded information technology firms in the United States. A research model is developed to examine the roles of information technology investment and chief information officer compensation in moderating the relationship between wireless and mobile strategy and firm performance. Topic modeling techniques and ordinary least squares regression are employed to analyze the data. The results support the positive effects of wireless and mobile strategy on firm performance. Additionally, chief information officer compensation is found to improve the performance implications of wireless and mobile strategy significantly. Furthermore, information technology investment strengthens the positive impact of wireless and mobile strategy on firm performance.

Essay two examines how a firm's IT governance affects IT investment and, consequently, firm performance, emphasizing the moderating role of risk-taking orientation. The practical implementation and alignment of IT governance practices are crucial for realizing the desired performance outcomes. Furthermore, the mechanism through which IT governance practices influence firm performance remains unclear and limited. Unlike the prevalent use of survey and case study methodologies in the strategic orientation literature, we employ Linguistic Inquiry and Word Count (LIWC) techniques to measure risk-taking orientation in the IT industry context. Drawing on text data from 418 public firms in the IT industry, this study identifies the complete and positive mediating role of IT investment between IT governance and firm performance. Moreover, it finds that risk-taking orientation positively moderates the relationship between IT

investment and firm performance. This study contributes to the IT governance literature by shedding light on the underlying mechanisms through which IT governance influences firm performance and the moderating role of risk-taking orientation.

Keywords: Wireless and mobile strategy, Firm performance, Information technology investment, Chief information officer compensation, Topic modeling, RBV, IT Governance, Risk-taking Orientation, LIWC, Firm Performance, IT Investment.

TABLE OF CONTENTS

CHAPTER 1. UTILIZING MACHINE LEARNING TO EXPLORE THE RELATIONSHIP BETWEEN ORGANIZATIONAL WIRELESS AND MOBILE STRATEGY AND FIRM PERFORMANCE: THE MODERATING ROLES OF IT INVESTMENT AND CIO COMPENSATION

Abstract

This study investigates the implications of organizational wireless and mobile strategy on firm performance in the context of publicly traded information technology firms in the United States. A research model is developed to examine the roles of information technology investment and chief information officer compensation in moderating the relationship between wireless and mobile strategy and firm performance. Based on the resource-based view, it is hypothesized that information technology investment positively moderates the relationship between wireless and mobile strategy and firm performance. Similarly, chief information officer compensation is expected to strengthen the positive relationship between wireless and mobile strategy and firm performance. Data is collected from CrunchBase, Compustat, BoardEx, and companies' official websites to test these hypotheses. Topic modeling techniques and ordinary least squares regression are employed to analyze the data. The results support the positive effects of wireless and mobile strategy on firm performance. Additionally, chief information officer compensation is found to improve the performance implications of wireless and mobile strategy significantly. Furthermore, information technology investment strengthens the positive impact of wireless and mobile strategy on firm performance. This study concludes by discussing the theoretical and practical implications of these findings.

Keywords: Wireless and mobile strategy, Firm performance, Information technology investment, Chief information officer compensation, Topic modeling, RBV

Introduction

As an essential and integral part of organizational information systems, a firm's wireless and mobile techniques are crucial to organizational performance (Viete & Erdsiek 2020; Picoto, Belanger, & Palma-dos-Reis 2012). A firm's information systems (IS) strategy emphasis on wireless and mobile techniques has been recognized as a critical component in research and IS practice (Agrawal & Zeng 2015). The success of businesses is closely tied to the impact of information technology on their ability to create and capture value for profitability (Drnevich & Croson, 2013). In this study, we focus on a firm's strategy from the perspective of wireless and mobile techniques, which is called wireless and mobile strategy in this paper. By following the existing definition of IS strategy and the characteristics of wireless technologies and mobile platforms, wireless and mobile strategy can be defined as an organizational viewpoint regarding investing in, deploying, using, and managing wireless techniques and mobile platforms. It is the shared view of the role of wireless techniques and mobile platforms within the firm (Chen et al. 2010; Bhargava & Sundaresan 2013; Rappaport 2002; Ghasemi & Sousa 2005).

Numerous studies have shown that wireless and mobile techniques can have a positive and significant influence on various organizational outcomes, including financial performance, productivity, and innovation (Viete & Erdsiek 2020; Picoto, Belanger, & Palma-dos-Reis 2012; Stoica, Roach, & Price, 2012).

The impact of wireless and mobile strategy on firm performance can manifest in different ways, such as organizational financial performance, workforce productivity, remote work, enterprise mobility, and collaboration tools (Madden & Madden 2013;

Picoto et al. 2012; Viete & Erdsiek 2020; Kim, Park, & Komarek 2021; Stoica, Roach, & Price 2012; Viete & Erdsiek 2020). Mobile platforms have transformed commerce and business operations, enabling mobile payments, mobile marketing, and e-commerce strategies (Mennecke & Strader, 2003). Furthermore, mobile platforms have reshaped advertising and marketing strategies, including location-based advertising, mobile apps, and personalized content delivery (Sharma, Herzog, & Melfi, 2008). Empirical findings demonstrate that mobile platforms positively and significantly affect the organization's performance.

In addition, it is worth noting that existing studies in the field of wireless and mobile strategy predominantly rely on exploratory studies such as expert interviews or survey-based data (Picoto et al., 2012; Stoica, Roach, & Price, 2012; Viete & Erdsiek 2020), inductive content analysis (Seedoyal Doargajudhur & Hosanoo 2023), and qualitative and quantitative methods (Choudhary et al. 2022), which can be prone to common method and subjective biases. The conventional approach for measuring wireless and mobile strategy using survey-based instruments may be susceptible to subjectivity from individuals' attitudes and emotions. Consequently, replicating prior studies becomes challenging. Although machine learning techniques, such as topic modeling, have been successfully employed to extract insights from unstructured text data in various domains (Choi, Menon & Tabakovic, 2021), to the best of our knowledge, no research employs these techniques to measure organizational wireless and mobile strategy. Thus, one of this research goals is to address the measurement challenge by adopting a novel approach based on natural language processing (NLP). Drawing inspiration from Choi, Menon, and Tabakovic (2021), we employ NLP to

measure the relative emphasis placed on wireless and mobile strategy in the mission, vision, and strategy statements of 418 publicly traded IT firms in the United States. Specifically, we used unsupervised machine learning techniques (i.e., topic modeling and hierarchical clustering) to infer firms' wireless and mobile strategy from the unstructured mission, vision, and strategy statements extracted from their official websites.

In light of the preceding discussions, this study aims to answer the following research questions:

1) How does organizational wireless and mobile strategy impact firm performance?

2) How does IT investment moderate the relationship between wireless and mobile strategy and firm performance?

3) How does CIO compensation moderate the relationship between wireless and mobile strategy and firm performance?

4) What are the direct effects of IT investment and CIO compensation on firm performance?

As a widely used strategic tool, mission statements are created by corporations for several purposes. They assert leadership (Klemm et al., 1991), inform employees of organizational goals and unify their efforts (Bart, 1998; Ireland & Hitt, 1992; Klemm et al., 1991; Pearce & David, 1987), act as an effective public relations tool (Bart, 1998; Falsey, 1989), provide a rationale for resource allocation (Bart, 1998; Bart et al., 2001), and inspire enthusiasm about the firm (Bartkus et al., 2000; Collins & Porras, 1991; Ireland & Hitt, 1992). Mission statements also guide critical strategic decision-making

(Ireland & Hitt, 1992). Therefore, it is believed that mission statements should reflect thoughtful consideration, careful planning, collaboration, and informed decision-making (Stallworth Williams, 2008). Both mission and vision statements guide a firm's strategic direction and communicate its purpose to stakeholders. Vision statements, in particular, articulate a firm's aspirations for the future and provide a long-term perspective on goals and achievements (Collins & Porras, 1996; Kotler & Armstrong, 2016; Pearce & Robinson, 2015; Rafferty & Griffin, 2004). While well-crafted mission and vision statements can improve firm performance, their effectiveness may depend on their alignment with the goals and values of the firm. Therefore, ongoing assessment and carefully crafting mission and vision statements are necessary to ensure their efficacy.

Our empirical analysis of unstructured mission, vision, and strategy text data from the official websites of 418 publicly traded IT firms in the United States and financial data spanning 2022-2023 reveals a positive association between wireless and mobile strategy and firm performance. Furthermore, this relationship is positively and significantly moderated by CIO compensation. CIOs involved in strategic decision-making and with a deeper understanding of the business's goals can better design wireless and mobile strategies that support and enhance the firm's overall performance. Besides, a well-compensated CIO may have more leverage in advocating for adequate resources to implement and maintain the wireless and mobile systems strategy, leading to better execution and improved firm performance. Higher CIO compensation can incentivize CIOs to align their efforts and decisions more closely with the organization's strategic goals. This alignment ensures that the wireless and mobile

strategy directly contributes to the firm's overall performance. Overall, the positive interaction between wireless and mobile strategy and CIO compensation can be attributed to various factors, including alignment of interests between the CIO and the firm, optimal resource allocation, and strategic decision-making. Accordingly, firms should design an optimal CIO compensation structure that incentivizes the CIO to prioritize the firm's long-term strategic objectives and make IT investment decisions in line with the wireless and mobile strategy.

IT investment also has the potential to improve the positive impact of wireless and mobile strategy on firm performance. There are three possible explanations for this finding. First, strategic IT investments can provide the organization with new capabilities and resources that align with its business strategy. These investments may include implementing advanced software, adopting cloud computing, utilizing big data analytics, or investing in artificial intelligence and automation (Sambamurthy, Bharadwaj & Grover 2003; Mell & Grance 2011; Davenport & Patil 2012; Brynjolfsson & McAfee 2014). Such capabilities can improve operational efficiency, decision-making, customer service, and competitiveness. Second, IT investments aligned with the wireless and mobile strategy can directly support achieving specific business objectives (McFarlan & Nolan 1995; Henderson & Venkatraman 1993; Li & Du 2014; Pavlou & El Sawy 2010). For instance, if the strategy focuses on expanding online sales channels, investing in e-commerce platforms and digital marketing tools would reinforce and amplify that goal. Finally, effective IT investments can lead to better data management and analysis, enabling data-driven decision-making critical for informed, strategic choices that positively impact firm performance. Investing in IT

infrastructure and systems can make an organization more agile and flexible in responding to market changes and opportunities (Weill & Ross 2004; Sambamurthy, Bharadwaj, & Grover 2003; Bharadwaj et al. 2013; Brown et al. 2012). This adaptability is crucial in today's rapidly evolving business landscape .

These findings have significant implications for wireless and mobile strategy research, as they highlight the crucial roles played by IT investment and CIO compensation in shaping the implementation of wireless and mobile strategy. Furthermore, our study contributes to applying machine learning techniques in wireless and mobile strategy domains. Prior research has already demonstrated the usefulness of machine learning in creating strategic-related construct measures (Choi, Menon, & Tabakovic 2021), and our study builds upon this by providing a novel perspective on deriving measurements and operationalizing the relative emphasis on wireless and mobile strategy reflected in mission, vision, and strategy statements. We offer valuable insights that complement and enrich the existing wireless and mobile strategy literature by applying machine learning techniques. Additionally, our study sheds light on the potential moderating effects of IT investment and CIO compensation, deepening our understanding of the mechanisms in the relationship between wireless and mobile strategy and firm performance. Overall, this research contributes to advancing the knowledge of wireless and mobile strategy by incorporating machine learning techniques and identifying the moderating roles of IT investment and CIO compensation.

This study is organized as follows. An overview of the literature review is provided in section 2, which has contributed to the field of wireless and mobile strategy

studies. It also compares this study with prior research and discusses the theory utilized in this study. Section 3 develops the research model and formulates the corresponding hypotheses based on existing theories and studies. Section 4 outlines the data collection process and describes the analysis methods used in this research. It also discusses the research questions and details the data features and structure. The study's main findings and their implications for research and practice are discussed in section 5. The paper concludes with section 6 by summarizing the key points and contributions of the study.

Literature review

Wireless and Mobile-related Literature

The literature on mobile platforms encompasses various topics encompassing the design, development, impact, and challenges of mobile operating systems, applications, and devices. For the topic of the evolution and development of mobile platforms, this area explores the historical evolution of mobile platforms from basic feature phones to advanced smartphones and tablets, highlighting the progression of operating systems, hardware, and user experiences (Corral et al. 2012; Sarkar et al. 2019; Hartmann, Stead, & DeGani 2011). As to the impact on business and economic implications, researchers analyze the economic impact of mobile platforms on firms, industries, and economies (Stoica, Roach, & Price 2012; Picoto et al. 2012; Soh & Grover 2020). Mobile platforms have transformed commerce and business operations, enabling mobile payments, mobile marketing, and e-commerce strategies (Mennecke & Strader, 2003). Researchers also explore how mobile platforms have reshaped advertising and marketing strategies, including location-based advertising, mobile apps, and personalized content delivery (Sharma, Herzog, & Melfi 2008). Furthermore,

mobile platforms influence retail operations, customer engagement, online-to-offline integration, and "omnichannel" retail (Hayden & Webster 2014). Finally, mobile platforms affect organizational financial performance, workforce productivity, remote work, enterprise mobility, and collaboration tools (Madden & Madden 2013; Picoto et al. 2012; Viete & Erdsiek 2020; Kim, Park, & Komarek 2021). Empirical findings demonstrate that mobile platforms have a positive and significant effect on the overall organization performance, underscoring the necessity of adopting wireless technology (Stoica, Roach, & Price 2012; Viete & Erdsiek 2020). Table 1.8 summarizes the organizational performance implications of mobile platforms-related literature.

The literature on wireless technology spans various topics related to wireless communication, networks, and their impact on multiple aspects of society, business, and technology (Rappaport 2002; Gibson 2012; Yang 2014). Research has explored how wireless technology adoption and effective utilization impact various aspects of business performance (Stoica, Roach, & Price 2012; Ozcan & Eisenhardt 2009). In other words, adopting and effectively using wireless technology can contribute to improved communication, efficiency, innovation, customer engagement, and competitive advantage. Finally, the literature on intelligent communication explores the intersection of advanced technologies, data analytics, and communication systems to enable more efficient and effective information exchange (Terashima 2001; Benyoucef & Grabot 2010).

In summary, prior studies mainly adopt exploratory studies such as expert interviews and a web survey (Picoto et al., 2012; Stoica, Roach, & Price, 2012; Viete & Erdsiek, 2020), inductive content analysis (Seedoyal Doargajudhur & Hosanoo,

2023), and qualitative and quantitative methods (Choudhary et al. 2022). This study differs from extant studies since it uses text analysis techniques to extract essential variables like wireless and mobile strategy from firms' mission, vision, and strategy statements. Nonetheless, this study is also considering the moderating roles of CIO compensation and IT investment, which are not jointly taken into account by prior studies.

The Rationale for using the Resource-Based View (RBV) of a firm

As one of the prominent theories in the field of strategic management, the Resource-Based View (RBV) has been extensively utilized by researchers in the information systems (IS) domain (Wade & Hulland, 2004; Bharadwaj, 2000; Mikalef et al. 2020; Wu, Straub, & Liang 2015). RBV is a crucial perspective for understanding why some firms outperform others. While RBV continues to evolve, contemporary insights highlight the importance of resource management in enhancing firm performance (Sirmon, Hitt, & Ireland, 2007; Sirmon, Hitt, Ireland, & Gilbert, 2011).

Drawing on the foundational work of Penrose in the early 1950s, RBV conceptualizes a firm as a bundle of strategic resources that serve as the foundation for achieving sustained competitive advantage (Barney, 1986, 1991; Wernerfelt, 1984; Penrose, 1959). RBV focuses on the internal resources of firms as sources of competitive advantage. It assumes that these resources are idiosyncratic and immobile. The former implies that firms within an industry must possess heterogeneity regarding the strategic resources they control. At the same time, the latter suggests that firm-controlled resources cannot be easily transferred or replicated across firms, resulting in long-lasting heterogeneity.

In RBV, firm resources are expected to possess specific characteristics to contribute to sustained competitive advantage. They should be valuable, rare, inimitable, and non-substitutable (Barney 1991; Wernerfelt 1984; Peteraf 1993). Furthermore, RBV has been extended to resource orchestration, which emphasizes the strategic actions of firm managers in structuring, bundling, and leveraging resources to create and sustain competitive advantage (Sirmon et al., 2011).

Research Model and Hypotheses

Information technology (IT) investment has the potential to directly create value for organizations (Bharadwaj, Paul, & Srivastava 2013; Brynjolfsson & Hitt 1996). However, its effectiveness can be enhanced when integrated with the organization's wireless and mobile strategy, improving IT capabilities and sustained competitive advantages (Picoto et al. 2012). Therefore, it is crucial for organizational leaders to align their IT investments and assets with the wireless and mobile strategy, thereby developing their IT abilities and skills. In this study, we adopt the Resource-Based View (RBV) theoretical perspective to examine the impact of the interactions between wireless and mobile strategies and IT investment on firm performance.

Additionally, we explore the role of the Chief Information Officer (CIO) in organizations and investigate how CIO compensation may influence the performance implications of wireless and mobile strategy. The CIO is critical in overseeing the organization's IT function and aligning it with the overall business strategy (Luftman & Kempaiah 2007; Ross & Weill 2002). We hypothesize that the compensation provided to the CIO can significantly influence their priorities and interests, which, in turn, can affect the implementation and outcomes of the wireless and mobile strategy.

Figure 1.1 illustrates the research model, which outlines the relationships and corresponding hypotheses to be tested in this study.

Hypotheses

Based on Chen et al. (2010)'s extensive review of the strategic management literature, wireless and mobile strategy can be defined as the organizational viewpoint regarding investing in, deploying, using, and managing wireless and mobile techniques. It is the shared view of the role of wireless and mobile techniques within the organization (Chen et al. 2010; Bhargava & Sundaresan 2013; Rappaport 2002; Ghasemi & Sousa 2005). Alternatively, wireless and mobile strategy provides a common understanding within a firm that guides subsequent decisions regarding IT investment and deployment in wireless and mobile techniques. Empirical studies have consistently shown positive implications of wireless and mobile for firm performance (Picoto et al. 2012; Stoica et al. 2012; Viete & Erdsiek 2020).

If a firm adopts innovative wireless and mobile techniques and strategy, it prioritizes responding to external opportunities and exploring and leveraging them for strategic benefits. During the implementation of the wireless and mobile strategy, the firm acquires and enhances information systems resources such as IS human capital, IT infrastructure flexibility, and IS relationship quality (Venkatesh, Brown, & Bala, 2013; Wei & Balasubramanian 2004; Gounaris & Dimitriadis 2003; Iyer & Henderson 2010). These resources are instrumental in supporting and implementing the wireless and mobile strategy. Mobile platforms would also transform commerce and business operations, enabling mobile payments, mobile marketing, and e-commerce strategies (Mennecke & Strader 2003). Mobile platforms have reshaped advertising and

marketing strategies, including location-based advertising, mobile apps, and personalized content delivery (Sharma, Herzog, & Melfi, 2008). Finally, mobile platforms affect organizational financial performance, workforce productivity, remote work, enterprise mobility, and collaboration tools (Madden & Madden 2013; Picoto et al. 2012; Viete & Erdsiek 2020; Kim, Park, & Komarek 2021). Empirical findings demonstrate that mobile platforms have a positive and significant effect on the overall organization performance, underscoring the necessity of adopting wireless technology (Stoica, Roach, & Price 2012; Viete & Erdsiek 2020). Given the perspective of the Resource-Based View (RBV), a firm's wireless and mobile resources and technology are decisive in determining its ability to achieve a competitive advantage (Barney, 1991; Aydiner et al., 2019; Teece, 2007), thereby positively influencing its overall firm performance. Consistent with the prior studies, we propose the following hypothesis:

H1: Organizational wireless and mobile strategy is positively related to firm performance.

CIOs are pivotal in managing and implementing information systems within a firm, significantly influencing its productivity, efficiency, and profitability (Yayla & Hu, 2008; Yayla & Hu, 2014). Organizations often offer higher compensation packages as incentives to attract and retain highly skilled CIOs capable of driving innovation and optimizing IT utilization to enhance firm performance. By hiring talented CIOs through competitive compensation, firms are likely to improve their IT capabilities, leading to superior financial performance, increased market share, and enhanced consumer satisfaction compared to their competitors. Considering the growing importance of digital transformation in achieving organizational success, CIOs assume a crucial role

in spearheading such initiatives. By providing robust IT support and adequate resources, firms have the opportunity to establish themselves as pioneers in digital endeavors and maintain a competitive edge, making the provision of attractive compensation to CIOs crucial for their overall success.

On the other hand, the compensation package offered to CIOs also indicates their responsibilities and the extent of their roles within a firm (Turedi & Erkan-Barlow, 2022). Typically, CIOs are accountable for managing IT budgets and overseeing projects. Competitive compensation can serve as a motivating factor for CIOs to take calculated risks and pursue ambitious objectives aimed at fostering innovation and improving organizational performance. In conclusion, a positive relationship exists between CIO compensation and firm performance, as a well-designed compensation package can attract highly capable CIOs who are instrumental in driving innovation, supporting digital transformation initiatives, and ultimately enhancing overall organizational performance . Therefore, we propose the following:

H2: CIO compensation is positively related to firm performance.

A substantial body of research has established a positive relationship between IT investment and firm performance. First, IT investment can enhance a firm's performance by improving efficiency and productivity. It enables firms to reduce labor costs and increase productivity through automation and streamlined processes (Brynjolfsson & Hitt, 2000; Huang & Liu, 2017). Second, IT investment enables better decision-making by supporting data analytics, enhancing strategic planning, forecasting, and risk management, leading to higher profitability and market value (Melville et al., 2004; Tarafdar et al., 2011). Finally, IT investment provides firms with

a competitive advantage by facilitating faster innovation, enabling quick responses to market changes, and delivering products and services to customers. It helps firms generate revenue and expand their market share and growth rates (Laudon & Laudon, 2018; Ray et al., 2019). Consequently,

H3: IT investment is positively related to firm performance.

For the following reasons, prior empirical studies have argued the positive moderating role of CIO compensation in the relationship between wireless and mobile strategy and firm performance. First, the alignment of interests between CIOs and firms can be influenced by CIO compensation (Dutta & Roy 2016; Chen & Huang 2017; Rai, Maruping, & Venkatesh 2009). Higher CIO compensation can incentivize CIOs to align their efforts and decisions more closely with the organization's strategic goals. This alignment ensures that the wireless and mobile strategy directly contributes to the firm's overall performance. Second, firms attract and retain top talent by providing high CIO compensation packages (Chan & Reich 2007; Laumer, Eckhardt, & Weitzel 2010).

