JoMSS

JOURNAL OF MANAGERIAL SCIENCES AND STUDIES

www.jomss.org

ISSN: 2988-6619

DOI : 10.61160

Using IT-Enabled Dynamic Capabilities to Develop Firm Inventive Capability and Business Process Agility: The Moderating Effect of aTumultuous Surroundings

S. Sudarnice[1]
sudarnice@usn.ac.id
Department of Management, Faculty of Economics and Business, University of Sembilanbelas November Kolaka, Indonesia.
Zainul Wasik[2]
zainul.wasik-2022@feb.unair.ac.id
Department of Management, Faculty of Economics and Business, Airlangga University, Surabaya, Indonesia
Lia Febria Lina[3]
liafebrialina@teknokrat.ac.id
Department of Management, Faculty of Economics Business, University of Teknokrat, Indonesia.

Info Article

History Article:
Submitted
Revised
Accepted

Keywords:
IT-enabled dynamic capability; Agility; Innovative Capability; Turbulence environment; Firm Performance.

Abstract

Businesses today must be flexible and creative in order to adapt to the ever-changing business circumstances. This study suggests that IT-enabled Dynamic Capabilities (ITDC) are used to shape firm business process agility and firm innovative capabilities in a turbulent environment. It does this by drawing on the multi-theoretic lens. The suggested model has a favorable and significant correlation, according to a study of 254 IT and business professionals from Indonesia's companies. The relationship between ITDC and agility is greatly tempered by marketing and technological upheaval. Comparably, marketing turbulence is also significantly mild. However, in contrast to expectations, technological turbulence has a negligible moderating influence on the link between ITDC and business inventive capabilities. This study demonstrates how firm agility and innovative capability mitigate the impact of ITDC on business performance. Practical ramifications and theoretical anchoring are also covered.

Menggunakan kemampuan Dinamis Yang Diaktifkan Oleh TI Untuk Mengembangkan Kemampuan Inventif Perusahaan Dan Kelincahan Proses Bisnis: Efek Moderasi Dari Lingkungan Yang Penuh Gejolak

Abstrak

Bisnis saat ini harus fleksibel dan kreatif untuk beradaptasi dengan keadaan bisnis yang terus berubah. Studi ini menunjukkan bahwa Kemampuan Dinamis yang Diaktifkan TI (IT-enabled Dynamic Capabilities, ITDC) digunakan untuk membentuk kelincahan proses bisnis perusahaan dan kemampuan inovatif perusahaan dalam lingkungan yang bergejolak. Hal ini dilakukan dengan menggunakan lensa multi-teori. Model yang disarankan memiliki korelasi yang baik dan signifikan, menurut sebuah studi terhadap 254 profesional TI dan bisnis dari perusahaan-perusahaan di Indonesia. Hubungan antara ITDC dan ketangkasan sangat dipengaruhi oleh gejolak pemasaran dan teknologi. Sebagai perbandingan, gejolak pemasaran juga tidak terlalu berpengaruh. Namun, berbeda dengan ekspektasi, gejolak teknologi memiliki pengaruh moderasi yang dapat diabaikan terhadap hubungan antara ITDC dan kemampuan menciptakan bisnis. Studi ini menunjukkan bagaimana kelincahan perusahaan dan kemampuan inovatif mengurangi dampak ITDC terhadap kinerja bisnis. Konsekuensi praktis dan landasan teoritis juga dibahas.

INTRODUCTION

Today's corporate environments are intensely competitive and dynamic (Ravichandran 2018). Because of fierce competition, erratic customer demand, time-to-market constraints, quick product obsolescence, intense globalization, and technological advancements, businesses must contend with environmental uncertainty (Huang et al. 2012; Nazir and Pinsonneault 2021; Tallon and Pinsonneault 2011). In order to survive and grow in the current climate of increased environmental volatility, businesses are looking for ways to become more agile by swiftly recognizing and responding to market opportunities and challenges (Huang et al. 2012; Nazir and Pinsonneault 2021). Because of this, contemporary businesses are making an effort to set themselves apart by utilizing IT to create dynamic IT capabilities and respond to moves made by rivals in order to maintain or enhance these capabilities (Lim et al. 2011). Similar to this, businesses rely significantly on IT to stay innovative and flexible in order to quickly adapt to market shifts and IT-driven competitive actions (Pavlou and El Sawy 2010; Lowry and Wilson 2016). Previous research has only examined IT capability, despite significant advancements in the literature (Cai et al. 2019; Melián Alzola et al. 2020). However, there hasn't been as much focus on the ITDC and how businesses use it to create value (e.g., Mikalef et al. 2021; van de Wetering and Besuyen 2021). Therefore, the following reasons served as inspiration for our investigation.