Offering competitive compensation packages for CIOs can attract experienced and skilled professionals with the expertise to design and execute effective wireless and mobile strategies. Additionally, it can help retain talented CIOs whom other opportunities might otherwise lure away. Third, CIO compensation packages also reflect their responsibility within a firm. Wireless and mobile technology play a critical role in the modern business environment, and CIOs are responsible for ensuring the security, reliability, and efficiency of these wireless and mobile-based information systems. Higher compensation may be justified by the increased risks associated with the position. A well-compensated CIO may have more leverage in advocating for

adequate resources to implement and maintain the wireless and mobile strategy effectively, leading to better execution and improved firm performance. Thus,

H4: CIO compensation positively moderates the relationship between organizational wireless and mobile strategy and firm performance.

Existing empirical studies have demonstrated the positive moderating role of IT investment in the relationship between wireless and mobile strategy and firm performance (Sabherwal & Chan 2001; Bharadwaj, Paul, & Srivastava 2013; Weill & Olson 1989). IT investment is crucial in enabling firms to implement their wireless and mobile strategies effectively, leading to improved performance outcomes. Specifically, when firms have a strategic orientation towards innovation and flexibility, IT investment allows them to leverage their wireless and mobile resources more effectively, resulting in enhanced performance.

In the context of the banking sector, investment in fixed assets has been shown to positively affect firms' profitability (Olatunji & Tajudeen, 2014). This study measures IT investment as software spending, representing intangible IT resources and assets. The software enables wireless and mobile technology's functionality, applications, and user experiences (Abowd & Mynatt, 2000; Akyildiz et al., 2006). The prominence of software in wireless and mobile technology is due to its ability to control and manage the hardware components, facilitate communication protocols, and provide a wide range of services to users (Isomursu & Lehtonen 2015; Gartner 2021; Heinzelman et al. 2002; Mitola III 1995).

IT investment significantly moderates the relationship between organizational wireless and mobile strategy and firm performance. By investing in wireless and mobile

technology, firms can enhance their implementation of wireless and mobile strategy, leading to improved performance outcomes. Therefore, we propose that IT investment positively moderates the relationship between wireless and mobile strategy and firm performance.

H5: IT investment positively moderates the relationship between organizational wireless and mobile strategy and firm performance.

Method

Data

We obtained our study's independent and dependent variables from multiple sources, namely Compustat, CrunchBase, and the official websites of publicly traded IT companies. To begin with, we compiled a comprehensive list of publicly traded companies from Compustat and then focused on selecting firms from the IT industry based on their Standard Industrial Classification (SIC) code. Our research sample consists of a total of 418 publicly traded IT companies.

Next, we collected mission, vision, and strategy statements from each IT company's official website. These statements are crucial indicators of a firm's strategic plans, outlining its business direction and strategic intent (Rarick & Vitton, 1995). By analyzing these mission, vision, and strategy statements, we gain insights into the organizational strategies of the IT companies of interest in our study. We have not found any existing studies that have utilized mission, vision, and strategy statements to measure organizational strategies.

In addition to the statements data, we collected IT spending data from the CrunchBase website, explicitly focusing on projections at the beginning of 2022.

Incorporating this information could complement the unstructured textual statements with quantitative IT spending data. The Compustat data were merged with the statements and IT spending data, providing a comprehensive dataset spanning 2022. The final dataset comprises 418 publicly traded IT companies, resulting in 370 observations.

We also gathered board data from the BoardEx database to include control variables in our analysis. These control variables help account for additional factors that may influence firm performance. The operationalization of the core constructs used in our study is outlined in Table 1.1.

The data collection involved gathering information from multiple sources to construct a comprehensive dataset that captures the relevant variables for our research analysis.

The measurement of the dependent variable in our study is the return on assets (ROA). ROA is a widely used financial ratio that indicates how effectively a firm generates profits from its total assets (Rostami, Rostami & Kohansal, 2016; Selling & Stickney, 1989). It is a key metric used by analysts, investors, and corporate management to assess a firm's efficiency in utilizing its assets to generate profit.

To measure the independent variable, wireless and mobile strategy, we employed the Latent Dirichlet allocation (LDA) technique to analyze the distribution of topics derived from the mission, vision, and strategy statements extracted from companies' official websites. LDA is a widely used topic modeling technique introduced by Blei, Ng, and Jordan (2003) and applied in various domains, including text analysis . This technique generates a probability distribution of topics, and based

on this distribution, we calculated the total scores of wireless and mobile strategy-related topics (Boyd, Gove, & Hitt, 2005). The higher the scores in the wireless and mobile strategy category, the greater the degree of shared perspective within a firm to pursue innovation and improve a firm's performance through IS tools. The measurement and derivation of wireless and mobile strategy measures from the topic modeling outputs are outlined in Table 1.1.

In Table 1.3, you will find descriptive statistics of the metrics used in our study, providing an overview of the variables' characteristics. Additionally, Table 1.4 presents the correlations among the variables, showing the relationships between different measures.

These tables provide valuable information on the measurement and descriptive statistics of the variables in our study, allowing for a comprehensive understanding of the data used in our analysis.

Nonetheless, our data analysis includes several control variables. These control variables help enhance the internal validity of the research by accounting for the influence of confounding and other extraneous factors that could affect the relationships under investigation.

The first control variable is the liquidity ratio, which measures a company's ability to meet short-term obligations or those due within one year (Beaver, 1966). This variable reflects a firm's financial stability and can impact its value (Husna & Satria, 2019). The age of the public firm is included as a control variable (Ling, Zhao & Baron, 2007). Age can influence performance as older firms may have established market positions and accumulated valuable resources. Revenue growth is also considered a

control variable (Thornhill, 2006). It captures the rate at which a firm's sales revenue increases, indicating its ability to expand and adapt to market dynamics.

Several board characteristics serve as control variables, including CEO compensation, gender ratio, board educational background, and the average age of board members. These variables reflect essential dimensions of corporate governance and can impact firm performance. By including these control variables, we can account for their potential influence on the relationships between wireless and mobile strategy, CIO compensation, IT investment, and firm performance, thereby strengthening the internal validity of our research.

Analysis techniques

Topic modeling

Developed in the 1990s by Deerwester et al. (1990), topic modeling is a widely used natural language processing (NLP) technique well-suited for analyzing text data. It aims to uncover latent themes or topics that represent the substantive content in a collection of documents. Topic modeling assumes that every document comprises a blend of various topics and a distribution of words characterizes every topic. Topic modeling is a statistical technique to unveil the inherent semantic structure within a set of documents and cluster them into meaningful topics. It has been applied in various domains to examine extensive text data and derive valuable insights.

The development of topic modeling can be traced back to latent semantic indexing (LSI) (Deerwester et al., 1990), which served as its foundation. Building upon LSI, probabilistic latent semantic analysis (PLSA) was introduced by Hofmann (2001), followed by the more comprehensive probabilistic generative model called Latent

Dirichlet Allocation (LDA) proposed by Blei et al. (2003). While other probabilistic models have been developed based on LSI, LDA has emerged as one of the most widely used topic models in the analysis of unstructured text data (Blei et al. 2003; Blei & Lafferty 2007; Griffiths & Steyvers 2004; Hong & Davison 2010). Researchers can uncover latent themes or topics within textual data by employing topic modeling techniques such as LDA, providing valuable insights into documents' underlying content and structure.

To perform the LDA analysis, we combined to create a corpus based on each firm's mission, vision, and strategy statements, resulting in a total of 418 documents for the sample. The number of topics for the LDA model is selected based on a triangulation approach using different measures of model fit, as shown in Figure 1.2. These measures include either minimized or maximized metrics

Figure 1.2 presents the four different measures of fit at various numbers of topics for the topic model estimation. The top panel displays two metrics that should be minimized for the best fit, while the bottom panel displays two metrics that should be maximized for the best fit. The values of these measures vary between 0 and 1, with 1 indicating the best fit. For this research, the optimal number of topics is determined to be 37 based on the fit measures.

After preprocessing the corpus, the LDA topic model is implemented using Python programming based on the selected optimal number of topics (Choudhury et al., 2019). It allows for extracting and analyzing the latent topics within the mission, vision, and strategy statements, providing insights into the content and themes across the sample of companies.

The LDA approach is a robust unsupervised machine-learning technique widely used in text analysis. According to Blei (2012), using Bayesian inference, LDA estimates the hidden parameters within a statistical framework. LDA identifies topics and keywords in a dataset without subjective bias by inverting the document generative process.

Unlike other methods, LDA is an unsupervised approach automatically extracts topics and keywords from preprocessed documents. However, it requires a specific number of topics to be generated as input. In the LDA estimation process, the algorithm analyzes the co-occurrence of words across documents and produces two main outputs: (1) the probability distribution of topics in each document and (2) the probability distribution of keywords in each topic. These outputs can be used to classify documents based on inferred topics.

This research applies the LDA algorithm to the dataset, generating 37 topics. Hierarchical clustering is a widely used technique in data analysis and machine learning that aims to cluster similar data points together based on their pairwise similarities or distances (Manning, Raghavan, & Schütze 2008; Jain & Dubes 1988; Lance & Williams 1967). This approach creates a hierarchical representation of data, where clusters are organized in a tree-like structure called a dendrogram. Hierarchical clustering can be particularly useful for organizing and understanding relationships within a dataset and visualizing the data's structure (Hahsler, Piekenbrock, & Doran 2020). Hierarchical clustering has applications in various fields, including biology, social sciences, marketing, and natural language processing (Everitt et al., 2011). In

topic modeling, hierarchical clustering can organize and classify topics generated from text data based on their semantic similarity (Manning et al., 2008).

By using hierarchical clustering, these 37 topics are classified into seven groups based on their cosine distances, shown in Figure 1.3, allowing for the identification of topics that have the highest relative emphasis on wireless and mobile strategy (Manning, Raghavan, & Schütze 2008; Das et al. 2007; Ding et al. 2002). This classification enables examining the relationship between these topics and firm performance outcomes. For this study, we have labeled these seven groups as shown in Table 1.7 and use the group mobile platforms and wireless solutions as a proxy of wireless and mobile strategy since they are significantly related for the following reasons. By following the definition of IS strategy and the characteristics of wireless technology and mobile platforms, wireless and mobile strategy can be defined as an organizational viewpoint regarding investing in, deploying, using, and managing wireless techniques and mobile platforms. It is the shared view of the role of wireless and mobile techniques within the organization (Chen et al. 2010; Bhargava & Sundaresan 2013; Rappaport 2002; Ghasemi & Sousa 2005). Based on the definition of wireless and mobile strategy, it emphasizes mobile platforms (Bhargava & Sundaresan 2013; Kamal & Shawish 2019), wireless technologies (Rappaport 2002; Goldsmith 2005), and intelligent communication (Mitra & Tzannes 2008; Ghasemi & Sousa 2005). Consistently, the group of mobile platforms and wireless solutions also has the keywords such as "mobile," "platform," "connect," "wireless," "technology," "communication," and "intelligent." While the other six topics are unrelated to the definition of wireless and mobile technology, thus we argue that the group of mobile platforms and wireless

solutions is considered the proxy measurement of wireless and mobile strategy. Figure 1.4 shows the entire process of generating topics based on the LDA algorithm and using hierarchical clustering to get 7 clusters. Based on these 7 clusters, we identify the group of mobile platforms and wireless solutions as the proxy of wireless and mobile strategy since their keywords are strongly correlated to the definition of wireless and mobile strategy (Chen et al. 2010; Bhargava & Sundaresan 2013; Rappaport 2002; Ghasemi & Sousa 2005).

OLS Regression

To test the hypotheses, we conducted an OLS regression analysis using a dataset comprising 370 firm-year observations from 418 publicly traded firms in the United States. These firms are selected based on their operation in the IT industry, as indicated by their four-digit standard industrial classification (SIC) codes.

Data from multiple sources are merged for each company in the sample, including financial data from Compustat, IT spending data from CrunchBase, CIO compensation data from BoardEx, and the wireless and mobile strategy measures generated using the LDA technique.

It is worth noting that firm performance is measured using a one-year lag of IT investment and wireless and mobile strategy, which follows the approach used in previous studies (Sabherwal et al., 2019; Dissanayake et al., 2021). This lag allows for assessing the impact of prior IT investment and wireless and mobile strategy on firm performance in subsequent periods.

Discussion

Outcomes of Hypotheses Testing

Table 1.5 shows the findings of the OLS regression analysis with robust standard errors, examining the impact of independent and moderating variables on firm value as measured by return on assets (ROA). Including the independent and moderating variables in the models improves the statistical fit, as indicated by R-squared increases and decreases in AIC and BIC.

Model 1 includes only the control variables. Model 2 introduces the direct effects of wireless and mobile strategy, IT investment, and CIO compensation on ROA. Model 3 incorporates IT investment as a moderator, examining its interaction with wireless and mobile strategy. Model 4 introduces CIO compensation as a moderator, examining its interaction with wireless and mobile strategy. Finally, Model 5 is the complete model that includes all the direct effects and interaction terms. By reviewing the coefficients and significance levels of the independent and moderating variables across the models, the study provides insights into the relationships between wireless and mobile strategy, IT investment, CIO compensation, and firm performance.

The results from Model 2 support Hypotheses 1 and 2. Hypothesis 1 states a positive relationship between wireless and mobile strategy and firm performance, supported by the statistically significant positive coefficient for wireless and mobile strategy ($\beta = 0.23$; $p < 0.05$). The findings indicate that firms with a solid wireless and mobile strategy tend to have higher firm performance, as measured by ROA.

Hypothesis 2 suggests that CIO compensation positively impacts firm performance, supported by the statistically significant positive coefficient for CIO

compensation ($\beta = 0.18$; $p < 0.001$). The results indicate that higher CIO compensation is associated with improved firm performance.

Hypothesis 3 proposes a positive relationship between IT investment and firm performance. Although this is not supported since the coefficient for IT investment is not significant($\beta = 0.0003$; $p > 0.10$), the direction of the relationship between IT investment and firm performance is positive.

Overall, the results provide evidence that wireless and mobile strategy and CIO compensation are essential factors influencing firm performance, and they support the hypotheses proposed in the study. Model 4 and Model 5 results support Hypothesis 4, which suggests that CIO compensation moderates the relationship between wireless and mobile strategy and firm performance.

The statistically significant positive coefficients for the interaction term between wireless and mobile strategy and CIO compensation ($\beta = 0.53$; $p < 0.01$; $\beta = 0.47$; $p < 0.05$) indicate that the positive relationship between wireless and mobile strategy and firm performance is positively moderated by CIO compensation. It means that as CIO compensation increases, the positive impact of wireless and mobile strategy on firm performance becomes stronger.

In other words, firms with higher CIO compensation may experience an improved effect of wireless and mobile strategy on firm performance compared to firms with lower CIO compensation. This finding suggests that CIO compensation can influence the effectiveness of wireless and mobile strategies in driving firm performance. Overall, the results demonstrate that the relationship between wireless

and mobile strategy and firm performance is contingent upon the level of CIO compensation, supporting the moderating role of CIO compensation in this relationship.

Model 3 and Model 5 results suggest a significant moderating effect of IT investment on the relationship between wireless and mobile strategy and firm performance. The coefficient for the interaction term between wireless and mobile strategy and IT investment is statistically insignificant ($\beta = +0.00$; $p < 0.001$), indicating that the level of IT investment significantly influences the relationship between wireless and mobile strategy and firm performance. Therefore, the data supports Hypothesis 5, which proposed a positive moderating effect of IT investment on the relationship between wireless and mobile strategy and firm performance.

These findings suggest that, in the context of this study, the level of IT investment does significantly alter the relationship between wireless and mobile strategy and firm performance. It indicates that the positive impact of wireless and mobile strategy on firm performance is contingent upon the level of IT investment.

Additional Analyses

The results from the robustness check using Tobin's q as the alternative dependent variable confirm the findings from the previous analysis. In Model 2 of Table 1.6, wireless and mobile strategy has a significant and positive relationship with Tobin's q ($\beta = 10.92$; $p < 0.05$), supporting Hypothesis 1. It indicates that firms emphasizing wireless and mobile strategy have higher market values as measured by Tobin's q.

Furthermore, CIO compensation is significantly and positively related to Tobin's q ($\beta = 8.54$; $p < 0.001$), supporting Hypothesis 2. It suggests that higher CIO compensation is associated with higher market values for firms. Additionally, the IT

investment coefficient is positive and insignificant ($\beta = 0.01$; $p > 0.10$), not supporting Hypothesis 3. These findings provide robustness to the earlier results and reinforce the positive relationships between wireless and mobile strategy, CIO compensation, IT investment, and firm performance as measured by Tobin's q.

In the analysis of the moderating role of IT investment on the relationship between wireless and mobile strategy and Tobin's q, the coefficient for the interaction term is found to be positive and significant, suggesting a positive moderation effect ($\beta = 0.05$; $p < 0.001$), indicating that the moderating effect of IT investment is supported. Therefore, Hypothesis 5 is supported.

On the other hand, CIO compensation is found to significantly and positively moderate the association between wireless and mobile strategy and Tobin's q ($\beta = 22.42$; $p < 0.05$). It supports Hypothesis 4, indicating that higher CIO compensation strengthens the positive relationship between wireless and mobile strategy and market values measured by Tobin's q.

These findings are consistent with the earlier analysis using ROA as the dependent variable and provide further support for the role of CIO compensation and IT investment in moderating the relationship between wireless and mobile strategy and firm performance.

Implications for Research

The findings suggest several essential research implications. First, this study contributes to the existing literature on wireless and mobile strategy by highlighting the potential moderating roles of IT investments and CIO compensation in the relationship between wireless and mobile strategy and firm performance. The study reveals that the

impact of wireless and mobile strategy on firm performance can vary depending on the level of IT investments and CIO compensation. It highlights the need for managers to carefully consider these factors when formulating and implementing their IS strategies to enhance firm performance. Additionally, the findings emphasize the importance of aligning the deployment of organizational IT resources with the organization's overall strategic goals.

The nuanced relationship between wireless and mobile strategy and firm performance uncovered in this study is consistent with the previous research. It suggests that a direct effect does not solely drive the link between wireless and mobile strategy and firm performance but is also influenced by other moderating factors such as IT investments and CIO compensation. Future research should therefore delve deeper into understanding the mechanisms through which IT investments interact with wireless and mobile strategy to impact firm performance. It will provide a more comprehensive understanding of the complex dynamics at play.

This study highlights the significance of considering the interplay between wireless and mobile strategy, IT investments, and CIO compensation to leverage organizational IT resources and enhance firm performance effectively. It calls for a more holistic approach to studying the relationship between wireless and mobile strategy and firm performance, considering the direct and indirect effects of IT investments and CIO compensation. Through this approach, organizations can make well-informed decisions regarding their wireless and mobile strategy, IT investments, and compensation practices to drive sustainable success.

Second, this study also makes significant theoretical contributions. On the one hand, it enhances the RBV literature by providing a strategic perspective on the relationship between IT investment, wireless and mobile strategy, and organizational performance. By considering the impact of wireless and mobile strategy, this study expands the understanding of how IT investment influences firm performance, validating the RBV in a new context by analyzing firms' mission, vision, and strategy statements. The findings demonstrate that the interaction between IT investment and wireless and mobile strategy shapes organizational performance. This advancement in knowledge contributes to a deeper understanding of the mechanisms through which IT resources generate competitive advantage and enhance firm performance.

These theoretical contributions enhance our understanding of the complex dynamics between IT investment, wireless and mobile strategy, CIO compensation, and firm performance. They shed light on the strategic decision-making processes within organizations and emphasize the importance of considering the interplay between IT resources, organizational strategies, and governance mechanisms to achieve sustained competitive advantage and improved performance.

Nonetheless, there is a need to consider other boundary conditions, such as environmental turbulence, in future research. The relationship between wireless and mobile strategy and firm performance is intricate and demands a more profound comprehension of their linkages, how they interact with IT investment, and the firm's overall strategic direction. Additionally, future studies must collect data over a more extended period and multiple years to obtain a more comprehensive understanding of how firms design their mission, vision, and strategy statements to enhance their

competitive advantages. It would provide a more robust and nuanced picture of the relationships under investigation.

Practical Implications

Wireless and mobile strategy and IT investment are closely interconnected concepts. The wireless and mobile strategy involves designing and formulating an overall plan for IT deployment to achieve organizational goals and objectives. On the other hand, IT investment entails acquiring and maintaining technology by allocating financial resources. It is crucial for a firm's wireless and mobile strategy to guide its IT investment decisions, ensuring that they are consistent with the strategic goals and objectives of the organization. Moreover, a firm's IT investment can significantly impact its ability and efficiency in attaining its strategic goals. By aligning IT investments with wireless and mobile strategy, a firm can optimize the advantages of IT and achieve greater levels of innovation, efficiency, and effectiveness.

Among the practical implications highlighted in this study, it is emphasized that the optimal allocation of organizational IT resources across different IS strategies is crucial for achieving competitive firm performance. The CIO plays a critical role in monitoring the implementation of wireless and mobile strategy and its impact on performance outcomes. Furthermore, managers should strategically distribute various IT resources to align with organizational performance goals. Given the limited nature of IT resources, it becomes imperative to make resource allocations that optimize firm performance.

IT investments carry several practical implications for businesses, including enhanced efficiency, improved customer experience, increased competitiveness, cost

savings, and improved decision-making. By carefully assessing potential IT investments and aligning them with business objectives, organizations can maximize the practical benefits derived from their IT investments. Regarding the practical implications of CIO compensation, this study offers valuable insights for organizations to assess the performance of their CIOs and align their incentives with significant business objectives. By utilizing these findings, organizations can make informed decisions on attracting and retaining top CIO talent and aligning their incentives with crucial business goals.

Furthermore, it is essential to recognize that the wireless and mobile strategy, IT investment, and CIO compensation should be integrated rather than treated as isolated components. Organizations should modify their IT investment portfolios based on specific circumstances to enhance competitive performance. Taking a holistic approach to account for the interplay among wireless and mobile strategy, IT investment, and CIO compensation can yield more effective outcomes for organizations.