First off, previous research (e.g., Ashrafi et al. 2019; Chen et al. 2014; Nazir and Pinsonneault 2021; Queiroz et al. 2018; Ravichandran 2018; Roberts and Grover 2012) identified a number of IT capabilities, including IT application orchestration capability, digital platform capability, business analytics capabilities, and electronic integration to drive business process agility. The ability to combine IT-based resources with other company resources and capabilities for improved firm performance is the fundamental definition of IT competence (Bharadwaj 2000; Melián-Alzola et al. 2020). The precise kind or kind of IT capacity to handle challenging business situations has been ignored in favor of aggregate overall assessments of the firm's IT capabilities in previous studies (e.g., Raymond et al. 2018; Stoel and Muhanna 2009; Wiesböck et al. 2020; Xue et al. 2012). It is also criticized for failing to explain why IT investments are beneficial to the company in a volatile environment, and there is a lack of consensus on how IT competency can be measured and how it contributes to improved business performance (Mikalef and Pateli 2017). In a similar vein, notably less information is known regarding utilizing IT capabilities and fostering innovation through the growth of ITDC (van de Wetering and Besuyen 2021). Information system (IS) experts advise businesses to use IT to build specialized competencies inside the company to deal with unstable settings (e.g., Mikalef and Pateli 2017; Pavlou and El Sawy 2010). Similarly, current research that provide a perceptive viewpoint has called for a general

change in emphasis from dynamic capacities to the ITDC to shape agility (Mikalef and Pateli 2017; Ravi Chandran 2018; Tan et al. 2017; Wang et al. 2017; Yeow et al. 2017).

Second, with the hope of increasing their innovative capability, modern businesses are making extensive use of IT resources, innovative capabilities, digital technologies, and IT services (e.g., digital platforms, enterprise systems, IT outsourcing capabilities, big data analytics) (Berente et al. 2019; Ghezzi and Cavallo 2020; Karimi-Alaghehband and Rivard 2020; Mikalef et al. 2021). Even though IT is thought to be a major innovation enabler (Nevo et al. 2020), it is unclear what mechanisms are needed for innovation and how IT and other supportive firm variables boost firms' capacity for innovation (van de Wetering et al. 2017). The majority of research on innovation only addresses conceptual issues (Ashurst et al., 2012; Damanpour and Aravind, 2012, for example). Additionally, some research on innovation is more general than others (Yang 2012; Ilmudeen et al., 2021), while others (Majchrzak and Shepherd, 2021; Yoo et al., 2012, 2010) concentrate on digital innovation. In conclusion, there aren't many empirical studies on IT and innovation. According to Hopkins and Brynjolfsson (2010), earlier research did not thoroughly examine the process via which IT can alter an individual's capacity for innovation. Therefore, study into the mechanisms underlying IT-enabled innovation and the antecedent and conditioning role of ITDCs capabilities innovation can be achieved has been urged for by recent studies on dynamic capabilities (van de Wetering and Besuyen 2021).