Limitations and future research

This study outlines opportunities for future research in which more perspectives can contribute to wireless and mobile strategy. We aim to examine specific research questions and theoretical lenses and highlight the future directions to diversify the phenomena under investigation. This study has the following limitations. The first limitation is attributed to a limited time frame. Due to the limited years of data collected, the findings may not fully represent the broader population. The study's statistical power may be affected by the small sample size, potentially leading to limited

generalizability of the results. While efforts were made to ensure the validity and reliability of the data within the sample, a more extensive and diverse participant pool would enhance the study's external validity and strengthen the overall robustness of the conclusions drawn. Second, this study focuses solely on the IT industry. The findings may lack generalizability to other industries or sectors by restricting the analysis to this specific sector.

Consequently, the insights and conclusions drawn from the study may not apply to organizations operating in different domains. Future research could consider exploring a broader range of industries to attain a more comprehensive understanding of the subject matter and its implications across various sectors. Finally, this study lies in its narrow focus on a firm's emphasis on mobile and wireless techniques, which may not fully encompass the breadth of a firm's overall information systems-related techniques. By solely concentrating on this specific aspect, the research may overlook other critical components of an organization's information systems strategy, potentially limiting the overall understanding of the strategic landscape. Future studies should incorporate a more comprehensive view of a firm's overall information systems strategy, including various dimensions and approaches, to provide a more holistic and nuanced analysis of its impact on firm performance and outcomes.

Conclusion

The question of how wireless and mobile strategy shape organizational performance is crucial to firms and society. Our study provides a deeper understanding of this phenomenon, supported by insights from applying machine learning techniques in unstructured data, considering the moderating roles of CIO compensation and IT

investment. The empirical findings imply that a firm's wireless and mobile strategy would improve its financial performance, further positively moderated by CIO compensation and IT investment. Based on our conceptualization and findings, we find a strong need for future studies to focus on strategic orientation by applying machine learning techniques to unstructured text data.

REFERENCES

Abowd, G. D., & Mynatt, E. D. (2000). Charting past, present, and future research in ubiquitous computing. *ACM Transactions on Computer-Human Interaction (TOCHI), 7*(1), 29-58.

Agrawal, D. P., & Zeng, Q. A. (2015). Introduction to wireless and mobile systems. Cengage learning.

Al-Surmi, A., Cao, G., & Duan, Y. (2020). The impact of aligning business, IT, and marketing strategies on firm performance. *Industrial Marketing Management, 84*, 39-49.

Akyildiz, I. F., Lee, W. Y., Vuran, M. C., & Mohanty, S. (2006). NeXt Generation/Dynamic Spectrum Access/Cognitive Radio Wireless Networks: A Survey. *Computer Networks, 50*(13), 2127-2159.

Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management?. *International Journal of Management Reviews, 11*(1), 29-49.

Arun, R., Suresh, V., Veni Madhavan, C. E., & Murthy, N. (2010, June). On finding the natural number of topics with latent dirichlet allocation: Some observations. In *Pacific-Asia conference on knowledge discovery and data mining* (pp. 391-402). Springer, Berlin, Heidelberg.

Aydiner, A. S., Tatoglu, E., Bayraktar, E., & Zaim, S. (2019). Information system capabilities and firm performance: Opening the black box through decision-making performance and business-process performance. *International Journal of Information Management, 47*, 168-182.

Barney, J. B. (1986). Strategic factor markets: Expectations, luck, and business strategy. *Management Science, 32*(10), 1231-1241.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management, 17*(1), 99-120.

Bart Baetz, C. K. M. C. (1998). The relationship between mission statements and firm performance: An exploratory study. *Journal of Management Studies, 35*(6), 823-853.

Bart, C. K., Bontis, N., & Taggar, S. (2001). A model of the impact of mission statements on firm performance. *Management Decision, 39*(1), 19-35.

Bartkus, B., Glassman, M., & McAfee, R. B. (2000). Mission statements: are they smoke and mirrors?. *Business Horizons, 43*(6), 23-23.

Beard, D. W., & Dess, G. G. (1979, August). Industry Profitability and Firm Performance: A Preliminary Analysis on the Business Portfolio Question. In *Academy of Management Proceedings* (Vol. 1979, No. 1, pp. 123-127). Briarcliff Manor, NY 10510: Academy of Management.

Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research*, 71-111.

Benitez-Amado, J., & Walczuch, R. M. (2012). Information technology, the organizational capability of proactive corporate environmental strategy and firm performance: a resource-based analysis. *European Journal of Information Systems, 21*, 664-679.

Benyoucef, L., & Grabot, B. (Eds.). (2010). *Artificial intelligence techniques for networked manufacturing enterprises management* (p. 510). New York: Springer.

Bhattacherjee, A., & Hikmet, N. (2007). Physicians' resistance toward healthcare information technology: A theoretical model and empirical test. *European Journal of Information Systems, 16*(6), 725-737.

Bhargava, H. K., & Sundaresan, K. (2013). Mobile platforms: Application development and security challenges. *Information Systems Management, 30*(3), 186-197.

Bharadwaj, A. S. (2000). A Resource-Based Perspective on Information Technology Capability and Firm Performance: an Empirical Investigation. *MIS Quarterly,* 169-196.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital Business Strategy: Toward a Next Generation of Insights. *MIS Quarterly, 37*(2), 471-482.

Bharadwaj, A., Paul, P., & Srivastava, R. K. (2013). Digital Business Strategy: Toward a Next Generation of Insights. *MIS Quarterly, 37*(2), 471-482.

Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent dirichlet allocation. *Journal of Machine Learning Research, 3*(Jan), 993-1022.

Blei, D. M., & Lafferty, J. D. (2007). A correlated topic model of Science. *The Annals of Applied Statistics, 1*(1), 17-35.

Blei, D. M. (2012). Probabilistic topic models. *Communications of the ACM, 55*(4), 77–84

Boyd, B. K. (1994). Board control and CEO compensation. *Strategic Management Journal, 15*(5), 335-344.

Brown, C. V., DeHayes, D. W., Hoffer, J. A., Martin, E. W., & Perkins, W. C. (2012). *Managing information technology (7th ed.).* Prentice Hall.

Brynjolfsson, E., & Hitt, L. M. (1996). Paradox Lost? Firm-Level Evidence on the Returns to Information Systems Spending. *Management Science, 42*(4), 541-558.

Brynjolfsson, E., & Hitt, L. M. (1998). Beyond the productivity paradox. *Communications of the ACM, 41*(8), 49-55.

Brynjolfsson, E., & Hitt, L. M. (2000). Beyond computation: Information technology, organizational transformation and business performance. *Journal of Economic Perspectives, 14*(4), 23-48.

Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. WW Norton & Company.

Chan, Y. E., & Reich, B. H. (2007). IT alignment: What have we learned? *Journal of Information Technology, 22*(4), 297-315.

Chatterjee, D., Pacini, C., & Sambamurthy, V. (2002). The shareholder-wealth and trading-volume effects of information-technology infrastructure investments. *Journal of Management Information Systems, 19*(2), 7-42.

Chen, J. V., & Huang, J. W. (2009). Strategic orientation, technology policy, and the moderating role of technology turbulence on performance. *Journal of Business Research, 62*(9), 974-981.

Chen, Z., & Huang, J. (2017). CIO Incentive Compensation and Firm Performance. *Information Systems Research, 28*(4), 877-891.

Chen, C. J., & Huang, J. W. (2016). The impact of CEO IT knowledge on IS alignment and firm performance: An agency theory perspective. *Journal of Information Technology, 31*(4), 348-365.

Chen, D. Q., Mocker, M., Preston, D. S., & Teubner, A. (2010). Information systems strategy: reconceptualization, measurement, and implications. *MIS Quarterly*, 233-259.

Choi, J., Menon, A., & Tabakovic, H. (2021). Using machine learning to revisit the diversification–performance relationship. *Strategic Management Journal, 42*(9), 1632-1661.

Choudhury, P., Wang, D., Carlson, N. A., & Khanna, T. (2019). Machine learning approaches to facial and text analysis: Discovering CEO oral communication styles. *Strategic Management Journal, 40*(11), 1705-1732.

Chun, R., & Davies, G. (2001). E-reputation: The role of mission and vision statements in positioning strategy. *Journal of Brand Management, 8*(4), 315-333.

Collin, J. A., & Porras, J. I. (1991). Organisational Vision and Visionary Organisations. *California Management Review, Fall.*

Collins, J. C., & Porras, J. I. (1996). Building your company's vision. *Harvard Business Review, 74*(5), 65-77.

Corral, L., Sillitti, A., Succi, G., Garibbo, A., & Ramella, P. (2012, March). Evolution of mobile software development from platform-specific to web-based multiplatform paradigm. In Proceedings of the 10th SIGPLAN symposium on New ideas, new paradigms, and reflections on programming and software (pp. 181-183).

Das, A., Datar, M., Garg, A., & Rajaram, S. (2007). Google news personalization: Scalable online collaborative filtering. *Proceedings of the 16th International Conference on World Wide Web,* 271-280.

Davenport, T. H., & Patil, D. J. (2012). *Data scientist*. Harvard business review, 90(5), 70-76.

Deerwester, S., Dumais, S. T., Furnas, G. W., Landauer, T. K., & Harshman, R. (1990). Indexing by latent semantic analysis. *Journal of the American Society for information science, 41*(6), 391-407.

Deveaud, R., SanJuan, E. & Bellot, P. (2014). Accurate and effective latent concept modeling for ad hoc information retrieval. *Document numérique, 17*(1), 61-84. doi:10.3166/DN.17.1.61-84.

Devece, C., Palacios-Marqués, D., Galindo-Martín, M. Á., & Llopis-Albert, C. (2017). Information systems strategy and its relationship with innovation differentiation and organizational performance. *Information Systems Management, 34*(3), 250-264.

Ding, C. H., He, X., Zha, H., & Gu, M. (2002). A Min-Max Cut Algorithm for Graph Partitioning and Data Clustering. *Proceedings of the IEEE International Conference on Data Mining*, 107-114.

Dissanayake, I., Jeyaraj, A., & Nerur, S. P. (2021). The impact of structure and flux of corporate boards on organizational performance: A perspective from the information technology industry. *The Journal of Strategic Information Systems, 30*(2), 101667.

Drnevich, P. L., & Croson, D. C. (2013). Information technology and business-level strategy: Toward an integrated theoretical perspective. *MIS Quarterly*, 483-509.

Dutta, S., & Roy, R. (2016). Impact of Compensation on the Alignment of IT and Business Strategy. *Journal of Management Information Systems, 33*(2), 497-529.

Everitt, B. S., Landau, S., Leese, M., & Stahl, D. (2011). *Cluster Analysis (5th ed.).* John Wiley & Sons.

Fadhilah, A. N., & Subriadi, A. P. (2019). The role of IT on firm performance. *Procedia Computer Science, 161*, 258-265.

Fahy, J. (2002). A resource-based analysis of sustainable competitive advantage in a global environment. *International Business Review, 11*(1), 57-77.

Falsey, T. A. (1989). *Corporate philosophies and mission statements: A survey and guide for corporate communicators and management*. Praeger.

Galbreath, J., & Galvin, P. (2006). Accounting for performance variation: how important are intangible resources?. *International Journal of Organizational Analysis, 14*(2), 150-170.

Galbreath, J., & Galvin, P. (2008). Firm factors, industry structure and performance variation: New empirical evidence to a classic debate. *Journal of Business Research, 61*(2), 109-117.

Gartner. (2021). *Magic Quadrant for Mobile Operating Systems*. Gartner Research.

Ghasemi, A., & Sousa, E. S. (2005). Spectrum sensing in cognitive radio networks: Requirements, challenges, and design trade-offs. *IEEE Communications Magazine, 45*(10), 101-107.

Gibson, J. D. (Ed.). (2012). *Mobile Communications Handbook*. CRC press.

Goldsmith, A. (2005). *Wireless communications*. Cambridge University Press.

Gounaris, S., & Dimitriadis, S. (2003). Assessing Service Quality Measuring SERVQUAL's Explanatory Power. *Journal of Services Marketing, 17*(4), 362-378.

Griffiths, T. L., & Steyvers, M. (2004). Finding scientific topics. *Proceedings of the National Academy of Science, 101,* 5228-5235.

Hahsler, M., Piekenbrock, M., & Doran, D. (2020). Introduction to Visualizations for Clustering Algorithms in R. *The R Journal, 12*(1), 116-133.

Haji, A. A., & Mohd Ghazali, N. A. (2018). The role of intangible assets and liabilities in firm performance: empirical evidence. *Journal of Applied Accounting Research, 19*(1), 42-59.

Hall, R. (1992). The strategic analysis of intangible resources. Strategic management journal, 13(2), 135-144.

Hartmann, G., Stead, G., & DeGani, A. (2011). Cross-platform mobile development. *Mobile Learning Environment, Cambridge, 16*(9), 158-171.

Hasan, S., Ferguson, J. P., & Koning, R. (2015). The lives and deaths of jobs: Technical interdependence and survival in a job structure. *Organization Science, 26*(6), 1665-1681.

Havakhor, T., Sabherwal, R., Steelman, Z. R., & Sabherwal, S. (2019). Relationships between information technology and other investments: A contingent interaction model. *Information Systems Research, 30*(1), 291-305.

Hayden, T., & Webster, T. (2014). *The mobile commerce revolution: Business success in a wireless world.* Que Publishing.

Heinzelman, W. B., Chandrakasan, A., & Balakrishnan, H. (2002). Energy-Efficient Communication Protocol for Wireless Microsensor Networks. *Proceedings of the 33rd Hawaii International Conference on System Sciences.*

Henderson, J. C., & Venkatraman, N. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM systems journal, 32*(1), 4-16.

Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2019). *Strategic management: Concepts and cases: Competitiveness and globalization*. Cengage Learning.

Hofmann, T. (2001). Unsupervised learning by probabilistic latent semantic analysis. *Machine learning, 42*(1), 177-196.

Hong, L., & Davison, B. D. (2010). Empirical Study of Topic Modeling in Twitter. *Proceedings of the First Workshop on Social Media Analytics*, 80-88.

Hu, Q., Huang, Z., Davern, M. J., & Wang, S. (2017). The influence of chief information officer compensation on information technology investment. *Information & Management, 54*(3), 334-347.

Huang, X., & Liu, W. (2017). Information technology investment and firm performance: A literature review and synthesis. *International Journal of Information Management, 37*(5), 487-503.

Hunter, L. C., Webster, E., & Wyatt, A. (2005). *Measuring intangible investment*. Melbourne Institute of Applied Economic and Social Research.

Huselid, M. A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal, 38*(3), 635-672.

Husna, A., & Satria, I. (2019). Effects of return on asset, debt to asset ratio, current ratio, firm size, and dividend payout ratio on firm value. *International Journal of Economics and Financial Issues, 9*(5), 50.

Ireland, R. D., & Hirc, M. A. (1992). Mission statements: Importance, challenge, and recommendations for development. *Business Horizons, 35*(3), 34-42.

Ireland, R. D., Hitt, M. A., & Williams, J. C. (1992). Self-confidence and decisiveness: Prerequisites for effective management in the 1990s. *Business Horizons, 35*(1), 36-44.

Isomursu, M., & Lehtonen, T. (2015). Mobile Application Ecosystems: A Developer Survey. *Telematics and Informatics, 32*(4), 720-734.

Iyer, B., & Henderson, J. C. (2010). Preparing for the Future: Understanding the Seven Capabilities of Cloud Computing. *MIT Sloan Management Review, 51*(2), 1-7.

Jain, A. K., & Dubes, R. C. (1988). Algorithms for Clustering Data. Prentice-Hall.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics, 3*(4), 305-360.

Jones, G. R., & Jones, G. R. (2013). *Organizational theory, design, and change*.

Kamal, M. M., & Shawish, A. (2019). *Mobile computing: Hardware, software, communications, and security.* In Mobile Computing (pp. 13-47). CRC Press.

Kaplan, R. S., & Norton, D. P. (2004). The strategy map: guide to aligning intangible assets. *Strategy & Leadership, 32*(5), 10-17.

Keil, M., & Tiwana, A. (2004). CIO compensation: A study of the relationship between firm performance and IT governance. MIS Quarterly, 28(2), 274-293.

Kherwa, P., & Bansal, P. (2020). Semantic n-gram topic modeling. *EAI Endorsed Transactions on Scalable Information Systems, 7*(26), e7-e7.

Kimmel, P. D., Weygandt, J. J., & Kieso, D. E. (2020). *Financial accounting: tools for business decision-making.* John Wiley & Sons.

Klemm, M., Sanderson, S., & Luffman, G. (1991). Mission statements: Selling corporate values to employees. *Long range planning, 24*(3), 73-78.

Kohli, R., & Grover, V. (2008). Business value of IT: An essay on expanding research directions to keep up with the times. *Journal of the Association for Information Systems, 9*(1), 23-39.

Kor, Y. Y., & Mesko, A. (2013). Dynamic managerial capabilities: Configuration and orchestration of top executives' capabilities and the firm's dominant logic. *Strategic Management Journal, 34*(2), 233-244.

Kotler, P., & Armstrong, G. M. (2010). *Principles of marketing*. Pearson Education India.

Kraaijenbrink, J., Spender, J. C., & Groen, A. J. (2010). The resource-based view: A review and assessment of its critiques. *Journal of Management, 36*(1), 349-372.

Kristandl, G., & Bontis, N. (2007). Constructing a definition for intangibles using the resource based view of the firm. *Management Decision, 45*(9), 1510-1524.

Lance, G. N., & Williams, W. T. (1967). A General Theory of Classificatory Sorting Strategies 1: Hierarchical Systems. *Computer Journal, 9*(4), 373-380.

Laskin, A. V. (Ed.). (2017). *The handbook of financial communication and investor relations.* John Wiley & Sons.

Laudon, K. C., & Laudon, J. P. (2004). *Management information systems: Managing the digital firm.* Pearson Educación.

Laumer, S., Eckhardt, A., & Weitzel, T. (2010). Electronic human resources management in an e-business environment. *Journal of Electronic Commerce Research, 11*(4), 240-256.

Lee, S. (2010). Effects of Capital Intensity on firm performance: the US Restaurant Industry. *The Journal of Hospitality Financial Management, 18*(1), 1-13.

Leidner, D. E., Lo, J., & Preston, D. (2011). An empirical investigation of the relationship of IS strategy with firm performance. *The Journal of Strategic Information Systems, 20*(4), 419-437.

Li, Y., & Du, T. C. (2014). Impact of mobile commerce strategy on mobile commerce success: A SEM-neural network approach. *Decision Support Systems, 59*, 181-191.

Li, Y., Tan, C. H., Teo, H. H., & Tan, B. C. (2006). Innovative usage of information technology in Singapore organizations: Do CIO characteristics make a difference?. *IEEE Transactions on Engineering Management, 53*(2), 177-190.

Libby, R., Short, D., & Libby, P. (2014). *EBOOK: Financial Accounting.* McGraw Hill.

Ling, Y., Zhao, H., & Baron, R. A. (2007). Influence of founder—CEOs' personal values on firm performance: Moderating effects of firm age and size. *Journal of Management, 33*(5), 673-696.

Liu, L., Tang, L., Dong, W., Yao, S., & Zhou, W. (2016). An overview of topic modeling and its current applications in bioinformatics. *SpringerPlus, 5*(1), 1-22.

Luftman, J. N., & Kempaiah, R. (2007). The Impact of Business Strategy and Maturity on Information Technology and Firm Performance. *Information Systems Management, 24*(1), 65-73.

Luthans, F., & Doh, J. P. (2018). *International management: Culture, strategy, and behavior.* McGraw-Hill.

Madden, J., & Madden, B. (2013). *Enterprise Mobility Management: Everything you need to know about MDM, MAM, and BYOD, 2013 Edition.* Jack Madden.

Mahsud, R., Yukl, G., & Prussia, G. E. (2011). Human capital, efficiency, and innovative adaptation as strategic determinants of firm performance. *Journal of Leadership & Organizational Studies, 18*(2), 229-246.

Makhija, M. (2003). Comparing the resource-based and market-based views of the firm: empirical evidence from Czech privatization. *Strategic Management Journal, 24*(5), 433-451.

Manning, C. D., Raghavan, P., & Schütze, H. (2008). *Introduction to Information Retrieval.* Cambridge University Press.

Mata, F. J., Fuerst, W. L., & Barney, J. B. (1995). Information technology and sustained competitive advantage: A resource-based analysis. *MIS Quarterly*, 487-505.

McFarlan, F. W., & Nolan, R. L. (1995). How to manage an IT outsourcing alliance. *MIT Sloan Management Review, 36*(2), 9.

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing.

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Information technology and organizational performance: An integrative model of IT business value. *MIS Quarterly*, 283-322.

Mennecke, B. E., & Strader, T. J. (Eds.). (2003). *Mobile commerce: technology, theory, and applications.* IGI Global.

Meso, P., & Smith, R. (2000). A resource-based view of organizational knowledge management systems. *Journal of Knowledge Management*.

Mikalef, P., Krogstie, J., Pappas, I. O., & Pavlou, P. (2020). Exploring the relationship between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. *Information & Management, 57*(2), 103169.

Mithas, S., & Rust, R. T. (2016). How information technology strategy and investments influence firm performance. *MIS Quarterly, 40*(1), 223-246.

Mitola III, J. (1995). Software Radios: Survey, Critical Evaluation, and Future Directions. *IEEE Aerospace and Electronic Systems Magazine, 10*(3), 7-28.

Mitra, S., & Tzannes, A. (2008). *An overview of intelligent communication systems. In Intelligent Communication Systems* (pp. 1-26). Springer.

Molloy, J. C., & Barney, J. B. (2015). Who captures the value created with human capital? A market-based view. *Academy of Management Perspectives, 29*(3), 309-325.

Nan, N., & Tanriverdi, H. (2017). Unifying the role of IT in hyperturbulence and competitive advantage via a multilevel perspective of IS strategy. *MIS Quarterly, 41*(3), 937-958.

Oduro, I. M., & Agyei, S. K. (2013). Mergers & acquisition and firm performance: Evidence from the Ghana Stock Exchange. *Research Journal of Finance and Accounting, 4*(7), 99-107.

Oh, W., & Pinsonneault, A. (2007). On the assessment of the strategic value of information technologies: conceptual and analytical approaches. *MIS Quarterly*, 239-265.

Okwo, I. M., Okelue, U. D., & Nweze, A. U. (2012). Investment in fixed assets and firm profitability: Evidence from the Nigerian brewery industry. *European Journal of Business and Management, 4*(20), 10-17.

Olatunji, T. E., & Adegbite, T. A. (2014). Investment in fixed assets and firm profitability: Empirical evidence from the Nigerian banking sector. *Asian Journal of Social Sciences and Management Studies, 1*(3), 78-82.

Ozcan, P., & Eisenhardt, K. M. (2009). Origin of alliance portfolios: Entrepreneurs, network strategies, and firm performance. *Academy of Management Journal, 52*(2), 246-279.

Park, S., & Kim, J. (2017). The effect of CIO equity compensation on IT investment and firm performance. *Information & Management, 54*(4), 422-431.

Pavlou, P. A., & El Sawy, O. A. (2010). The "Third Hand": IT-enabled competitive advantage in turbulence through improvisational capabilities. *Information Systems Research, 21*(3), 443-471.

Pearce, J. A., & David, F. (1987). Corporate mission statements: The bottom line. *Academy of Management Perspectives, 1*(2), 109-115.

Pearce, J. A., & Robinson, R. B. (2015). Strategic management: Planning for domestic & global competition. (*No Title*).

Penrose, E. T. 1959/1995.*The Theory of the Growth of the Firm*,3rd ed. Oxford University Press, Oxford, UK.

Peteraf, M. A. (1993). The Cornerstones of Competitive Advantage: A Resource-Based View. *Strategic Management Journal, 14*(3), 179-191.

Piccoli, G., & Ives, B. (2005). IT-dependent strategic initiatives and sustained competitive advantage: a review and synthesis of the literature. *MIS Quarterly*, 747-776.

Picoto, W., Belanger, F., & Palma-dos-Reis, A. (2012). Leveraging on mobile business to enhance firm performance: An organizational level study.

Powell, T. C., & Dent-Micallef, A. (1997). Information technology as competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal, 18*(5), 375-405.

Rafferty, A. E., & Griffin, M. A. (2004). Perceptions of organizational change: A stress and coping perspective. *Journal of Applied Psychology, 89*(4), 755-768.

Rai, A., Maruping, L. M., & Venkatesh, V. (2009). Offshore information systems project success: The role of social embeddedness and cultural characteristics. *MIS Quarterly, 33*(3), 617-641.

Rappaport, T. S. (2002). *Wireless communications: Principles and practice (2nd ed.).* Prentice Hall.

Rarick, C. A., & Vitton, J. (1995). Corporate strategy: Mission statements make cents. *Journal of Business Strategy*.

Ravichandran, T., Lertwongsatien, C., & Lertwongsatien, C. (2005). Effect of information systems resources and capabilities on firm performance: A resource-based perspective. *Journal of Management Information Systems, 21*(4), 237-276.

Ray, G., Barney, J. B., & Muhanna, W. A. (2019). Information technology and corporate strategy: A research perspective. *MIS Quarterly, 43*(1), 1-21.

Ray, K. G. (2022). *Mergers and acquisitions: Strategy, valuation and integration.* PHI Learning Pvt. Ltd.

Ross, J. W., & Weill, P. (2002). Six IT Decisions Your IT People Shouldn't Make. *Harvard Business Review, 80*(11), 84-92.

Rostami, S., Rostami, Z., & Kohansal, S. (2016). The effect of corporate governance components on return on assets and stock return of companies listed in Tehran stock exchange. *Procedia Economics and Finance, 36,* 137-146.

Rumelt, R. P. (1982). Diversification strategy and profitability. *Strategic Management Journal, 3*(4), 359-369.

Sabherwal, R., Sabherwal, S., Havakhor, T., & Steelman, Z. (2019). How does strategic alignment affect firm performance? The roles of information technology investment and environmental uncertainty. *MIS Quarterly, 43*(2), 453-474.

Sabherwal, R., & Chan, Y. E. (2001). Alignment between business and IS strategies: A study of prospectors, analyzers, and defenders. *Information Systems Research, 12*(1), 11-33.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: reconceptualizing the role of information technology in contemporary firms. *MIS Quarterly, 27*(2), 237-263.

Sarkar, A., Goyal, A., Hicks, D., Sarkar, D., & Hazra, S. (2019, December). Android application development: A brief overview of android platforms and evolution of security systems. *In 2019 Third International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC) (pp. 73-79).* IEEE.

Schriber, S. (2015). Toward a competitive dynamics perspective on value potential in M&A. In *The Routledge companion to mergers and acquisitions* (pp. 348-360). Routledge.

Selling, T. I., & Stickney, C. P. (1989). The effects of business environment and strategy on a firm's rate of return on assets. *Financial Analysts Journal, 45*(1), 43-52.

Sharma, C., Herzog, J., & Melfi, V. (2008). *Mobile Advertising: supercharge your brand in the exploding wireless market.* Wiley Publishing.

Shumway, T. (2001). Forecasting bankruptcy more accurately: A simple hazard model. *The Journal of Business, 74*(1), 101-124.

Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of Management Review, 32*(1), 273-292.

Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. (2011). Resource orchestration to create competitive advantage: Breadth, depth, and life cycle effects. *Journal of Management, 37*(5), 1390-1412.

Soh, F., & Grover, V. (2020). Effect of release timing of app innovations based on mobile platform innovations. *Journal of Management Information Systems, 37*(4), 957-987.

Stallworth Williams, L. (2008). The mission statement: a corporate reporting tool with a past, present, and future. *The Journal of Business Communication (1973), 45*(2), 94-119.

Steelman, Z. R., Havakhor, T., Sabherwal, R., & Sabherwal, S. (2019). Performance consequences of information technology investments: Implications of emphasizing new or current information technologies. *Information Systems Research, 30*(1), 204-218.

Stoica, M., Roach, W., & Price, D. (2012). Wireless business and the impact on firm performance: The strategic move to adopt a new technology. *International Journal of Management & Information Systems (IJMIS), 16*(1), 45-54.

Susanto, A., & Meiryani, M. (2019). The impact of environmental accounting information system alignment on firm performance and environmental performance: A case of small and medium enterprises s of Indonesia. *International Journal of Energy Economics and Policy, 9*(2), 229.

Tanković, A. Č. (2013). Defining strategy using vision and mission statements of Croatian organizations in times of crisis. *Economic research-Ekonomska istraživanja, 26*(sup1), 331-342.

Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2011). The impact of technostress on role stress and productivity. *Journal of Management Information Systems, 28*(1), 301-328.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319-1350.

Terashima, N. (2001). *Intelligent Communication Systems: Toward Constructing Human Friendly Communication Environment*. Elsevier.

Thornhill, S. (2006). Knowledge, innovation and firm performance in high-and low-technology regimes. *Journal of Business Venturing, 21*(5), 687-703.

Turedi, S., & Erkan-Barlow, A. (2022). CIO equity compensation and IT investment: the moderating role of board monitoring and evidence of managerial myopia. *Review of Behavioral Finance*, (ahead-of-print).

Vayansky, I., & Kumar, S. A. (2020). A review of topic modeling methods. *Information Systems, 94*, 101582.

Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems. *MIS Quarterly, 37*(1), 21-54.

Viete, S., & Erdsiek, D. (2020). Mobile information technologies and firm performance: The role of employee autonomy. *Information Economics and Policy, 51*, 100863.

Wade, M., & Hulland, J. (2004). The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS Quarterly*, 107-142.

Wagner, J. (2012). International trade and firm performance: a survey of empirical studies since 2006. *Review of World Economics, 148*(2), 235-267.

Wei, C. P., & Balasubramanian, S. (2004). Exploring the Impact of Mobile Computing for ERP. *Industrial Management & Data Systems, 104*(7), 582-590.

Weill, P., & Broadbent, M. (1998). *Leveraging the new infrastructure: How market leaders capitalize on information technology*. Harvard Business Press.

Weill, P., & Ross, J. W. (2004). *IT Governance: How Top Performers Manage IT Decision Rights for Superior Results*. Harvard Business School Press.

Weill, P., Subramani, M., & Broadbent, M. (2002). IT infrastructure for strategic agility. Available at SSRN 317307.

Weill, P., & Olson, M. H. (1989). Managing Investment in Information Technology: Mini Case Examples and Implications. *MIS Quarterly, 13*(1), 3-17.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal, 5*(2), 171-180.

Wu, S. P. J., Straub, D. W., & Liang, T. P. (2015). How information technology governance mechanisms and strategic alignment influence organizational performance. *MIS Quarterly, 39*(2), 497-518.

Yang, K. (2014). Wireless sensor networks.

Yayla, A. A., & Hu, Q. (2008, January). Determinants of CIO compensation structure and its impact on firm performance. In *Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008)* (pp. 427-427). IEEE.

Yayla, A. A., & Hu, Q. (2014). The effect of board of directors' IT awareness on CIO compensation and firm performance. *Decision Sciences, 45*(3), 401-436.

Graphs and tables

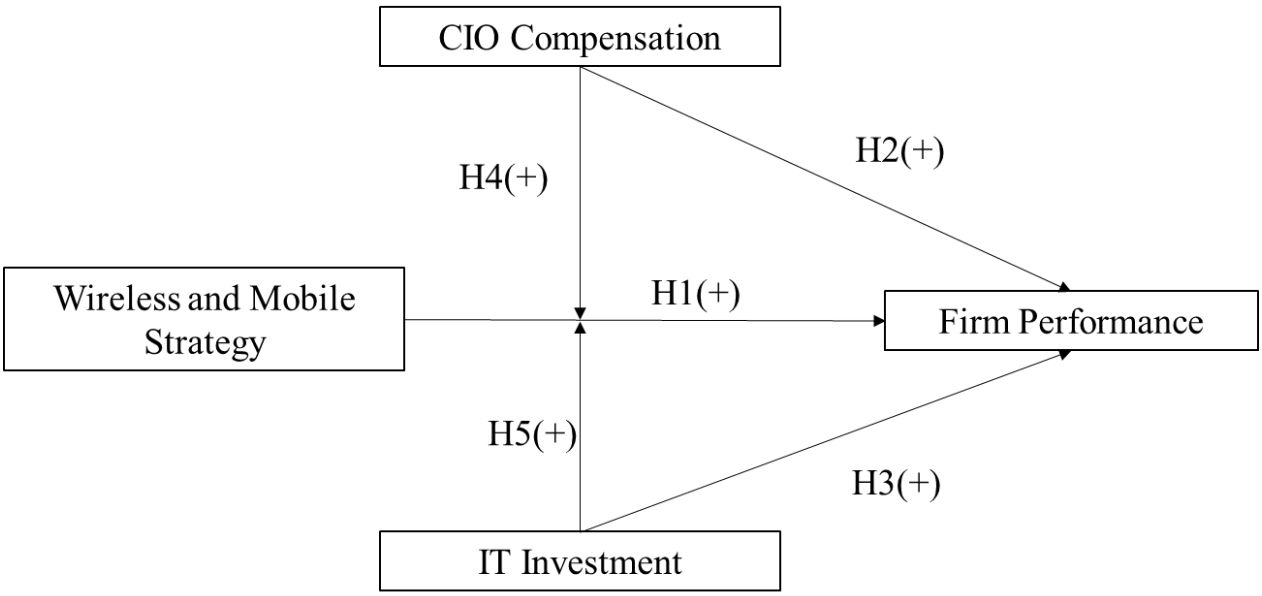


Figure 1.1 Research Model

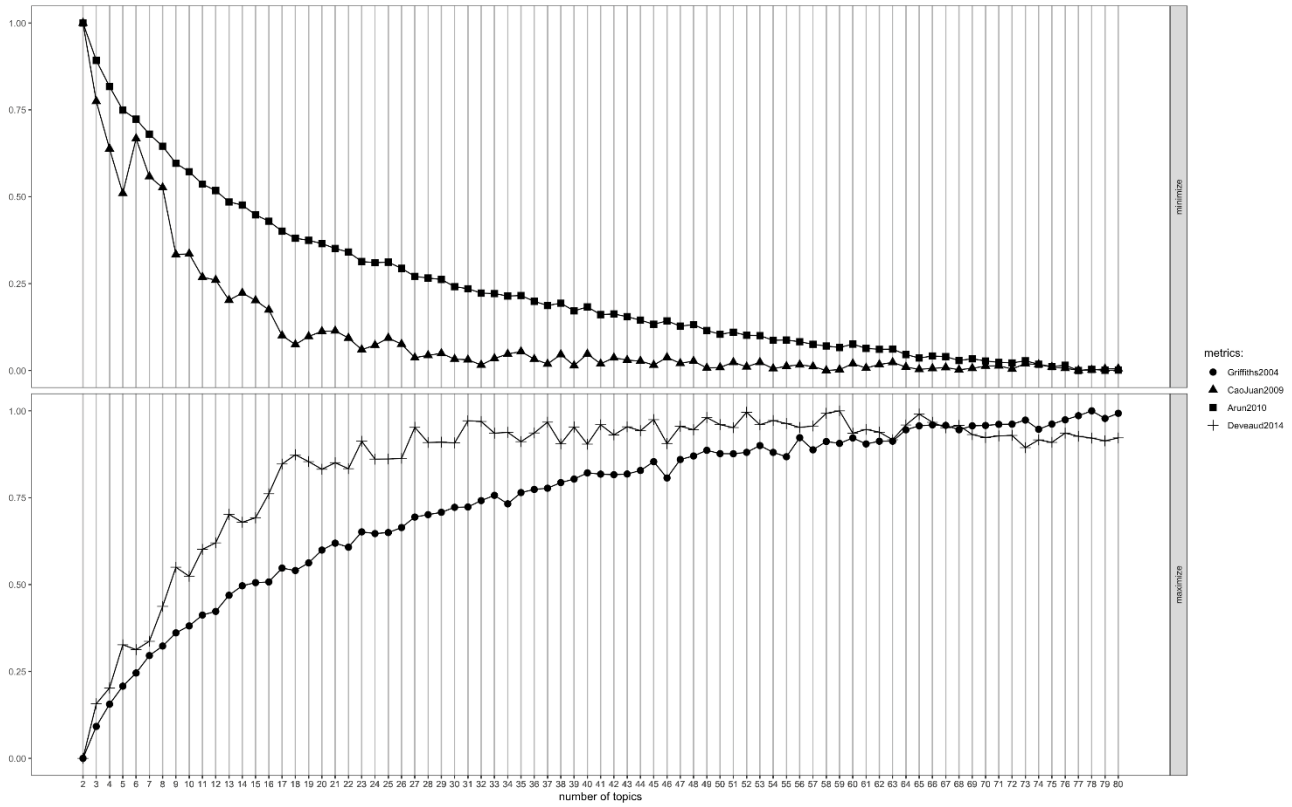
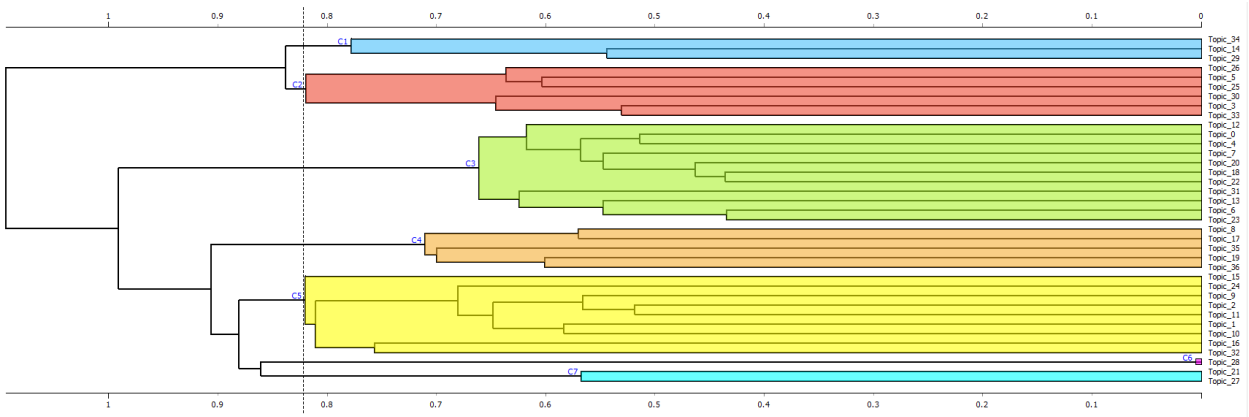


Figure 1.2 Optimal Number of Topics Analysis Results



Notes of classifications: C1: Design and Manufacturing; C2: Mobile Platforms & Wireless Solutions; C3: Digital Transformation and Leadership; C4: Analytics and Security; C5: Governance, Client Service, and Healthcare; C6:Others; C7: Digital Payment.

Figure 1.3 Hierarchical clustering of 37 topics

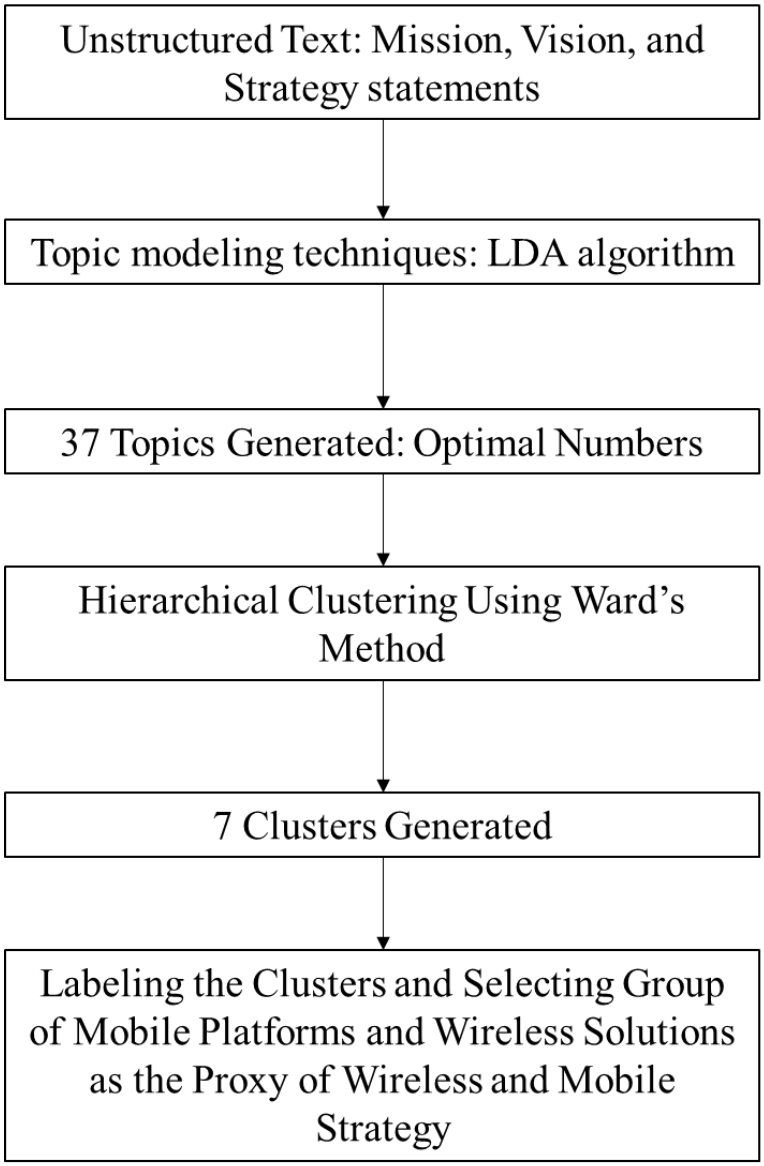


Figure 1.4 The Process of Clustering

Table 1.1 Measurement Operationalization

Constructs	Definitions	Operationalization
Wireless and Mobile Strategy	an organizational viewpoint regarding investing in, deploying, using, and managing wireless techniques and mobile platforms. It is the shared view of the role of wireless techniques and mobile platforms within the organization (Chen et al. 2010; Bhargava & Sundaresan 2013; Rappaport 2002; Ghasemi & Sousa 2005).	The extent to which the organization has a shared perspective to pursue innovation through wireless techniques and mobile platforms (Chen et al. 2010; Bhargava & Sundaresan 2013; Rappaport 2002; Ghasemi & Sousa 2005). In our context, it is operationalized as the total topic scores in the wireless and mobile categories.
Firm performance	A firm's potential and ability to efficiently utilize available IT resources to achieve its goals (Peterson, Gijsbers, & Wilks 2003; Taouab & Issor 2019).	The natural log of Tobin's q is the measure of firm performance. Tobin's q is the ratio between the market value and the replacement value of firm assets (Wernerfelt & Montgomery 1988; Bharadwaj et al. 1999).
CIO compensation	the financial remuneration and benefits provided to Chief Information Officers (CIOs) for their organizational roles and responsibilities (Keil & Tiwana 2004).	It includes the salary, bonuses, stock options, incentives, and other forms of compensation that CIOs receive for their contributions to the strategic management and implementation of information technology within the organization.

Table 1.2 Definitions of Control Variables

Variable	Definitions
Revenue growth	the increase in a company's sales or revenue over time (Laskin 2017).
Current ratio	a liquidity ratio that measures a company's ability to pay short-term obligations or those due within one year (Beaver 1966).
Profitability	Measuring efficiency indicates a firm's ability to produce a return on investment (Rumelt 1982).
Public firm age	the number of years a firm is listed on an exchange (i.e., listing age) (Shumway 2001).
CEO compensation	the total value of the package of pay and benefits that a CEO receives for their services (Boyd 1994).
CIO on board	Whether CIO serves as a board member.
Board average compensation	The average compensation of board members.
CIO dummy variable	The number of board members with IT background
Board gender diversity	The gender ratio of board members is measured as females divided by males.
Board educational background	The number of board members with Ph.D. degrees.
Board average age	The average age of board members.

Table 1.3 Descriptive Statistics

Variables (N=417)	Mean	Standard Deviation	Min	Max
1. ROA	0.02	0.27	-0.11	1.40
2. Wireless and mobile strategy	0.16	0.10	0.03	0.57
3. IT Investment	244.33	1215.32	0.02	16200
4. CIO Compensation	0.87	0.91	0.49	4.00
5. Design & Manufacturing	0.09	0.11	0.01	0.61
6. Governance, Client Service, and Healthcare	0.22	0.12	0.07	0.86
7. Board Gender Diversity	0.03	0.08	0.00	0.5
8. Board Education	0.02	0.10	0.00	1.00
9. Board Average Age	56.11	1.85	50.20	73.50
10. Firm Age	32.78	21.17	0.54	62.00
11. Liquidity	4.75	8.74	+0.00	128.52
12. Tobin's q	5.95	12.96	+0.00	71.36

Table 1.4 Correlation Coefficients

	1	2	3	4	5	6	7	8	9	10	11
1. ROA	1.00										
2. Wireless and mobile strategy	0.16	1.00									
3. IT Investment	0.16	-0.03	1.00								
4. CIO Compensation	0.63	0.07	-0.04	1.00							
5. Design & Manufacturing	-0.02	0.03	-0.05	-0.02	1.00						
6. Governance, Client Service, and Healthcare	0.02	-0.24	0.09	0.03	-0.23	1.00					
7. Board Gender Diversity	0.04	0.09	0.13	-0.05	+0.0 0	-0.02	1.00				
8. Board Education	0.11	0.12	-0.04	0.09	0.18	-0.06	0.24	1.00			
9. Board Average Age	0.10	-0.01	0.02	0.06	-0.00	0.04	0.16	0.16	1.00		
10. Firm Age	0.09	0.05	0.06	0.10	-0.07	-0.00	0.17	-0.03	0.06	1.00	
11. Liquidity	-0.00	-0.02	+0.0 0	0.01	-0.04	0.06	0.01	-0.03	-0.02	-0.04	1.00

N=287

Table 1.5 OLS regression predicting firm performance.