Thirdly, according to several IS experts (e.g., Cheng and Yang 2017; Prajogo 2016; Wilden and Gudergan 2015), dynamic capabilities are significantly moderated by a tumultuous environment. Despite the abundance of research on turbulent environments (Ahammad et al., 2021; Chu et al., 2018; Su and Yang, 2018), previous studies have mostly looked at the relationship at the aggregate level between dynamic capabilities and turbulent environments (Cheng and Yang, 2017; Mikalef and Pateli, 2017; Wang et al., 2017). Chu et al. (2018) state that more research is needed to determine the moderating effects of market turbulence and technological turbulence, as there is currently insufficient and conflicting empirical evidence about the moderating effect of turbulent environments (Bodlaj et al., 2012; Wilden and Gudergan, 2015). Therefore, there is a lack of a comprehensive knowledge of how different types of turbulence may have different consequences on dynamic capacities and turbulent environments. According to this theory, current research (e.g., Chen et al. 2015; Nevo and Wade 2010; Stoel and Muhanna 2009) supports the idea that the influence of IT skills on firm performance should be investigated by taking other firm resources into account as intermediaries and the business environments as moderators.

In conclusion, IT has the potential to facilitate a company's agility (Li et al., 2021; Lu and Ramamurthy, 2011; Nazir

and Pinsonneault, 2021). However, IT systems may also be rigid or unadaptable to changing circumstances. Thus, in situations when a company is unable to respond quickly to opportunities and threats, IT may become a restricting resource (Tallon 2008; van de Wetering and Besuyen 2021). Accordingly, researchers have begun to uncover the effects of IT-enabled capabilities on agility, innovation, and its eventual outcome (Melián-Alzola et al. 2020; Queiroz et al. 2018; Raschke 2010). The relationship between IT and agility has emerged as an intriguing research subject. Extremely unpredictable markets are characterized by unstable customer demand, short product lifecycles, hypercompetition, rapid product obsolescence, and uncertain technological development (Huang et al. 2012; Tallon and Pinsonneault 2011). In these markets, a firm's only means of survival is through innovation and agility. According to Pavlou and El Sawy (2011), academics propose that managers can effectively adapt to unstable settings by leveraging dynamic capabilities, which enable them to expand, alter, and reorganize current operational capabilities into more environment-appropriate ones. Researchers have been asking questions concerning the relationship between IT competence and agility, which has prompted them to investigate the fundamental mediating processes and boundary conditions in this relationship (Cai et al. 2019). The relationship between a company's IT capabilities and its business process agility is highly significant (see, for example, Chen et al. 2014; Lu and Ramamurthy 2011; Queiroz et al. 2018; Ravichandran 2018). However, there is a significant research gap as no study has examined the ITDC as a predictor of both business process agility and innovative capability together by taking the turbulent environment's moderating effect into account. In light of this, the following are the research questions:

H1: What effect does dynamic capacity afforded by IT have on the agility of business processes? How is the volatile technology environment and marketing environment influencing this relationship?

H2: What impact does IT-enabled dynamic capability have on a company's capacity for innovation? How is the volatile technology environment and marketing environment influencing this relationship?

This work makes a significant contribution and does so in three ways. The ITDC study is still in its early stages, to start with (Mikalef and Pateli 2017). Comparably, earlier research has focused on the characterization, antecedents, classification, and repercussions of dynamic capabilities using a variety of conceptualizations (e.g., Helfat and Peteraf 2003; Li and Liu 2014; Lin and Wu 2014; Pavlou and El Sawy 2011; Teece 2007; Teece et al. 1997; Wu 2010). In order to show how ITDC can influence agility and innovation capability, this study expands on IT capabilities and integrates with dynamic capability1 theory. Second, research on agility and innovation is relevant and important as Indonesia's business settings get more

complex and chaotic (Huang et al. 2012). Therefore, this research employs Indonesia as a testing ground that could provide important discoveries (Li and Liu 2014). Lastly, despite the fact that studies have concentrated on the moderating role of turbulent environments (e.g., Li and Liu2014; Nevo and Wade2011), little is known about how the influence of turbulent environments modifies the relationship between ITDC and agility as well as ITDC and innovative capability. Therefore, as the distinct construct, this study methodically examines the complex and subtle moderating effect of technology and market volatility.

The rest of the paper is organized as follows. The theoretical backdrop and literature review are covered in the next section, which is then followed by the research model, hypothesis development, analyses, discussion of the findings, implications, and conclusion.