	Model 1	Model 2	Model 3	Model 4	Model 5
	ROA	ROA	ROA	ROA	ROA
Wireless and mobile strategy		0.23*	0.09	-0.24*	-0.32**
		(0.11)	(0.10)	(0.12)	(0.11)
IT Investment		0.00	-0.00***	0.00	-0.00***
		(0.00)	(0.00)	(0.00)	(0.00)
CIO Compensation		0.18***	0.18***	0.09**	0.10**
		(0.02)	(0.02)	(0.03)	(0.03)
Wireless and mobile strategy *IT Investment			+0.00***		+0.00***
			(0.00)		(0.00)
Wireless and mobile strategy *CIO Compensation				0.53**	0.47*
				(0.20)	(0.20)
Design & Manufacturing	-0.04	0.00	-0.00	-0.00	-0.01
	(0.11)	(0.07)	(0.07)	(0.07)	(0.07)
	-0.03	-0.07	-0.11	-0.07	-0.11+
Governance & Client Service	(0.10)	(0.07)	(0.07)	(0.07)	(0.06)
Board Gender Diversity	-0.00	0.01	-0.08	0.05	-0.04
	(0.17)	(0.10)	(0.07)	(0.10)	(0.06)
Board Education	0.09	0.03	0.06	0.01	0.04
	(0.19)	(0.12)	(0.12)	(0.11)	(0.11)
Board Average Age	0.01	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm Age	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Liquidity	-0.00	-0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Industry	Yes	Yes	Yes	Yes	Yes
Cons	-0.45+	-0.06	-0.01	0.01	0.05
	(0.25)	(0.19)	(0.18)	(0.20)	(0.18)
N	417	417	417	417	417
R^2	0.020	0.446	0.506	0.490	0.540

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.6 Robustness Check

	Model 1	Model 2	Model 3	Model 4	Model 5
	ROA	ROA	ROA	ROA	ROA
Wireless and mobile strategy		10.92*	4.24	-11.62*	-15.40**
		(5.22)	(4.52)	(5.70)	(5.40)
IT Investment		+0.00	-0.00***	0.00	-0.00***
		(0.00)	(0.00)	(0.00)	(0.00)
CIO Compensation		8.54***	8.50***	4.24**	4.67**
		(1.01)	(1.02)	(1.60)	(1.60)
Wireless and mobile strategy *IT Investment			0.05***		0.05***
			(0.00)		(0.00)
Wireless and mobile strategy *CIO Compensation				25.09**	22.42*
				(9.49)	(9.43)
Design & Manufacturing	-1.68	0.17	-0.16	-0.15	-0.41
	(5.00)	(3.41)	(3.38)	(3.24)	(3.25)
	-1.31	-3.26	-5.11	-3.45	-5.14+
Governance & Client Service	(4.56)	(3.30)	(3.15)	(3.12)	(2.96)
Board Gender Diversity	-0.16	0.53	-3.72	2.29	-1.83
		(4.95)	(3.22)	(4.80)	(2.98)
	(7.85)				
Board Education	4.14	1.28	3.06	0.33	2.08
	(9.24)	(5.83)	(5.65)	(5.19)	(5.10)
Board Average Age	0.32	-0.13	-0.15	-0.11	-0.14
	(0.21)	(0.16)	(0.15)	(0.17)	(0.16)
Firm Age	0.04	0.01	0.01	0.00	0.01
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Liquidity	-0.00	-0.02	-0.01	-0.00	0.01
	(0.04)	(0.03)	(0.02)	(0.02)	(0.03)
Industry	Yes	Yes	Yes	Yes	Yes
Cons	-16.15	2.41	4.83	5.82	7.69
	(11.77)	(9.18)	(8.37)	(9.45)	(8.74)
N	417	417	417	417	417
R^2	0.020	0.446	0.506	0.490	0.540

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.7 A Total of 37 Topics

Group 1 Design and Manufacturing	
Topics Involved	Top 5 keywords in each topic
Topic 34	0.081*"energy" + 0.080*"power" + 0.060*"solar" + 0.027*"technology" + 0.024*"patent"
Topic 14	0.081*"application" + 0.065*"lead" + 0.039*"design" + 0.039*"high" + 0.036*"product"
Topic 29	0.049*"high" + 0.048*"semiconductor" + 0.038*"manufacturing" + 0.035*"technology" + 0.028*"performance"
Group 2 Mobile Platforms & Wireless Solutions	
Topic 26	0.115*"company" + 0.083*"mobile" + 0.076*"platform" + 0.043*"connect" + 0.039*"user"
Topic 5	0.092*"device" + 0.041*"product" + 0.040*"wireless" + 0.035*"technology" + 0.029*"communication"
Topic 25	0.080*"technology" + 0.072*"world" + 0.036*"intelligent" + 0.036*"image" + 0.034*"consumer"
Topic 30	0.072*"system" + 0.065*"customer" + 0.061*"technology" + 0.047*"solution" + 0.036*"commercial"
Topic 3	0.124*"network" + 0.068*"communication" + 0.063*"solution" + 0.050*"service" + 0.038*"provider"
Topic 33	0.062*"cost" + 0.043*"provide" + 0.042*"deliver" + 0.033*"time" + 0.033*"high"
Group 3 Digital Transformation and Leadership	
Topic 12	0.066*"learn" + 0.047*"leadership" + 0.038*"career" + 0.036*"investor" + 0.035*"read"
Topic 0	0.090*"innovation" + 0.051*"technology" + 0.038*"world" + 0.032*"future" + 0.030*"change"
Topic 4	0.044*"people" + 0.042*"corporate" + 0.039*"employee" + 0.037*"create" + 0.035*"community"
Topic 7	0.068*"people" + 0.052*"partner" + 0.034*"client" + 0.030*"logo" + 0.024*"culture"
Topic 20	0.054*"work" + 0.032*"people" + 0.029*"drive" + 0.023*"diversity" + 0.022*"success"
Topic 18	0.312*"customer" + 0.051*"service" + 0.045*"trust" + 0.044*"support" + 0.043*"deliver"
Topic 22	0.150*"team" + 0.074*"experience" + 0.054*"build" + 0.047*"expertise" + 0.037*"challenge"
Topic 31	0.066*"digital" + 0.055*"business" + 0.046*"transformation" + 0.045*"work" + 0.039*"icon"
Topic 13	0.063*"business" + 0.050*"group" + 0.040*"technology" + 0.036*"change" + 0.034*"growth"
Topic 6	0.107*"company" + 0.074*"year" + 0.058*"develop" + 0.048*"world" + 0.040*"industry"
Topic 23	0.177*"global" + 0.092*"leader" + 0.091*"industry" + 0.069*"lead" + 0.064*"world"

Group 4 Analytics and Security	
Topic 8	0.042*"create" + 0.039*"focus" + 0.034*"tool" + 0.027*"time" + 0.025*"free"
Topic 17	0.099*"solution" + 0.086*"technology" + 0.076*"smart" + 0.072*"product" + 0.032*"design"
Topic 35	0.027*"blockchain" + 0.027*"online" + 0.025*"size" + 0.021*"computer" + 0.020*"digital"
Topic 19	0.135*"security" + 0.069*"secure" + 0.042*"organization" + 0.041*"protect" + 0.025*"threat"
Topic 36	0.206*"datum" + 0.051*"analytic" + 0.034*"data" + 0.028*"insight" + 0.027*"drive"
Group 5 Governance, Client Service, and Healthcare	
Topic 15	0.064*"board" + 0.055*"company" + 0.050*"director" + 0.030*"executive" + 0.026*"management"
Topic 24	0.066*"market" + 0.049*"product" + 0.044*"supply" + 0.038*"company" + 0.038*"chain"
Topic 9	0.057*"quality" + 0.055*"core" + 0.054*"industry" + 0.037*"recognize" + 0.034*"commitment"
Topic 2	0.065*"business" + 0.057*"operation" + 0.056*"service" + 0.037*"support" + 0.033*"management"
Topic 11	0.133*"service" + 0.122*"client" + 0.056*"provide" + 0.054*"company" + 0.034*"offer"
Topic 1	0.129*"software" + 0.087*"solution" + 0.044*"management" + 0.043*"platform" + 0.041*"base"
Topic 10	0.047*"company" + 0.046*"product" + 0.030*"include" + 0.029*"line" + 0.028*"acquire"
Topic 16	0.063*"care" + 0.059*"solution" + 0.051*"healthcare" + 0.042*"improve" + 0.037*"health"
Topic 32	0.076*"learn" + 0.045*"development" + 0.041*"simulation" + 0.028*"software" + 0.026*"year"
Group 6 Digital Payment	
Topic 21	0.095*"payment" + 0.077*"financial" + 0.076*"business" + 0.033*"solution" + 0.030*"grow"
Topic 27	0.085*"solution" + 0.060*"card" + 0.046*"end" + 0.043*"service" + 0.042*"digital"
Group 7 Others	
Topic 28	0.066*"game" + 0.037*"content" + 0.036*"app" + 0.024*"gaming" + 0.023*"user"

Table 1.8 Key Literature Summary

Citations	Research Questions	Findings
Picoto, W., Belanger, F., & Palma-dos-Reis, A. (2012). Leveraging on mobile business to enhance firm performance: An organizational level study.	Examines the impact of mobile business/mobile platforms on firm performance.	Mobile business value has a positive and significant effect on the overall business impact of mobile business on the organization.
Soh, F., & Grover, V. (2020). Effect of release timing of app innovations based on mobile platform innovations. *Journal of Management Information Systems, 37*(4), 957-987.	Investigates how the timing of introducing new app innovations within the context of mobile platform innovations can influence outcomes.	Mpi-based app innovations that enter the market early affect app performance more than those that enter late.
Stoica, M., Roach, W., & Price, D. (2012). Wireless business and the impact on firm performance: The strategic move to adopt a new technology. *International Journal of Management & Information Systems (IJMIS), 16*(1), 45-54.	Investigates the relationship between adopting wireless technology and firm performance	Underscoring the necessity of adopting wireless technology in rural areas.
Viete, S., & Erdsiek, D. (2020). Mobile information technologies and firm performance: The role of employee autonomy. *Information Economics and Policy, 51*, 100863.	Explores the relationship between the adoption of mobile information technologies and firm performance, specifically focusing on the influence of employee autonomy.	The returns to mobile ict are higher.
Kim, J., Park, J. C., & Komarek, T. (2021). The impact of Mobile ICT on national productivity in developed and developing countries. *Information & Management, 58*(3), 103442.	Examines the impact of mobile Information and Communication Technology (ICT) on national productivity	Mobile ICT plays an essential role in improving national productivity in developing countries.
Choudhary, P. K., Routray, S., Upadhyay, P., & Pani, A. K. (2022). Adoption of enterprise mobile systems–An alternative theoretical perspective. *International Journal of Information Management, 67*, 102539.	Explores questions such as how organizations make decisions about mobile systems, what factors influence their choices, and how these systems impact various aspects of their operations and management.	Employees' use of contexts and intentions to comply with the ems policy are strong antecedents of adapting to new systems.
Seedoyal Doargajudhur, M., & Hosanoo, Z. (2023). The mobile technological era: insights into the consequences of constant connectivity of personal devices by knowledge workers. *Information Technology & People, 36*(2), 701-733.	Explores the effects of constant connectivity through personal mobile devices on knowledge workers.	The double-edged sword brought about by bring-your-own-device implementation.

Table 1.9 Wireless and Mobile Strategy Examples with the Highest Scores

Topics Involved	Top 5 keywords in each topic	Firms with the highest score	Mission, Vision, and Strategy statements
Topic# 26	0.115*"company" + 0.083*"mobile" + 0.076*"platform" + 0.043*"connect" + 0.039*"user"	ZNGA	mission to connect the world through games. Zynga is a global leader in interactive entertainment with a mission to connect the world through games. With massive global reach in more than 175 countries and regions, Zynga has a diverse portfolio of popular game franchises that have been downloaded more than four billion times on mobile including CSR Racing™, Empires & Puzzles™, FarmVille™, Golf Rival™, Hair Challenge™, Harry Potter: Puzzles & Spells™, High Heels!™, Merge Dragons!™, Merge Magic!™, Toon Blast™, Toy Blast™, Words With Friends™ and Zynga Poker™. With Chartboost, a leading mobile advertising and monetization platform, Zynga is an industry-leading next-generation platform with the ability to optimize programmatic advertising and yields at scale. Founded in 2007, Zynga is headquartered in California with locations in North America, Europe and Asia. For more information, visit www.zynga.com or follow Zynga on Twitter, Instagram, Facebook or the Zynga blog. Zynga is a leading developer of the world's most popular social games that are played by millions of people around the world each day. Zynga's early years Zynga was founded as a project by Mark Pincus in January of 2007 to create a social poker game to launch on The Facebook platform, which opened to third party developers in May of that year. The company was named after Mark's dog, Zinga, which was a shortened form of the word Enzinga, Swahili for warrior princess. Zynga's first headquarters was in the "Chip Factory," the former Williams Potato Chip factory in Potrero Hill, San Francisco. Zynga Poker launched on July 1, 2007, and became the first social online poker game, featuring real people with their pictures. It quickly became one of the largest free poker games in the world, and today is the largest free mobile poker game to this day.

			Zynga closed its first round of outside funding in November 2007 led by Fred Wilson from Union Square Ventures and Brad Feld from Foundry Group. On March 7, 2008, Zynga Poker became the first game in the West to sell virtual goods at scale by allowing players to buy its poker chips. Zynga adopted a bold mission: to connect the world through games. Its vision was that gaming would become a mass market activity, and 'play' would be as important a verb in our daily lives as search, shop and share. FarmVille FarmVille, which would become the most popular social game at that time, was developed in just six weeks by a team of nine people. It launched on June 19, 2009 and became an immediate viral hit, reaching 1 million DAUs by the end of its first week, peaking at 32 million DAU. Over its twelve year run the original FarmVille amassed over 700 million total installs. Under the leadership of chief technical officer Cadir Lee, Zynga pioneered the use of big data and analytics to develop mass market consumer apps, which accelerated testing and development and drastically reduced time to market for games. Zynga developed and launched many hit games on Facebook, including Mafia Wars, FarmVille, CityVille, FrontierVille, CastleVille, YoVille and Cafe World. CityVille, which reached 26 million daily users in 12 days, and according to VentureBeat became the fastest growing game in history. Five of these games surpassed $1 million per day in bookings, and Zynga became the most successful game developer on Facebook's platform. Nasdaq Zynga hyper growth Zynga grew its games through "Bold Beats," – innovative new features that excite and ignite players by adding a new dimension of play. Some examples included: 'animals that moved' in FarmVille and new cities in Mafia Wars. /p> Zynga grew its player network to 300 million monthly active users (MAUs) and at its peak on Facebook, represented an

			estimated 20% of Facebook page views and 19% of Facebook revenue in 2011. Zynga was one of the fastest-growing consumer internet companies in Silicon Valley history, reaching $1 billion in annual bookings, 1 billion installs and 3,000 employees in just four years. In December 2010, Zynga acquired Newtoy and Words With Friends. Over the next few years, Zynga developed Words With Friends into a forever franchise, and it became one of the most beloved social games of all time. Each day, Words With Friends sees more than 70 million words played. Zynga went public in December 2011 and was one of the first companies to ring the bell at its own headquarters. CSR Zynga's growing pains and transition to mobile In May 2012, Facebook changed its homepage navigation to favor newly installed apps, making it difficult for players to find older games. As a result of these changes, Zynga lost a significant amount of its players, which marked the beginning of a long decline in Web gaming on Facebook. Zynga moved its focus to developing and growing its mobile gaming business. In June of 2013, Zynga acquired Spooky Cool Labs, which became its social casino division and developed games such as Hit It Rich, Wizard of Oz Slots, and Willy Wonka Slots. In June 2013, Pincus recruited Don Mattrick as CEO, who pursued a strategy of high fidelity games for mobile. As part of this strategy, Zynga acquired NaturalMotion in February 2014, whose studios in London developed graphically rich mobile titles including our forever franchise CSR Racing. Unfortunately, as the company focused its efforts on new product releases, Zynga's long-time forever franchises suffered and saw declines, and the company's financial position worsened. What Will Our Players Thank Us For? "What will our players thank us for?

			In April 2015, Pincus returned as CEO to restore Zynga's focus on its forever franchises and long-time players, in addition to reducing operating costs — closing nearly half of Zynga's studios, reducing the company's workforce by 18 percent. In August 2015, Pincus recruited Frank Gibeau, to Zynga's board, and in February 2016 convinced Gibeau to become CEO, bringing to Zynga Gibeau's decades of experience in gaming. As CEO, Gibeau recruited a world-class management team and supercharged Zynga's growth, leading to record breaking revenue. Empires & Puzzles The Gibeau era: The world's fastest-growing mobile game company Under Gibeau's leadership, Zynga doubled down on forever franchises, leveraging the company's excellence in data, analytics and live operations to grow existing games, acquire talented studios, and develop the next generation of mobile games. Within a few years of Gibeau's tenure as CEO, Zynga became one of the fastest growing public gaming companies. The leadership team acquired leading new franchises such as Merge Dragons!, Empires & Puzzles, Toon Blast, and Toy Blast, and applied Zynga's world-class live operations and data analytics to turbocharge growth. Zynga Games In May 2018, Zynga acquired Gram Games, developer of Merge Dragons!. In January 2019, Zynga acquired Small Giant Games, developer of Empires & Puzzles. In July 2020, Zynga acquired Peak Games, developer of Toon Blast and Toy Blast. In October 2020, Zynga acquired Rollic, a fast-growing Hyper Casual games publisher. Rollic's portfolio of hit hyper-casual games have been downloaded more than a billion times. In August 2021, Zynga acquired Chartboost, a leading mobile monetization platform with more than 700 million monthly active users and more than 90 billion monthly advertising auctions. In October of 2021, Zynga acquired StarLark, developer of the Golf Rival franchise, the world's second-largest mobile golf game.

			Today, Zynga is one of the largest developers of mobile games in the West with more than 183 million monthly active users playing its mobile games. Zynga is a leading developer of the world's most popular social games that are played by millions of people around the world each day.

Table 1.10 Wireless and Mobile Strategy Examples with the Lowest Scores

Topics involved	Top 5 keywords in each topic	Firms with lowest score	Mission, Vision, and Strategy statements
Topic# 26	0.115*"company" + 0.083*"mobile" + 0.076*"platform" + 0.043*"connect" + 0.039*"user"	ABST	to create a track-and-trace solution that worked no matter what someone might do to the device. Absolute adds resilience to your endpoint We help organizations recover and resume normal operations in the face of security breaches. Absolute envisions a world where security and IT professionals always retain control over their devices and data. We're the first and only company to offer uncompromised visibility and near real-time remediation of security breaches at the source. Absolute Persistence™ returns devices to their desired state of safety and efficacy after malicious attacks or user error, thanks to our unique location in the firmware of more than 500 million devices built by most of the world's top device manufacturers. Absolute at a glance The world's only firmware-embedded endpoint visibility and control platform 13,000+ global customers 500 million endpoints 140 patents Factory-embedded by 28 top device manufacturers How we got here Absolute was founded in 1993 as a response to the problem of laptop theft and loss. Originally called "LoJack for Laptops" (and later Computrace) our mission was to create a track-and-trace solution that worked no matter what someone might do to the device. In the early 2000s, we began to partner with device manufacturers. We had the privilege of being factory-

			embedded within the BIOS level of their firmware, making Absolute nearly impossible to remove. This was a big step for us. But at the time, we had no idea how big it was. That privileged position created something the world hadn't seen yet: true resilience for a software agent. Whenever someone attempts to remove or reconfigure Absolute, it reasserts itself on the next boot sequence. This technology, now called Persistence, allowed us to offer more and more value to our customers. Today, Absolute users can see all of their devices from a single pane of glass, remotely query and remediate them at scale, and even extend Persistence to the rest of their mission-critical applications, enabling true resilience across their organizations. Absolute helps governments, corporations, agencies, educational institutions, and more to stay resilient in the face of growing and ever-changing cyber threats.

CHAPTER 2. THE INFLUENCE OF IT GOVERNANCE ON FINANCIAL PERFORMANCE: A MODERATED-MEDIATION ANALYSIS

Abstract

Although the relationship between IT governance and firm performance is generally positive, the effective implementation and alignment of IT governance practices are crucial for realizing the desired performance outcomes. Furthermore, the mechanism through which IT governance practices influence firm performance remains unclear and limited. To address this gap, this study examines how a firm's IT governance affects IT investment and, consequently, firm performance, emphasizing the moderating role of risk-taking orientation. Additionally, unlike the prevalent use of survey and case study methodologies in the strategic orientation literature, we employ Linguistic Inquiry and Word Count (LIWC) techniques to measure risk-taking orientation in the IT industry context. Drawing on text data from 418 public firms in the IT industry, this study identifies the complete and positive mediating role of IT investment between IT governance and firm performance. Moreover, it finds that risk-taking orientation positively moderates the relationship between IT investment and firm performance. This study is expected to contribute to the IT governance literature by shedding light on the underlying mechanisms through which IT governance influences firm performance and the moderating role of risk-taking orientation.

Keywords: IT Governance, Risk-taking Orientation, LIWC, Firm Performance, IT Investment.

Introduction

IT governance is the processes, structures, and mechanisms that ensure IT investments and activities are aligned with the organization's strategic objectives (Weill & Ross, 2004). It encompasses decision-making, accountability, and performance

measurement to effectively manage and utilize IT resources (De Haes & Van Grembergen 2004). Effective IT governance is crucial for organizations because it enables strategic alignment, efficient resource allocation, risk management, performance measurement, and decision-making in IT (Luftman & Kempaiah, 2007). It helps organizations optimize their IT capabilities and leverage technology for a competitive advantage. Furthermore, several IT governance frameworks and models have been developed to guide organizations in implementing effective IT governance practices. Examples of these frameworks include COBIT (Control Objectives for Information and Related Technologies), ITIL (Information Technology Infrastructure Library), and ISO/IEC 38500 (Corporate Governance of IT).

IT governance studies have sparked controversy about the correlation between IT governance and firm performance. On the one hand, research suggests a positive relationship between effective IT governance and firm performance (Weill & Ross 2004; Zhu, Kraemer, & Xu 2006). Organizations with robust IT governance practices experience improved operational efficiency, innovation, cost-effectiveness, and overall business performance. However, on the other hand, the impact of IT governance on firm performance may be indirect and mediated by various factors (Tanriverdi 2006; Chan & Reich 2007; Reich & Benbasat 2000). For instance, IT investment is often a mediator between IT governance and firm performance, as investments determine how IT resources are utilized to achieve desired outcomes (Weill & Ross 2004).

Moreover, several moderating factors can influence the correlation between IT governance and firm performance, including organizational culture (Weill & Ross 2004), industry context (Luftman 2004), IT capabilities (Bharadwaj 2000), and risk-

taking orientation (Artur 2009). For example, a solid risk-taking orientation may enhance the positive influence of IT investments on firm performance (Zhu, Kraemer, & Xu 2006). Nevertheless, the mechanisms through which IT governance practices affect firm performance remain unclear and limited (Ilmudeen, 2021). While there is an acknowledgment of the importance of IT governance in influencing firm performance, the specific mechanisms and causal relationships are often complex and multifaceted (Luftman & Ben-Zvi 2010). There are evolving challenges and complexities of IT governance and its impact on firm performance, highlighting the need for further research (Tallon, Ramirez, & Short 2013; Peterson 2004). The precise ways IT governance practices directly impact different dimensions of firm performance are not always well understood. Research on IT governance and firm performance has progressed, but there is a continued need to uncover the intermediary factors (mediators) and contextual influences (moderators) that link IT governance to performance outcomes. The full spectrum of how IT governance practices translate into improved firm performance remains a subject of ongoing exploration. Therefore, this study explores the mechanisms IT governance may improve firm performance. Additionally, it seeks to investigate the potential moderating role of risk-taking orientation in the correlation between IT governance and firm performance.

Strategic orientation is critical in information systems literature as it provides a framework for aligning information systems (IS) with organizational strategies (Chaganti & Sambharya 1987; Chan et al. 1987; Morgan & Strong 2003). It refers to the extent to which an organization's IS function is aligned with its overall strategic goals and objectives (Voss & Voss, 2000; Kindermann et al., 2021). Organizations

should continuously adapt to changing market conditions to maintain an advantage in today's highly competitive and fast-paced business environment (Englehardt & Simmons 2002). Information systems play a crucial role in this process by providing the necessary support for strategic decision-making, improving operational efficiency, and enabling innovation. However, aligning them with the organization's strategic objectives is essential to realize IS's benefits fully (Henderson & Venkatraman 1993). Strategic orientation enables organizations to leverage IS to achieve their strategic goals and objectives. In summary, the strategic orientation of an organization's IS function is a critical factor in achieving strategic goals and objectives.

As to the methodology used in prior research, many studies in the strategic orientation literature employ survey research to gather data on firms' strategic orientations and other relevant factors such as firm performance and market conditions (Huang, Davison & Gu, 2017). Case studies are also frequently employed in the strategic orientation literature to investigate how firms implement and operationalize their strategic orientations in practice (Felin & Zenger, 2014). Experimental research manipulates the independent variable (strategic orientation) and observes the effects on dependent variables such as firm performance or innovation (Lu, Yao & Zhang, 2011). Additionally, longitudinal studies track changes in strategic orientation over time and observe the effects on firm performance or other variables of interest (Chen & Qin, 2018). Instead, this study differs from the existing research regarding the methodology. LIWC helps address certain limitations of existing strategic orientation studies, such as common methods and subjective biases resulting from survey-based responses (Chau

et al. 2020; Huang, Hong, & Burtch 2017; Yin, Bond & Zhang 2014; Hong, Hu, & Burtch 2018; Miranda, Young, & Yetgin 2016).

Accordingly, this study addresses the following research questions:

1) What is the relationship between a firm's IT governance and IT investment?

2) To what extent does IT investment mediate the correlation between IT governance and firm performance?

3) How does risk-taking orientation moderate the correlation between IT investment and firm performance?

The research makes significant contributions to IT governance research by highlighting the crucial mediating role of IT investment and the moderating role of risk-taking orientation in shaping the actual implementation of IT investment. Moreover, the existing literature has demonstrated and validated the effectiveness of the LIWC technique in constructing measures related to strategic concepts and identifying language use patterns and trends (Hong, Hu, & Burtch 2018). Our study extends the LIWC technique's application to IT governance and strategic orientations. We offer a fresh perspective on measuring and operationalizing the relative emphasis of strategic orientations in earnings call transcripts. Our insights complement and enrich the literature on strategic orientations by highlighting the application of LIWC techniques to the IT governance field and emphasizing the potential mediating mechanisms of IT investment and the moderating role of risk-taking orientation.

This paper is structured in the following manner. Section 2 reviews the pertinent body of literature contributing to IT governance studies, comparing this study with

prior research. Section 3 develops the research model and corresponding hypotheses based on existing theories and studies. Section 4 outlines the data and analysis methods employed in this research, considering the research questions and the characteristics and structure of the data. Section 5 discusses the main findings and their implications for research and practice. Finally, Section 6 concludes the paper.

Literature Review and Theoretical Foundation

IT governance encompasses the specification of decision rights and accountability frameworks to promote favorable behavior in the use of IT (Weill & Ross, 2004). It involves establishing decision rights and an accountability framework to encourage desirable practices in IT utilization (Van Grembergen, 2004). One well-known framework for IT governance and control over IT resources is COBIT (IT Governance Institute, 2007). COBIT, developed by ISACA (Information Systems Audit and Control Association), is widely recognized as a comprehensive framework for IT governance. It offers a broad set of control objectives, management guidelines, and maturity models for IT governance. Within COBIT, IT governance domains and processes focus on strategic alignment, value delivery, risk management, and performance measurement.

IT governance's key components and practices include strategic alignment, risk management, resource management, performance measurement, and compliance (Tricker 2015). Strategic alignment refers to the ability of an organization to connect its IT resources and capabilities with its business objectives and strategies (Henderson and Venkatraman, 1993). It involves establishing a mutual understanding between business and IT leaders regarding the role of IT in achieving organizational goals

(Luftman et al., 2004). Risk management involves identifying, assessing, and mitigating IT-related risks that could negatively impact corporate objectives (ISACA, 2012). Effective risk management in IT governance ensures identifying, evaluating, and managing potential threats to protect organizational assets (Wu and Chen, 2011). Resource management encompasses the efficient and effective utilization of IT resources, including financial, human, and technological resources (Van Grembergen & De Haes, 2015). Resource management practices involve aligning IT resource allocation with organizational priorities and optimizing resource utilization to achieve business value (Lunardi et al., 2011). Performance measurement involves assessing IT initiatives and investments to ensure they contribute to organizational goals and provide value (Weill and Ross, 2004). Performance measurement practices enable organizations to evaluate the outcomes and impacts of IT investments on firm performance (Peterson and Saarinen, 2017). Compliance and control practices ensure adherence to legal, regulatory, and internal policies and controls related to IT (Van Grembergen & De Haes, 2015). Effective control mechanisms in IT governance aim to minimize risks and ensure compliance with applicable laws and regulations (ISACA, 2012).

Many studies have examined the correlation between IT governance and firm performance (Hamdan et al. 2019; Vejseli & Rossmann 2017; Boritz & Lim 2008). They explore how effective IT governance practices contribute to improved operational efficiency, innovation, cost-effectiveness, and overall business performance (Huang et al. 2010; Héroux & Fortin 2018; Weill & Ross 2005). Research indicates that IT governance positively affects firm financial performance by improving the strategic

alignment of IT with business objectives and enhancing IT resource management (Weill & Ross, 2004). Effective IT governance mechanisms positively influence firm financial performance through better decision-making regarding IT investments and resource allocation (Peterson & Saarinen, 2017). Furthermore, IT governance practices positively impact operational performance by improving the efficiency and effectiveness of IT operations, reducing downtime, and enhancing service quality (Tallon et al., 2000). Strategic alignment and risk management practices within IT governance positively influence operational performance by facilitating the delivery of IT services and reducing operational risks (Luftman et al., 2004).

Effective IT governance practices foster innovation by aligning IT investments with strategic objectives, promoting collaboration, and providing a supportive IT infrastructure (Ross et al., 2006). IT governance mechanisms, such as IT steering committees and innovation-focused policies, positively influence firm innovation performance by encouraging exploring and exploiting IT capabilities (Tavares et al., 2019). These studies collectively indicate that effective IT governance practices positively impact various dimensions of firm performance, including financial performance, operational performance, and innovation performance. Organizations can enhance their overall performance and competitive advantage by aligning IT with business objectives, managing risks, optimizing resource allocation, and promoting innovation.

Regarding IT governance's mediating and moderating factors, the literature explores various mediating factors that influence the correlation between IT governance and firm performance, such as IT investment and organizational agility.

The IT investment is a mediator in the correlation between IT governance and firm performance, as effective governance practices influence investment decisions that, in turn, impact performance outcomes (Peterson & Saarinen, 2017). IT investment acts as a mediator by translating the effects of IT governance into tangible outcomes and performance improvements (Wu & Chen, 2011). Additionally, organizational agility mediates between IT governance and firm performance, as effective governance enables organizations to adapt and respond quickly to dynamic market conditions (Akkermans & Helden, 2002). IT governance practices support organizational agility, which mediates the positive impact of IT governance on firm performance, particularly in dynamic environments (Tavares et al., 2019).

Studies also discuss moderating factors that influence the strength of the correlation between IT governance and firm performance, including firm size, top management support, and environmental uncertainty. Firm size moderates the correlation between IT governance and firm performance, as larger firms may benefit more from effective governance practices due to the scale and complexity of their IT operations (Peterson & Saarinen, 2017). The positive impact of IT governance on firm performance is more pronounced in larger organizations with more excellent IT resources and capabilities (Wu & Chen, 2011). Top management support moderates the correlation between IT governance and firm performance, as strong support from top executives enhances the effectiveness and implementation of IT governance practices (Weill & Ross, 2004). The positive impact of IT governance on firm performance is strengthened by top management support and commitment to IT initiatives (Croteau & Bergeron, 2001). Environmental uncertainty moderates the correlation between IT

governance and firm performance as effective governance practices become more crucial in uncertain and turbulent business environments (Luftman et al., 2004). The positive impact of IT governance on firm performance is amplified in environments characterized by high levels of uncertainty and rapid technological changes (Trimi & Berbegal-Mirabent, 2012).

In summary, previous studies emphasize the significance of IT governance in understanding the strategic behavior and decision-making of organizations concerning their utilization of IT. However, we have not found any studies investigating the mediating role of IT investment and the moderating role of risk-taking orientation on the correlation between IT governance and firm performance. Additionally, we have not found the utilization of LIWC technique-based text analysis for measuring risk-taking orientation. To address this gap, we examine the mediating role of IT investment between IT governance and firm performance, considering the moderating role of risk-taking orientation. Furthermore, existing studies predominantly employ survey data, which may be subject to common methods and subjective biases. LIWC methodologies in this study will enhance previous empirical findings and provide a new perspective by analyzing available unstructured data, explicitly developing measures of strategic orientations latent in earnings call transcripts.

Research Model and Hypotheses Development

Figure 2.1 presents the research model and corresponding hypotheses. IT governance refers to the framework of processes, policies, and procedures that guide the decision-making and management of IT resources within an organization (Zhang, Zhao & Kumar, 2016; Weill & Ross, 2004; Tavana, Di Caprio & Santos-Arteaga, 2019).

IT governance guarantees that IT investments are aligned with business objectives and that IT risks are effectively managed. The primary purpose of IT governance is to ensure that IT supports and enables the organization to achieve its goals.

For instance, IT governance frameworks such as COBIT (Control Objectives for Information and Related Technology) offer a set of best practices for managing IT investments, which include risk assessment, cost-benefit analysis, and project management. By adhering to these frameworks, organizations can ensure that their IT investments are aligned with their strategic objectives and implemented in a manner that minimizes risks while maximizing benefits. Similarly, robust IT governance practices assist organizations in managing the ongoing risks associated with IT investments, such as data security, regulatory compliance, and business continuity. Organizations can mitigate these risks by establishing appropriate controls and processes and ensuring their IT investments consistently deliver value over time.

Several studies have verified a positive correlation between IT governance and a firm's IT investment. Gu, Xue, & Ray (2008) examine the influence of IT governance on IT investment performance, validating the significant role of IT governance in realizing value from IT investments. When a firm has effective IT governance, its IT investments are optimized, aligned with its business strategy, and deliver value within acceptable risk boundaries (Symons, 2005). In other words, IT-related risks are better managed, increasing confidence in IT investments and enhancing their effectiveness. Overall, a robust IT governance framework enables organizations to make informed choices, allocate resources judiciously, and maximize the value and impact of IT investments. It ensures that IT investments are strategic, well-aligned with business

goals, and contribute to the organization's overall success. Thus, effective IT governance plays a vital role in driving the success of IT investments.

H1: IT governance is positively related to a firm's IT investment.

IT governance has a positive relationship with firm performance for several reasons. First, effective IT governance ensures that IT activities align with the organization's strategic goals. This alignment allows IT investments to contribute to achieving business objectives, enhancing firm performance directly. Second, IT governance assists in optimizing resource allocation, leading to improved company performance. Organizations can achieve better outcomes and cost-effectiveness by efficiently allocating financial, human, and technological resources. Third, IT governance frameworks incorporate risk management practices that mitigate potential risks and contribute to firm performance. Organizations can minimize disruptions and vulnerabilities by identifying and managing IT-related risks, thus enhancing overall performance. Lastly, effective IT governance facilitates informed decision-making regarding IT investments and initiatives, further enhancing firm performance.

Studies have consistently demonstrated a positive correlation between IT governance and firm performance (Hamdan et al., 2019; Khalil & Belitski, 2020; Ilmudeen, 2021). The findings indicate that various IT governance mechanisms function as dynamic capabilities and are directly associated with firm performance, although the impact of each mechanism may vary (Khalil & Belitski, 2020). Similarly, Ilmudeen (2021) argues that IT governance mechanisms positively impact IT-enabled dynamic capabilities. Furthermore, IT-enabled dynamic capabilities positively

influence agility and innovative ability, which in turn have a positive relationship with firm performance. Therefore,

H2: IT governance is positively related to firm performance.

Although the correlation between IT governance and firm performance is generally positive, the effective implementation and alignment of IT governance practices are crucial for realizing the desired performance outcomes. Moreover, the specific mechanisms through which IT governance practices impact firm performance are still unclear and limited (Ilmudeen, 2021). IT investment can mediate between IT governance and firm performance, as it provides the underlying support and implementation necessary for effective governance directly associated with firm performance. Business-IT alignment is derived from IT governance practices and the management of IT investments to achieve firm performance. IT governance helps organizations allocate IT resources efficiently and effectively, including managing IT budgets, prioritizing IT projects, and ensuring proper resource allocation to maximize value and return on investment. Organizations can optimize resource allocation to enhance operational efficiency, reduce costs, and improve firm performance.

Additionally, IT governance frameworks often incorporate risk management practices to identify and mitigate potential risks associated with IT investments. Effective risk management within IT governance ensures that potential risks are assessed and managed appropriately, reducing the likelihood of IT-related failures and their impact on firm performance. In light of these discussions, we hypothesize:

H3: IT investment mediates the positive correlation between IT governance and firm performance.

Risk-taking orientation refers to a firm's willingness to take risks and pursue innovative opportunities, and it is positively related to a firm's investment in IT (Lee & Lim, 2001; Bhattacherjee & Park, 2014; Hmieleski & Corbett, 2006). Risk-taking has also been demonstrated to positively impact firm performance (Putniņš & Sauka, 2020; Swierczek & Ha, 2003). Extensive studies have empirically verified the positive relationship between IT investment and firm performance (Brynjolfsson & Hitt, 2000; Huang & Liu, 2017; Melville et al., 2004; Tarafdar et al., 2011; Laudon & Laudon, 2018; Ray et al., 2019). Furthermore, firms with a higher risk-taking orientation are more likely to invest in IT initiatives with the potential for higher returns and performance improvements. On the one hand, risk-taking is positively associated with proactiveness and innovation (Naldi et al., 2007).

On the other hand, organizations with a higher risk-taking orientation may be more effective in leveraging IT investments to achieve superior performance outcomes (Lee & Lim, 2001; Hmieleski & Corbett, 2006). Overall, risk-taking orientation acts as a positive moderator, strengthening the positive relationship between IT investment and firm performance, particularly in a hypercompetitive environment characterized by uncertainty and the need to be agile and responsive (Bhattacherjee & Park, 2014). Organizations with a higher risk-taking orientation are more likely to capitalize on the potential benefits and opportunities associated with IT investments, leading to superior performance outcomes. Thus, we hypothesize:

H4: Risk-taking orientation positively moderates the relationship between IT investment and firm performance.

Method

Data

We obtained the independent and dependent variables from separate sources: Compustat, CrunchBase, and publicly traded IT companies' official websites. Initially, we collected the complete list of publicly traded companies from Compustat and focused explicitly on firms in the IT industry using the SIC code as our research target. It resulted in a total of 418 publicly traded IT companies. Additionally, based on this list of IT industry companies, we collected earnings call transcripts to measure risk-taking orientation for each firm, as the language used in earnings calls reflects firms' propensity for risk-taking. Earnings call transcripts serve as a platform for executives to discuss the firm's financial performance, strategies, and risk factors (Yamamoto et al., 2022; Fu, Wu, & Zhang, 2021). Higher levels of risk disclosure may indicate a more proactive approach toward risk management and a willingness to take calculated risks. The communication style and language CEOs and management use during earnings calls can provide insights into their risk-taking orientation. For example, CEOs who employ more optimistic or aggressive language and emphasize growth opportunities may be associated with a higher risk-taking orientation. The language used in earnings calls can influence investor perception and the market's assessment of a firm's risk profile.

IT spending data was collected from the CrunchBase website, which was projected spending for 2022. Finally, we supplemented the unstructured statement text and IT spending data with Compustat data throughout 2022. The final dataset comprises 418 publicly traded IT companies, resulting in 260 observations due to limited data on IT investment. We also collected board data from the BoardEx database to incorporate control variables.

The measurements of the independent and dependent variables are as follows: The dependent variable in our study is the return on assets (ROA) (Rostami, Rostami & Kohansal, 2016; Selling & Stickney, 1989). ROA is a financial ratio that indicates a firm's profitability in relation to its total assets. It is widely used by analysts, investors, and corporate management to assess a firm's efficiency in utilizing its assets to generate profit.

ITGOV-Score represents internal and external IT governance (Zhang, Zhao, & Kumar 2016). It is a summary IT governance measure including 11 factors representing both internal and external IT governance. The 11 factors are categorized into oversight, leadership IT background, and IT leadership importance. All 11 factors are coded as a number between 0 and 1. We then summarize them to get the composite ITGOVScore, the same approach as the GOV-Score calculated in the finance literature. ITGOV-Score is between 0 and 1. The closer the ITGOV-Score is to 1, the more influential the firm's IT governance. Table 2.4 presents the details of these 11 factors.

We analyzed earnings call transcripts using the Linguistic Inquiry and Word Count (LIWC) tool to measure risk-taking orientation. The results of the LIWC analysis provided a measurement of risk-taking orientation based on the degree of risk-related

language usage. Firms exhibiting a higher degree of risk-related language usage are considered to have a higher level of risk-taking orientation, which is verified in our example in Table 2.5. This example demonstrates that the firm SCWX, with a higher LIWC score of 1.92, has a higher level of risk-taking orientation since the keyword "risk" appear three times compared to the firm DTMXF, for which the keyword "risk" only appears one time with a lower LIWC score 0.02.

Table 2.1 shows the descriptive statistics of the metrics used and the correlations among the variables.

Lastly, a series of control variables are included in the data analysis. Given that this research examines the firm performance implications of IT governance, risk-taking orientation, and IT investment, including control variables helps enhance internal validity by mitigating the impact of confounding and other extraneous variables.

The liquidity ratio is a control variable that measures a company's capacity to meet short-term obligations or those due within one year (Beaver, 1966) and can influence a firm's value (Husna & Satria, 2019). Organizational efficiency is measured as the ratio of operating and nonoperating income and is included as a control variable since it is a determinant of performance (Mahsud, Yukl & Prussia, 2011).

Additional control variables include public firm age (Ling, Zhao & Baron, 2007), revenue growth (Thornhill, 2006), and various board characteristics such as CEO compensation, gender ratio, board educational background, and the average age of board members. These control variables help account for potential influences on firm performance beyond the main variables of interest.

Analysis techniques

LIWC analysis

LIWC (Linguistic Inquiry and Word Count) analysis is a widely used text analysis tool in research for examining the linguistic content of written or spoken text (Tausczik & Pennebaker 2010). It enables researchers to analyze text based on predefined linguistic categories, providing insights into language's psychological, emotional, and cognitive dimensions (Chau et al. 2020; Huang, Hong, & Burtch 2017; Yin, Bond & Zhang 2014; Hong, Hu, & Burtch 2018; Miranda, Young, & Yetgin 2016). LIWC categorizes words into linguistic dimensions, such as positive and negative emotions, cognitive processes, social processes, linguistic style, and topical categories. The tool has a predefined dictionary that assigns words to specific types (Pennebaker et al. 2001).

LIWC analysis has found applications in diverse domains, including psychology, social sciences, marketing, organizational behavior, and political science. It aids researchers in understanding the psychological and emotional aspects conveyed through language, identifying linguistic patterns, and exploring the influence of language on various outcomes. By offering a quantitative tool, LIWC analysis enables researchers to delve into the linguistic content of the text and extract meaningful insights.

Numerous research studies have utilized LIWC analysis to examine language's psychological, emotional, and cognitive aspects across different domains. This study

uses LIWC analysis to analyze firms' earning call transcripts and extract risk-related terms to measure their risk-taking orientation.