THEORETICAL CONTEXTS

Dynamic Qualities for Agility And Inventiveness Enabled by IT

Companies are always investigating innovative and strategic agility (Kohtamäki et al. 2020). A firm's capacity to:

(1) Recognize and shape possibilities and threats;
(2) Grasp market opportunities; and
(3) Retain competitiveness through the augmentation, fusion, and reconfiguration of a firm's tangible and intangible resources can be defined as dynamic capabilities (Teece 2007).

In order to remain competitive, businesses must rely on their IT capabilities due to the unpredictable uncertainties brought about by the dynamic environment (Mikalef et al. 2021; Wang et al. 2012). Agility can be diagnosed as a "dynamic capability" according to the dynamic capabilities view (Raschke 2010; Sambamurthy et al. 2003). According to IS academics, lower-order capabilities made possible by IT can help promote higher-order business capabilities (Mithas et al. 2011; Wang et al. 2017). Businesses are improving their mechanisms for product circulation because digital technologies facilitate the innovation of new services and transformation (Ranta et al. 2021). Strong market exploiting agility can help companies concentrate their current knowledge and information to put them in a position where they can recognize new opportunities and adapt to changes (Cheng et al. 2020). In light of this, we hypothesise in this study that ITDC is a lower-order IT skill that may be used to enhance business process agility, a higher-order capability that in turn influences firm performance.

Sensing, coordinating, learning, integrating, and reconfiguring are the components of ITDC, as mentioned (Mikalef and Pateli 2017, 2016b). To create and maintain a competitive edge, the business needs sensing, seizing, and reconfiguration capabilities that are easily established (Teece 2007). According to Roberts and Grover (2012), sensing entails funding research projects, analyzing supplier and

competitor replies, and investigating consumer demands. Sensing necessitates learning about the environment and new technology capabilities since businesses need to scan, search, and explore across markets and technologies both locally and worldwide in order to recognize and shape opportunities (Teece 2007). In the real world, people are more than just tools, and their ability to coordinate is essential to explaining and theorizing about a company's operational agility (Tan et al. 2017). According to Roberts and Grover (2012), the company's channel coordination and inter-functional coordination procedures enable it to take advantage of market opportunities. According to Yeow et al. (2017), learning is the process by which businesses analyze performance or obtain new insights in order to identify and assess specific areas that require improvement. Integrating: A case study by Huang et al. (2012) discovered that a company's capacity to collect, compile, and distribute information was improved by IT by utilizing its proficiency in efficient information processing. As a result, operational agility is eventually attained and possibilities for innovation and competitive action can be sensed and responded to. Reconfiguring: The capacity to combine and rearrange the firm's structures and assets as it expands, and as markets and technologies evolve, the company will undoubtedly continue to grow profitably (Teece 2007).

Businesses must quickly adapt their operations, services, and products to reflect shifting consumer preferences. According to Wang et al. (2017), companies with greater agility2 can therefore perform better than those of lower enterprises. According to Sambamurthy et al. (2003), agile organizations are often aware of chances for competitive action, such as value generation, capture, and competitive performance through innovations in products, services, channels, and market segmentation. By seizing chances for innovation and competitive action, such as launching new goods and services, breaking into untapped markets, and forming strategic partnerships, agile businesses may quickly adjust to changing circumstances (Roberts and Grover 2012). Businesses with low agility won't be able to modify their operations and procedures in reaction to changes (Bhatti et al. 2021). According to Autio et al. (2021) and Ravichandran (2018), innovative organizations are also more likely to be involved in learning, investigating, and able to cope with high levels of uncertainty. These firms are also more likely to use capabilities like digital platforms to respond to opportunities and threats. For instance, in order to learn from cooperative partnerships and create competitive products, a company might enhance its performance by creating novel technologies or integrating particular proprietary. (Lin and Wu 2014). Strong dynamic capabilities enable a company to effectively create and renew assets and resources as well as rearrange them to support innovation and respond to market shifts (Teece 2017). While inactivity stems from a lack of the necessary agility to respond to digital transitions, insufficient dynamic

capacities are the root cause of inactivity (Chirumalla 2021).