OLS Regression

Using OLS regression, we tested our hypotheses on 260 firm-year observations across 418 publicly traded firms based in the United States. These firms operate in the IT industry, as indicated by their four-digit Standard Industrial Classification (SIC) codes.

For each company, we merged financial data from Compustat, IT spending data from CrunchBase, IT governance data from 10k filings and proxy statements, and risk-taking orientation data from the LIWC analysis. We employed a one-year lag of IT investment and governance variables to measure firm performance, consistent with prior studies (Sabherwal et al., 2019; Dissanayake, Jeyaraj & Nerur, 2021).

Discussion

Outcomes of hypotheses testing

Table 2.1 presents the variables' means, correlations, and standard deviations. To address heteroskedasticity, we utilized White's (1980) procedure in the regression analyses to ensure reliable hypothesis testing. VIF (Variance Inflation Factor) values in the non-mediated models were 1.06, indicating the absence of collinearity issues. Similarly, in the mediated models, the VIF values were 1.07, showing no collinearity problems. Notably, slightly higher VIF values in mediated models are commonly observed (Baron & Kenny, 1986).

Table 2.2 presents the outcomes of OLS regression explaining firm value, measured as Tobin's q. Including our independent, mediating, and moderating variables improves the model's statistical fit, as indicated by an increase in R^2 and a decrease in AIC and BIC values.

Model 1 includes only the control variables. Model 2 examines the correlation between IT governance and IT investment. Model 3 explores the effects of IT investment on Tobin's q. Model 4 investigates the influence of IT governance on Tobin's q. Finally, Model 5 represents the whole model, incorporating all the mediators and moderators.

H1 is supported as Model 2 reveals a statistically significant positive coefficient for IT governance: $\beta = 73.49$, $p < 0.01$. These results prove a positive correlation between IT governance and IT investment. Based on Model 4, we also find that the positive correlation between IT governance and Tobin's q is significant: $\beta = 0.46$, $p < 0.05$. Hence, Hypothesis 2 is supported.

Regarding the control variables, the results indicate a negative and significant coefficient for revenue growth ($p < 0.10$). However, the coefficients for other control variables, such as board gender diversity and liquidity, exhibit a negative relationship with Tobin's q, but they are statistically insignificant. Conversely, control variables like board education, board average age, and firm age show a positive relationship with Tobin's q, but they are also insignificant.

Table 2.2 also includes models testing hypotheses 3 and 4. Baron and Kenny (1986) state that mediation is demonstrated when four conditions are met. Model 2

satisfies the first condition, showing a significant relationship between the predictor (IT governance) and the mediator (IT investment). The second condition is also met, as Model 4 demonstrates a significant relationship between the predictor (IT governance) and the dependent variable (Tobin's q): $\beta = 0.46$, $p < 0.05$. It validates the second condition. The third condition, which requires a relationship between the mediator and the dependent variable, is met in Model 3, where IT investment is positively related to Tobin's q ($p < 0.01$).

Furthermore, Models 4 and 5 demonstrate that after accounting for IT investment, the original significant influence of IT governance becomes insignificant. These findings support H3 and suggest the presence of a mediation effect, indicating that IT investment mediates the positive correlation between IT governance and firm performance. These models eliminate the relationship between the predictor and dependent variables, suggesting complete mediation.

Regarding the moderating role of risk-taking orientation, H4 is supported as Model 5 shows a statistically significant positive coefficient for the interaction between IT investment and risk-taking orientation: $\beta = 0.03$, $p < 0.001$. These results confirm the positive moderating role of risk-taking orientation.

Additional analysis

We also conducted a robustness check for the OLS regression using ROA as an alternative dependent variable, as shown in Table 2.3. The outcomes are consistent with the previous findings, supporting all the hypotheses.

Regarding H1, Model 2 demonstrates a significant positive correlation between IT governance and IT investment ($\beta = 73.49$; $p < 0.01$). The results support the hypothesis that IT governance positively affects IT investment.

Furthermore, for H2, Model 4 shows that IT governance is positively and significantly related to ROA ($\beta = 0.01$; $p < 0.05$). This finding supports the hypothesis that IT governance positively influences firm performance, as measured by ROA.

H4 is also supported, as indicated by Model 5, which shows a significant and positive moderating effect of risk-taking orientation on the relationship between IT investment and firm performance ($\beta = +0.00$; $p < 0.001$).

Finally, in line with Baron and Kenny's (1986) conditions for mediation, all four conditions are satisfied. Therefore, H3 is supported, indicating the mediating role of IT investment in the correlation between IT governance and firm performance.

Implications for research

The findings suggest several essential research implications. First, this study underscores the role of IT investment as a critical mediator in the correlation between IT governance and firm performance. Organizations should recognize the significance of allocating resources and assets in IT initiatives to enhance overall performance. Understanding the specific pathways through which IT investment impacts firm performance can guide decision-making and resource allocation in IT-related projects.

Second, the research sheds light on the moderating role of risk-taking orientation in the relationship between IT investment and firm performance. Organizations need to consider their risk-taking orientation when making IT investment

decisions. A higher risk-taking orientation can amplify the positive impact of IT investment on firm performance, suggesting that organizations should evaluate their risk appetite and foster a culture that encourages calculated risk-taking in IT initiatives.

Furthermore, this study makes methodological contributions by employing the Linguistic Inquiry and Word Count (LIWC) techniques to measure risk-taking orientation in the IT industry context. This methodological approach offers a novel way to assess risk-taking orientation, providing researchers with an alternative tool for studying strategic orientations in the IT field. This contribution expands the methodological toolkit available for future research in this area.

Additionally, the study addresses existing IT governance literature gaps by examining the underlying mechanisms through which IT governance practices influence firm performance. By establishing the positive mediating role of IT investment, the research clarifies how IT governance practices impact performance outcomes. This contribution enhances the theoretical foundations of IT governance research and expands knowledge in this domain.

Finally, the findings of this study can guide managers and IT leaders in making informed decisions regarding IT governance and investment strategies. The results indicate that organizations should focus on implementing effective IT governance mechanisms and fostering a risk-taking orientation to maximize the benefits of IT investments. Managers can use these insights to optimize IT decision-making processes, allocate resources appropriately, and create a supportive organizational environment.

Practical implications

This study has several practical implications. First, it is essential to enhance IT governance implementation. The findings of this study emphasize the importance of effectively implementing and aligning IT governance practices. Practitioners should ensure that IT governance mechanisms are appropriately implemented within their organizations. It includes establishing clear policies, procedures, and structures that promote effective decision-making, resource allocation, and risk management in IT investments. Organizations can benefit from adopting best practices and frameworks for IT governance, such as COBIT or ITIL, to guide their implementation efforts.

Second, it is essential to optimize IT investment strategies. This study highlights the mediating role of IT investment in the correlation between IT governance and firm performance. Practitioners should pay attention to allocating resources and assets in IT initiatives. It is crucial to evaluate and prioritize IT investments based on their potential impact on firm performance. To make informed investment decisions, organizations should thoroughly assess IT projects' expected benefits, risks, and potential gains.

Third, the research underscores the moderating role of risk-taking orientation in the relationship between IT investment and firm performance. Practitioners should cultivate a culture that encourages calculated risk-taking in IT decision-making processes. Organizations with a higher risk-taking orientation can potentially enhance the positive impact of IT investments on firm performance. It requires creating an environment that supports innovation, experimentation, and learning from failures in IT initiatives.

Furthermore, the study introduces the Linguistic Inquiry and Word Count (LIWC) techniques to measure risk-taking orientation in the IT industry context. Practitioners can consider incorporating text analysis tools and techniques like LIWC in their research and decision-making processes. These methods offer a new approach to assessing strategic orientations and can provide valuable insights into the psychological and linguistic aspects of risk-taking and decision-making in IT governance.

Additionally, based on the study's findings, practitioners can identify best practices for IT governance that can potentially improve firm performance. It is essential to explore established frameworks and models for IT governance, such as ISO/IEC 38500 or NIST Cybersecurity Framework, and adapt them to the unique requirements and circumstances of the organization. Implementing these best practices can help organizations establish robust IT governance structures and processes, improving decision-making and overall performance.

Finally, organizations should view IT governance as a continuous process that requires constant learning and improvement. It is essential to regularly assess and appraise the effectiveness of IT governance practices in achieving desired performance outcomes. Through observing key performance indicators (KPIs) related to IT governance, organizations can identify areas for improvement, adjust strategies accordingly, and adapt to changing technological and business landscapes.

Conclusion

IT governance is essential to a firm's competitive advantage. The underlying mechanisms of how IT governance improves firm performance is crucial to firms' success. This study provides a deeper understanding of this phenomenon, supported by insights from applying text mining techniques in unstructured data, considering the moderating roles of risk-taking orientation. The empirical findings suggest that a firm's IT governance improves its financial performance through the mediating role of IT investment, further positively moderated by risk-taking orientation. Based on our conceptualization and findings, we find a strong need for future studies to focus on IT governance and strategic orientation by applying machine learning techniques to unstructured text data.

References

Acur, N., & Kandemir, D. (2017). Strategic orientation, innovation and firm performance: An analysis in Turkish manufacturing industry. *Journal of Manufacturing Technology Management, 28*(1), 8-24. https://doi.org/10.1108/JMTM-10-2015-0103.

Al-Qirim, N. A. (2006). The impact of IT governance on the relationship between risk-taking orientation and IT investment in Jordanian firms. *International Journal of Accounting Information Systems, 7*(4), 414-432.

Akkermans, H., & Helden, K. V. (2002). Vicious and virtuous cycles in ERP implementation: A case study of interrelations between critical success factors.

Artur, R. O. T. (2009, July). IT Risk Management in the Context of IT Governance: Theory vs. Practice. In *The 6th International Symposium on Risk Management and Cyber-Informatics: RMCI* (pp. 10-13).

Auh, S., & Menguc, B. (2005). The influence of top management team functional diversity on strategic orientations: the moderating role of environmental turbulence and inter-functional coordination. *International Journal of Research in Marketing, 22*(3), 333–350.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173.

Bettinazzi, E. L., Jacqueminet, A., Neumann, K., & Snoeren, P. (2023). Media Coverage of Firms in the Presence of Multiple Signals: A Configurational Approach. *Academy of Management Journal,* (ja).

Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly,* 169-196.

Bhattacherjee, A., & Park, S. C. (2014). Why do firms invest in information technology? The role of industry-specific business risks. *Journal of Strategic Information Systems, 23*(1), 45-64.

Boritz, J. E., & Lim, J. H. (2008, January). IT control weaknesses, IT governance and firm performance. In *IT Governance and Firm Performance (January 11, 2008).(CAAA) 2008 Annual Conference Paper.*

Boso, N., Cadogan, J. W., & Story, V. M. (2013). Entrepreneurial orientation, market orientation, network ties, and performance: Study of entrepreneurial firms in a developing economy. *Journal of Business Venturing, 28*(6), 708-727.

Brown, A. D., & Grant, G. G. (2005). Framing the frameworks: A review of IT governance research. *Communications of the Association for Information Systems, 15*(1), 696-712.

Brynjolfsson, E., & Hitt, L. M. (2000). Beyond computation: Information technology, organizational transformation and business performance. *Journal of Economic Perspectives, 14*(4), 23-48.

Calder, A., & Watkins, S. (2008). Investigating IT governance in theory and practice in a UK banking environment. *Journal of Enterprise Information Management, 21*(3), 264-282.

Chaganti, R., & Sambharya, R. (1987). Strategic orientation and characteristics of upper management. *Strategic Management Journal, 8*(4), 393-401.

Chan, Y. E., Huff, S. L., Barclay, D. W., & Copeland, D. G. (1997). Business strategic orientation, information systems strategic orientation, and strategic alignment. *Information Systems Research, 8*(2), 125-150.

Chan, Y. E., & Reich, B. H. (2007). IT alignment: what have we learned?. *Journal of Information Technology, 22*(4), 297-315.

Chau, M., Li, T. M., Wong, P. W., Xu, J. J., Yip, P. S., & Chen, H. (2020). Finding People with Emotional Distress in Online Social Media: A Design Combining Machine Learning and Rule-Based Classification. *MIS Quarterly, 44*(2).

Chen, Y., & Chen, Y. (2017). Relative future orientation and IT investment: The moderating role of institutional distance. *Information & Management, 54*(6), 726-737.

Chen, J., Chen, Y., & Vanhaverbeke, W. (2011). Innovation orientation and firm performance: the role of organizational learning capability. *Journal of Business Research, 64*(12), 1311-1319.

Chen, C., & Huang, K. (2018). The impact of future orientation and IT governance on IT investment in Chinese firms. *Information & Management, 55*(3), 339-352.

Chen, Y., Li, X., & Li, Y. (2015). IT governance, risk-taking orientation and IT investment: Evidence from Chinese firms. *Information & Management, 52*(1), 75-86.

Chen, Y. S., Lin, M. J. J., & Chang, C. H. (2011). The positive effects of relationship learning and absorptive capacity on innovation performance and competitive advantage in industrial markets. *Industrial Marketing Management, 40*(8), 1244-1253.

Chen, Y., & Qin, Y. (2018). Research on the relationship between strategic orientation and innovation performance of high-tech enterprises: The moderating role of entrepreneurial orientation. *Sustainability, 10*(6), 1918.

Chwelos, P., Benbasat, I., & Dexter, A. S. (2001). Empirical test of an EDI adoption model. *Information Systems Research, 12*(3), 304-321.

Croteau, A. M., & Bergeron, F. (2001). An information technology trilogy: business strategy, technological deployment and organizational performance. *The Journal of Strategic Information Systems, 10*(2), 77-99.

Cyert, R. M., & March, J. G. (1963). A behavioral theory of the firm. *Englewood Cliffs, NJ, 2*(4), 169-187.

Damanpour, F., & Evan, W. M. (1984). Organizational innovation and performance: The problem of "organizational lag". *Administrative Science Quarterly, 29*(3), 392-409.

Damanpour, F., & Schneider, M. (2008). Characteristics of innovation and innovation adoption in public organizations: Assessing the role of managers. *Journal of Public Administration Research and Theory, 19*(3), 495-522.

De Haes, S., & Van Grembergen, W. (2004). IT governance and its mechanisms. *Information Systems Control Journal, 1*, 27-33.

De Haes, S., & Van Grembergen, W. (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management, 26*(2), 123-137.

Deutscher, F., Zapkau, F. B., Schwens, C., Baum, M., & Kabst, R. (2016). Strategic orientations and performance: A configurational perspective. *Journal of Business Research, 69*(2), 849-861.

Englehardt, C. S., & Simmons, P. R. (2002). Organizational flexibility for a changing world. *Leadership & Organization Development Journal, 23*(3), 113-121.

Felin, T., & Zenger, T. R. (2014). Closed or open innovation? Problem solving and the governance choice. *Research Policy, 43*(5), 914-925.

Fu, X., Wu, X., & Zhang, Z. (2021). The information role of earnings conference call tone: Evidence from stock price crash risk. *Journal of Business Ethics, 173*, 643-660.

Gatignon, H., & Xuereb, J. M. (1997). Strategic orientation of the firm and new product performance. *Journal of Marketing Research, 34*(1), 77-90.

Gu, B., Xue, L., & Ray, G. (2008). IT governance and IT investment performance: An empirical analysis. *Available at SSRN 1145102.*

Hamdan, A., Khamis, R., Anasweh, M., Al-Hashimi, M., & Razzaque, A. (2019). IT governance and firm performance: Empirical study from Saudi Arabia. *Sage Open, 9*(2), 2158244019843721.

Henderson, J. C., & Venkatraman, N. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal, 32*(1), 4-16.

Henderson, J. C., Venkatraman, N., & Oldach, S. H. (1993). Continuous strategic alignment: Exploiting information technology capabilities for competitive success. *European Management Journal, 11*(2), 139-149. https://doi.org/10.1016/0263-2373(93)90010-M

Héroux, S., & Fortin, A. (2018). The moderating role of IT-business alignment in the relationship between IT governance, IT competence, and innovation. *Information Systems Management, 35*(2), 98-123.

Hessels, J., Oerlemans, L. A., & van der Zwan, P. W. (2017). Technology orientation and new venture performance in the healthcare industry. *Journal of Technology Transfer, 42*(4), 752-768.

Hitt, M. A., Ireland, R. D., & Sirmon, D. G. (2011). Strategic entrepreneurship: Creating value for individuals, organizations, and society. *Academy of Management Perspectives, 25*(2), 57-75.

Hmieleski, K. M., & Corbett, A. C. (2006). Proclivity for improvisation as a predictor of entrepreneurial intentions. *Journal of Small Business Management, 44*(1), 45-63.

Holsapple, C. W., & Singh, M. (2001). The effects of proactivity orientation on IT investment. *Information & Management, 39*(2), 139-150.

Hong, Y., Hu, Y., & Burtch, G. (2018). Embeddedness, pro-sociality, and social influence: Evidence from online crowdfunding. *MIS Quarterly*, Forthcoming.

Hsu, C. F., & Hu, Q. (2013). The impact of IT governance on IT spending and firm performance: An empirical investigation. *Journal of Information Systems, 27*(2), 225-248.

Hsu, P. F., Chen, Y. Y., & Hu, Q. (2016). The moderating effect of IT governance on the relationship between proactivity orientation and IT investment. *International Journal of Information Management, 36*(4), 542-552.

Huang, Q., Davison, R. M., & Gu, J. (2017). An empirical study of strategic orientation and E-business adoption in China. *Information & Management, 54*(1), 43-54.

Huang, N., Hong, Y., & Burtch, G. (2017). Social Network Integration and User Content Generation. *MIS Quarterly, 41*(4), 1035-1058.

Huang, X., & Liu, W. (2017). Information technology investment and firm performance: A literature review and synthesis. *International Journal of Information Management, 37*(5), 487-503.

Huang, K., Xu, Y., & Davison, R. M. (2018). The impact of proactivity orientation on digital transformation. *Information & Management, 55*(8), 978-988.

Huang, R., Zmud, R. W., & Price, R. L. (2010). Influencing the effectiveness of IT governance practices through steering committees and communication policies. *European Journal of Information Systems, 19*(3), 288-302.

Hult, G. T. M., Hurley, R. F., & Knight, G. A. (2005). Innovativeness: Its antecedents and impact on business performance. *Industrial Marketing Management, 34*(8), 809-821.

Ilmudeen, A. (2021). The Role of It Governance and Managing It Investment on Firm Performance. In *Corporate Governance and Its Implications on Accounting and Finance* (pp. 104-120). IGI Global.

Ilmudeen, A. (2022). Information technology (IT) governance and IT capability to realize firm performance: enabling role of agility and innovative capability. *Benchmarking: An International Journal, 29*(4), 1137-1161.

ISACA. (2012). COBIT 5: *A Business Framework for the Governance and Management of Enterprise IT*. Isaca.

IT Governance Institute. (2007). COBIT 4.1: Framework, Control Objectives, Management Guidelines, Maturity Models. IT Governance Institute.

James, C., & Collins, C. O. L. L. I. N. S. (1994). *Built to Last: Successful Habits of Visionary Companies.*

Janssen, L. A., Luciano, E. M., & Testa, M. G. (2013, January). The influence of organizational culture on IT governance: Perception of a group of IT managers from Latin American companies. In *2013 46th Hawaii International Conference on System Sciences* (pp. 4485-4494). IEEE.

Jha, S., & Iyer, L. S. (2006). IT governance and IT investment: a study in Indian firms. *Journal of Global Information Management, 14*(2), 1-16.

Kaplan, R. S., & Mikes, A. (2012). Managing risks: A new framework. *Harvard Business Review, 90*(6), 48-60.

Khalil, S., & Belitski, M. (2020). Dynamic capabilities for firm performance under the information technology governance framework. *European Business Review, 32*(2), 129-157.

Kim, D. H., & Kim, H. W. (2015). The impact of IT investment on firm performance: With respect to the degree of future-orientedness of industry. *Journal of Business Research, 68*(4), 823-830.

Kindermann, B., Beutel, S., de Lomana, G. G., Strese, S., Bendig, D., & Brettel, M. (2021). Digital orientation: Conceptualization and operationalization of a new strategic orientation. *European Management Journal, 39*(5), 645-657.

Kohli, A. K., & Jaworski, B. J. (1990). Market orientation: the construct, research propositions, and managerial implications. *Journal of Marketing, 54*(2), 1-18.

Laudon, K. C., & Laudon, J. P. (2004). *Management Information Systems: Managing the Digital Firm*. Pearson Educación.

Lee, H. M., Lee, S. H., & Kim, H. J. (2017). The moderating effect of IT governance on the relationship between technology orientation and IT investment. *Information & Management, 54*(5), 639-651.

Lee, J. N., & Lim, C. (2001). Information technology investment and firm performance: An empirical study. *Journal of Management Information Systems, 17*(4), 121-143.

Li, J. J. (2005). The formation of managerial networks of foreign firms in China: the effects of strategic orientations. *Asia Pacific Journal of Management, 22*(4), 423–443.

Li, S., & Li, Y. (2019). The impact of CEO hubris on firm innovation: The mediating role of R&D investment efficiency. *Journal of Business Research, 104*, 441-453.

Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. *MIS Quarterly, 31*(1), 59-87. https://doi.org/10.2307/25148758

Liang, H., You, J., & Liu, X. (2010). The effect of proactivity orientation on technology innovation adoption: A study of Chinese firms. *Journal of Engineering and Technology Management, 27*(1-2), 33-45.

Lu, J., Yao, J. E., & Zhang, H. (2011). Testing the relationship between organizational culture and knowledge management practices: A Chinese experience. *Journal of Knowledge Management, 15*(4), 590-601. https://doi.org/10.1108/13673271111154649

Luftman, J. (2004). Assessing business-IT allignment maturity. In Strategies for information technology governance (pp. 99-128). Igi Global.

Luftman, J., & Kempaiah, R. (2007). Key issues for IT executives 2007: The transformational CIO. *MIS Quarterly Executive, 6*(2), 59-73.

Luftman, J., & Ben-Zvi, T. (2010). Key issues for IT executives 2010: judicious IT investments continue post-recession. *MIS quarterly Executive, 9*(4), 263-273.

Lumpkin, G. T., & Dess, G. G. (2001). Linking two dimensions of entrepreneurial orientation to firm performance: The moderating role of environment and industry life cycle. *Journal of Business Venturing, 16*(5), 429-451.

Lunardi, G. L., Becker, J. L., & Maçada, A. C. (2011). IT governance mechanisms and administration effectiveness: a study in Brazilian public

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Information technology and organizational performance: An integrative model of IT business value. *MIS Quarterly,* 283-322.

Miller, D., & Friesen, P. H. (1982). Innovation in conservative and entrepreneurial firms: Two models of strategic momentum. *Strategic Management Journal, 3*(1), 1-25.

Miller, D. (1983). The correlates of entrepreneurship in three types of firms. *Management Science, 29*(7), 770-791.

Miller, D. (1996). Configurations revisited. *Strategic Management Journal, 17*(7), 505-512.

Miranda, S. M., Young, A., & Yetgin, E. (2016). Are social media emancipatory or hegemonic? Societal effects of mass media digitization in the case of the SOPA discourse. *MIS Quarterly, 40*(2), 303-330.

Morgan, R. E., & Strong, C. A. (2003). Business performance and dimensions of strategic orientation. *Journal of Business Research, 56*(3), 163-176.

Naldi, L., Nordqvist, M., Sjöberg, K., & Wiklund, J. (2007). Entrepreneurial orientation, risk taking, and performance in family firms. *Family Business Review, 20*(1), 33-47.

Narver, J. C., & Slater, S. F. (1990). The effect of a market orientation on business profitability. *Journal of Marketing, 54*(4), 20-35.

Pennebaker, J. W., Francis, M. E., & Booth, R. J. (2001). Linguistic inquiry and word count: LIWC 2001. *Mahway: Lawrence Erlbaum Associates, 71*(2001), 2001.

Peterson, R. R., & Saarinen, T. (2017). IT governance mechanisms and firm performance: A review and research agenda.

Peterson, R. R. (2003). Strategies for managing internal IT markets. *MIS Quarterly, 27*(2), 163-196.

Peterson, R. (2004). Crafting information technology governance. *Information Systems Management, 21*(4), 7-22.

Putniņš, T. J., & Sauka, A. (2020). Why does entrepreneurial orientation affect company performance?. *Strategic Entrepreneurship Journal, 14*(4), 711-735.

Rai, A., Patnayakuni, R., & Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS Quarterly, 30*(2), 225-246.

Ravichandran, T., & Rai, A. (2000). Quality management in systems development: An organizational system perspective. *MIS Quarterly, 24*(3), 381-415.

Ray, G., Barney, J. B., & Muhanna, W. A. (2019). Information technology and corporate strategy: A research perspective. *MIS Quarterly, 43*(1), 1-21.

Reich, B. H., & Benbasat, I. (2000). Factors that influence the social dimension of alignment between business and information technology objectives. *MIS Quarterly*, 81-113.

Ross, J. W., Weill, P., & Robertson, D. (2006). *Enterprise Architecture as Strategy: Creating a Foundation for Business Execution*. Harvard business press.

Sabherwal, R., & Sabherwal, S. (2005). An empirical taxonomy of IT governance structures. *Information Systems Management, 22*(4), 26-34.

Sheng, S., Nah, F. F.-H., & Siau, K. (2008). An empirical investigation of the key factors for success in ERP systems implementation. *Journal of Computer Information Systems, 49*(2), 17-23. https://doi.org/10.1080/08874417.2008.11645997.

Short, J. C., Ketchen Jr, D. J., Shook, C. L., & Ireland, R. D. (2010). The concept of "opportunity" in entrepreneurship research: Past accomplishments and future challenges. *Journal of Management, 36*(1), 40-65.

Sinkovics, R. R., & Roath, A. S. (2004). Strategic orientation, capabilities, and performance in manufacturer—3PL relationships. *Journal of Business Logistics, 25*(2), 43-64.

Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of Management Review, 32*(1), 273-292.

Slater, S. F., & Narver, J. C. (1995). Market orientation and the learning organization. *Journal of Marketing, 59*(3), 63-74.

Strempek, R. B. (1997). *The Effect of Strategic Orientation and Adaptability on Organizational Behaviors and Performance: The Case of Electronic Commerce in the Hosiery Industry* (Doctoral dissertation, Virginia Tech).

Swierczek, F. W., & Ha, T. T. (2003). Entrepreneurial orientation, uncertainty avoidance and firm performance: an analysis of Thai and Vietnamese SMEs. *The International Journal of Entrepreneurship and Innovation, 4*(1), 46-58.

Symons, C. (2005). IT governance framework. *FOrrester research.*

Szymanski, D. M., & Bharadwaj, S. G. (1999). The role of intangible assets in the transformation of the US economy. *Journal of Marketing, 63*(Special Issue), 1-23.

Tanriverdi, H. (2006). Performance effects of information technology synergies in multibusiness firms. *MIS Quarterly,* 57-77.

Tang, X., & Jiang, J. (2018). The impact of IT governance on the relationship between proactivity orientation and IT investment. *Journal of Business Research, 91*, 65-76.

Tallon, P. P., Kraemer, K. L., & Gurbaxani, V. (2000). Executives' perceptions of the business value of information technology: A process-oriented approach.

Tallon, P. P., Ramirez, R. V., & Short, J. E. (2013). The information artifact in IT governance: Toward a theory of information governance. *Journal of Management Information Systems, 30*(3), 141-178.

Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2011). The impact of technostress on role stress and productivity. *Journal of Management Information Systems, 28*(1), 301-328.

Tausczik, Y. R., & Pennebaker, J. W. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of language and social psychology, 29*(1), 24-54.

Tavana, M., Di Caprio, D., & Santos-Arteaga, F. J. (2019). The effects of IT governance on IT value and organizational performance. *International Journal of Information Management, 46*, 175-186.

Tavares, L. V., Moraes, G. H., & Lopes, A. P. (2019). IT governance, innovation, and firm performance: A literature review and research agenda.

Tricker, R. I. (2015). *Corporate governance: Principles, policies, and practices.* Oxford University Press, USA.

Trimi, S., & Berbegal-Mirabent, J. (2012). Business implications of open innovation: Evidence from the transformation of consumer electronics.

Van Grembergen, W., & Saull, R. (2001). Introduction to the Minitrack on IT Governance and its Mechanisms. *Proceedings of the 34th Hawaii International Conference on System Sciences.*

Van Grembergen, W., & De Haes, S. (2015). *Enterprise Governance of Information Technology: Achieving Alignment and Value*, Featuring COBIT 5.

Van Grembergen, W., De Haes, S., & Guldentops, E. (2004). Structures, processes and relational mechanisms for IT governance. In *Strategies for Information Technology Governance* (pp. 1-35). IGI Global.

Venkatraman, N. (1989). Strategic orientation of business enterprises: The construct, dimensionality, and measurement. *Management Science, 35*(8), 942-962.

Vejseli, S., & Rossmann, A. (2017). The impact of IT governance on firm performance a literature review.

Voss, G. B., & Voss, Z. G. (2000). Strategic orientation and firm performance in an artistic environment. *Journal of Marketing, 64*(1), 67-83.

Wade, M., & Hulland, J. (2004). Review: The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS Quarterly, 28*(1), 107-142.

Wang, X., Chen, Y., Lu, L., & Chen, H. (2021). The impact of IT governance on the relationship between technology orientation and IT investment: An empirical study of Chinese firms. *Journal of Business Research, 122,* 166-176.

Wang, H., Lu, C., & Su, J. (2014). Does corporate social responsibility affect the cost of capital? Evidence from Chinese listed firms. *Journal of Business Ethics, 125*(4), 709-723.

Wang, C. H., Hsu, W. T., & Wang, C. C. (2014). Proactivity orientation and innovation in high-tech firms: The mediating effects of exploratory and exploitative innovations. *Journal of Business Research, 67*(7), 1468-1476.

Weill, P., & Ross, J. W. (2004). *IT governance: How top performers manage IT decision rights for superior results.* Harvard Business Press.

Weill, P., & Ross, J. W. (2005). A matrixed approach to designing IT governance. *MIT Sloan management Review*.

Weill, P., & Woodham, R. (2002). Don't just lead, govern: Implementing effective IT governance. *MIT Sloan Management Review, 44*(1), 20-26.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: Journal of the Econometric Society*, 817-838.

Wu, J. H., & Chen, Y. C. (2011). An integrated model for IT governance and its impact on firm performance.

Yamamoto, R., Kawadai, N., Kurita, M., & Baba, S. (2022). Managements' tone strategies by earnings call transcripts in the global markets. *Journal of Asset Management, 23*(3), 246-255.

Yin, D., Bond, S. D., & Zhang, H. (2014). Anxious or angry? Effects of discrete emotions on the perceived helpfulness of online reviews. *MIS Quarterly, 38*(2), 539-560.

Zhang, P., Zhao, K., & Kumar, R. L. (2016). Impact of IT governance and IT capability on firm performance. *Information Systems Management, 33*(4), 357-373.

Zhou, K. Z., Yim, C. H., & Tse, D. K. (2005). The effects of strategic orientations on technological- and market-based breakthrough innovations. *Journal of Marketing, 69*(2), 42–60.

Zhou, K. Z., & Li, C. B. (2007). How does strategic orientation matter in Chinese firms? *Asia Pacific Journal of Management, 24*(4), 447–466.

Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of innovation assimilation by firms in different countries: a technology diffusion perspective on e-business. *Management Science, 52*(10), 1557-1576.

Graphs and tables

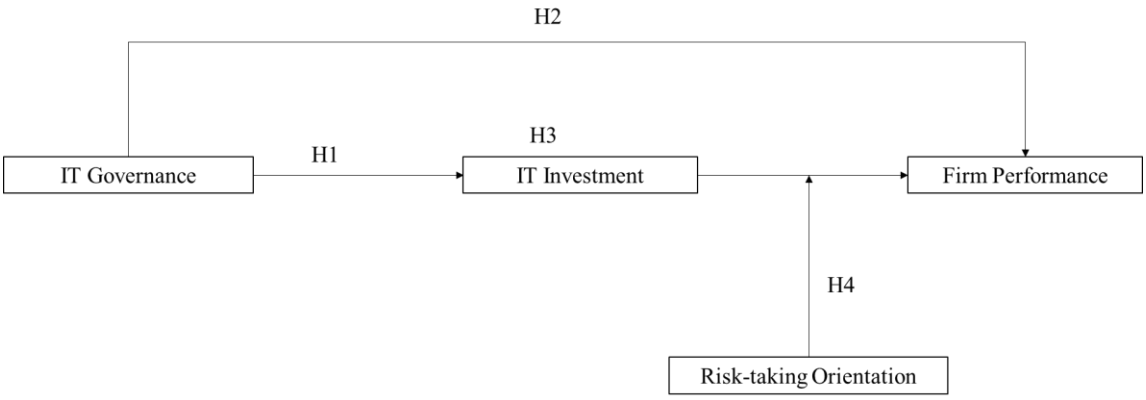


Figure 2.1 Research Model

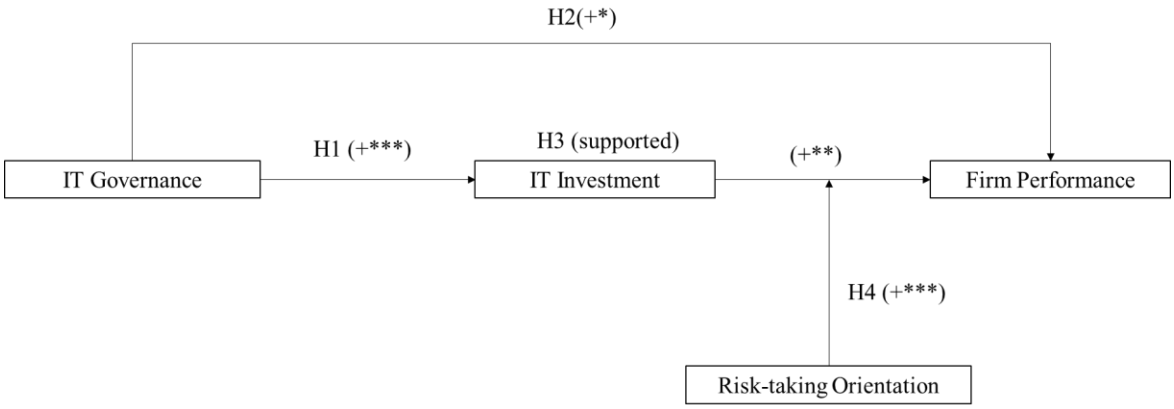


Figure 2.2 Results of Analysis

Table 2.1. Descriptive statistics and bivariate correlations

	Means	S.D.	1	2	3	4	5	6	7	8	9	10
1. Tobin's Q	5.17	11.86	1.00									
2. IT governance	1.51	3.52	0.14	1.00								
3. Risk-taking orientation	0.34	0.24	-0.03	-0.12	1.00							
4. IT investment	244.33	1215.32	0.20	0.25	-0.08	1.00						
5. Board Gender Diversity	0.04	0.09	0.06	0.16	-0.06	0.15	1.00					
6. Board Education	0.03	0.10	0.14	-0.03	0.04	-0.04	0.23	1.00				
7. Board Average Age	56.15	2.26	0.08	-0.01	-0.00	0.02	0.08	0.20	1.00			
8. Firm Age	33.08	21.73	0.13	-0.02	0.03	0.09	0.22	-0.00	0.10	1.00		
9. Revenue Growth	-5.81	42.61	-0.16	0.05	0.02	-0.01	-0.09	-0.05	-0.12	-0.12	1.00	
10. Liquidity	4.73	7.86	-0.01	-0.04	-0.01	-0.00	0.02	-0.04	-0.00	-0.00	-0.08	1.00

Table 2.2. Results of regression analysis

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
	Tobin's Q	IT investment	Tobin's Q	Tobin's Q	Tobin's Q
IT Governance		73.49** (24.44)		0.46* (0.22)	-0.00 (0.22)
Risk-taking orientation		-281.27 (416.49)	-1.00 (3.66)	-0.96 (3.72)	-7.57* (3.69)
IT Investment			0.00** (0.00)		-0.00** (0.00)
IT Investment* Risk-taking orientation					0.03*** (0.01)
Board Gender Diversity	-2.78 (10.08)	1767.69 (1336.80)	-6.19 (11.72)	-6.43 (11.93)	-23.36* (11.39)
Board Education	12.38 (7.79)	-728.72 (938.35)	16.59* (8.29)	16.16+ (8.37)	21.10** (7.77)
Board Average Age	0.46 (0.42)	13.61 (58.04)	0.17 (0.51)	0.19 (0.52)	0.03 (0.48)
Firm Age	0.05 (0.04)	5.26 (5.35)	0.07 (0.05)	0.08+ (0.05)	0.09* (0.04)
Revenue Growth	-0.03+ (0.02)	0.01 (1.90)	-0.03+ (0.02)	-0.03* (0.02)	-0.03* (0.02)
Liquidity	-0.01 (0.09)	0.45 (10.88)	-0.02 (0.10)	-0.01 (0.10)	-0.00 (0.09)
cons	-21.89 (23.51)	-730.91 (3248.50)	-6.24 (28.68)	-8.27 (28.99)	2.21 (26.79)
N	288	185	186	185	185
R^2	0.039	0.083	0.098	0.084	0.230

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2.3 Robustness check

	Model 1	Model 2	Model 3	Model 4	Model 5
	ROA	IT investment	ROA	ROA	ROA
IT Governance		73.49**		0.01*	-0.00
		(24.44)		(0.00)	(0.00)
Risk-taking orientation		-281.27	-0.02	-0.02	-0.16*
		(416.49)	(0.08)	(0.08)	(0.08)
IT Investment			0.00**		-0.00**
			(0.00)		(0.00)
IT Investment* Risk-taking orientation					0.00***
					(0.00)
Board Gender Diversity	-0.06	1767.69	-0.13	-0.14	-0.49*
	(0.21)	(1336.80)	(0.25)	(0.25)	(0.24)
Board Education	0.26	-728.72	0.35*	0.34+	0.44**
	(0.16)	(938.35)	(0.17)	(0.18)	(0.16)
Board Average Age	0.01	13.61	0.00	0.00	0.00
	(0.01)	(58.04)	(0.01)	(0.01)	(0.01)
Firm Age	0.00	5.26	0.00	0.00+	0.00*
	(0.00)	(5.35)	(0.00)	(0.00)	(0.00)
Revenue Growth	-0.00+	0.01	-0.00+	-0.00*	-0.00*
	(0.00)	(1.90)	(0.00)	(0.00)	(0.00)
Liquidity	-0.00	0.45	-0.00	-0.00	-0.00
	(0.00)	(10.88)	(0.00)	(0.00)	(0.00)
cons	-0.57	-730.91	-0.24	-0.28	-0.06
	(0.50)	(3248.50)	(0.60)	(0.61)	(0.56)
N	288	185	186	185	185
R^2	0.039	0.083	0.098	0.084	0.230

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2.4 Measurement of IT governance

1. Big4	One auditor is a big four (Deloitte, PricewaterhouseCoopers (PwC), Ernst & Young (EY), KPMG); 0 otherwise.
2. the independent board of directors	Percentage of independent directors on the board.
3. CEO or CFO with IT experience	One if the CEO or CFO has IT-related experience; 0 otherwise.
4. top management (TMT) with IT experience	Percentage of top management with IT-related experience.
5. board of directors with IT experience	Percentage of Board of directors with IT-related experience
6. audit committees with IT experience	Percentage of audit committee members with IT-related experience.
7. CIO position	One if a company has CIO or CTO position; 0 otherwise.
8. CIO tenured year	The number of years he/she has been in the position in the company.
9. CIO compensation	The natural log of the CIO salary and bonus in the year of disclosing ITMWs and/or the preceding year.
10. CIO-TMT pay gap	The ratio of the CIO salary and bonus to the average salary and bonus of the non-IT executive.
11. IT strategy committee	One if the company has an IT strategic committee; 0 otherwise.

Table 2.5 Examples of high VS. low risk-taking orientation

Firm TIC	Risk-taking orientation LIWC score	Earning call transcripts
SCWX	**1.92**	"Finally, I'd like to remind you that all statements made during this call that relate to future results and events are forward-looking statements based on current expectations. Actual results and events could differ materially from those projected due to a number of **risks** and uncertainties, which are discussed in our press release, web deck and SEC filings. We assume no obligation to update our forward-looking statements. The Taegis brand signals our evolution, offering best-in-class cloud-native software and higher value to our customers. It extends beyond protection to automated investigation and response taken in context with each customer's **risks** and vulnerabilities. And with cloud-native software, we rapidly build, scale and deploy the additional capabilities our customers seek to secure their organizations in an industry that requires constant innovation. Yes. First of all, thank you for the question. I think, unfortunately, anytime there are incidents, particularly when we've seen kind of the announcements that happened back to back to back over the last couple of months, it increases and validates the **risk** that exists out there. And I think it's created a heightened desire from the Board level down because we are having a lot of conversations with Boards to figure out and ensure that processes and controls they can put in place and that they can work with their management teams to ensure that they're getting the appropriate prevention, detection, response and prediction, if you will, of where the hackers are going."
DTMXF	**0.02**	"In addition, these statements involve substantial known and unknown **risks** and uncertainties that contribute to the possibility that the predictions, forecasts, projections, and other forward-looking statements will provide inaccurate, certain of which are beyond the company's control. Readers should not place undue reliance on forwardlooking statements. Except as required by law, the company does not undertake to revise or update these forward-looking statements after the date hereof reflect the occurrence of future unanticipated events."

Table 2.6 Key Literature Summary

Citations	Research Questions	Findings
Boritz, J. E., & Lim, J. H. (2008, January). IT control weaknesses, IT governance and firm performance. In IT Governance and Firm Performance (January 11, 2008).(CAAA) 2008 Annual Conference Paper.	Investigate whether companies with material IT control weaknesses have weaker IT governance than companies without such inadequacies.	These indicators of IT governance effectiveness are significantly associated with a reduced likelihood of a company reporting material IT control weaknesses. IT governance improves financial performance by reducing IT control weaknesses and related costs.
Hamdan, A., Khamis, R., Anasweh, M., Al-Hashimi, M., & Razzaque, A. (2019). IT governance and firm performance: Empirical study from Saudi Arabia. Sage Open, 9(2), 2158244019843721.	Exploring the impact of IT governance on the firm performance.	IT governance has a positive effect solely on the operational performance of companies based in Saudi Arabia.
Huang, R., Zmud, R. W., & Price, R. L. (2010). Influencing the effectiveness of IT governance practices through steering committees and communication policies. European Journal of Information Systems, 19(3), 288-302.	The influence of IT governance practices from three small-/medium-sized organizations.	Differences in these firms' IT steering committees and governance-related communication policies were found to explain differences in the firms' IT use outcomes.
Héroux, S., & Fortin, A. (2018). The moderating role of IT-business alignment in the relationship between IT governance, IT competence, and innovation. Information Systems Management, 35(2), 98-123.	Examine the moderating role of IT-business alignment in the correlation between IT governance, IT competence, and innovation.	Results from a survey of senior executives/officers in charge of IT suggest that while excellent IT governance triggers more innovation, IT-business alignment does not moderate this relationship.
Weill, P., & Ross, J. W. (2005). A matrixed approach to designing IT governance. MIT Sloan management review.	Examined IT governance in the context of organizational changes	Companies derive greater value from their IT investments when senior managers dedicate effort to designing, implementing, and communicating IT governance processes.

Weill, P., & Ross, J. W. (2004). IT governance: How top performers manage IT decision rights for superior results. Harvard Business Press.	Discuss IT governance as a crucial aspect of aligning information technology with business goals.	Provides a comprehensive overview of IT governance principles and practices, emphasizing the importance of managing IT decision rights to achieve superior business outcomes.
Tavares, L. V., Moraes, G. H., & Lopes, A. P. (2019). IT governance, innovation, and firm performance: A literature review and research agenda.	An overview of the correlation between IT governance, innovation, and firm performance.	Suggest future research to deepen our understanding of how IT governance practices impact innovation outcomes and overall organizational success.
Peterson, R. R., & Saarinen, T. (2017). IT governance mechanisms and firm performance: A review and research agenda.	A comprehensive review of existing research on the correlation between IT governance mechanisms and firm performance.	Future research should explore the dynamic nature of IT governance mechanisms, investigate the role of digital transformation, and conduct cross-disciplinary research.
Wu, J. H., & Chen, Y. C. (2011). An integrated model for IT governance and its impact on firm performance.	The literature investigates the mediating and moderating effects of IT infrastructure and organizational culture on the correlation between IT governance and firm performance.	The discoveries enhance comprehension of the intricate correlation between IT governance and firm performance. The literature suggests potential avenues for future research, including exploring specific industries and contexts.