The Use of Contingency Theory to Turbulent Environments

One of the contingency elements has been recognized as the turbulent environment (Prajogo 2016; Cheng and Yang 2017). According to Cheng and Yang (2017), Pavlou and El Sawy (2010), and Prajogo (2016), it is characterized by chaotic competitive behavior, rapidly changing technology, and unclear client demand. Two categories of turbulent environments are identified in this study: first, technological turbulence, which refers to changes in new technologies and technological innovations; second, market turbulence, which indicates changes in customer wants and rivals' new products (Pavlou and El Sawy 2010). While they operate differently, market and technology turbulence are both essential components of a turbulent environment (Su et al. 2013). To provide a competitive advantage, firms' competencies need to match the features of the environment in which they operate (Prajogo 2016; Stoel and Muhanna 2009). In light of this, Pavlou and El Sawy (2011) contended that "new product development (NPD) units need to reconfigure their existing operational NPD capabilities to build new products that better match the environment, where the dynamic capabilities become more valuable in turbulent environments."

According to earlier research (e.g., Prajogo 2016; Stoel and Muhanna 2009; Xue et al. 2012), the chaotic environment's moderating effect on IT capability can be explained by contingency theory. Comparably, the innovation capability literature applies the contingency theory to determine the degree to which innovation initiatives will succeed in the chaotic context in which they are implemented (Prajogo 2016). For instance, market volatility was identified by Wang et al. (2015a) as the environmental factor that modifies the relationship between capability, innovation, cooperation, and performance. Similar to this, Rai and Tang (2010) discovered that environmental turbulence had beneficial moderating effects on the links between competitive process capabilities (process alignment and process flexibility) and competitive performance. Different kinds of product and process innovation techniques in providing business performance are impacted by competitive business environments as contingency factors (Prajogo 2016; Stoel and Muhanna 2009). This study uses contingency theory to explain the ITDC influence on agility and innovative capabilities while taking the turbulent environment into account as the moderator, with the exception of a few previous studies that provide some insight into the moderating effect of the turbulent environment.

According to Battistella et al. (2017), businesses operating in a highly competitive environment are critical to building the skills necessary to face and ultimately defeat competition. Businesses are considering ways to become more adaptable in rearranging their resources, procedures, and

strategies to provide more effective and efficient responses when the business environment gets more chaotic (Chen et al. 2017). The question that now has to be answered is how each dynamic capability afforded by IT fosters innovation. To begin with, sensing refers to the recognition of technical and business opportunities as well as risks (Tai et al. 2018). Second, coordinating entails a company integrating and coordinating both internal and external operational procedures as soon as it detects a chance for innovation (Roberts and Grover 2012). Third, learning: after a new product is introduced and a market opportunity is detected by sensing, it is necessary to decide how to restore the operational capabilities that now exist through learning and acquiring new knowledge and skills (Teece 2007). Fourth, integration, which calls for incorporating newly acquired information into a group system in order to apply newly configured operational capabilities (Pavlou and El Sawy 2011). The resource bases (i.e., assets and related skills, procedures, or routines) are then reconfigured, transformed, or renewed (Tai et al. 2018). Thus, ITDC fosters a company's capacity for innovation, which allows it to respond nimbly to quickly shifting consumer expectations and market conditions (Yang 2012).

To function in turbulent times, businesses need to have a certain set of skills, and being able to recognize and react to environmental shifts is essential (Ashrafi et al. 2019). As a result, the company engages in a variety of activities that generate value in a dynamic and unexpected environment (Ahammad et al. 2021). Previous research has shown the potential for IT-enabled capabilities in a volatile environment in a number of ways. For example, companies need to build strong information processing capabilities to deal with the volatile environment in order to achieve market agility (Li et al. 2021). Digital product innovation in tumultuous contexts requires exceptional information collection, efficient knowledge management, quick information processing, and flexible decision-making skills (Wiesböck et al. 2020). Businesses usually need to drastically reorganize processes in today's volatile business climate in order to react to unforeseen changes in the environment or opportunities presented by different digital technologies (Chen et al. 2021).

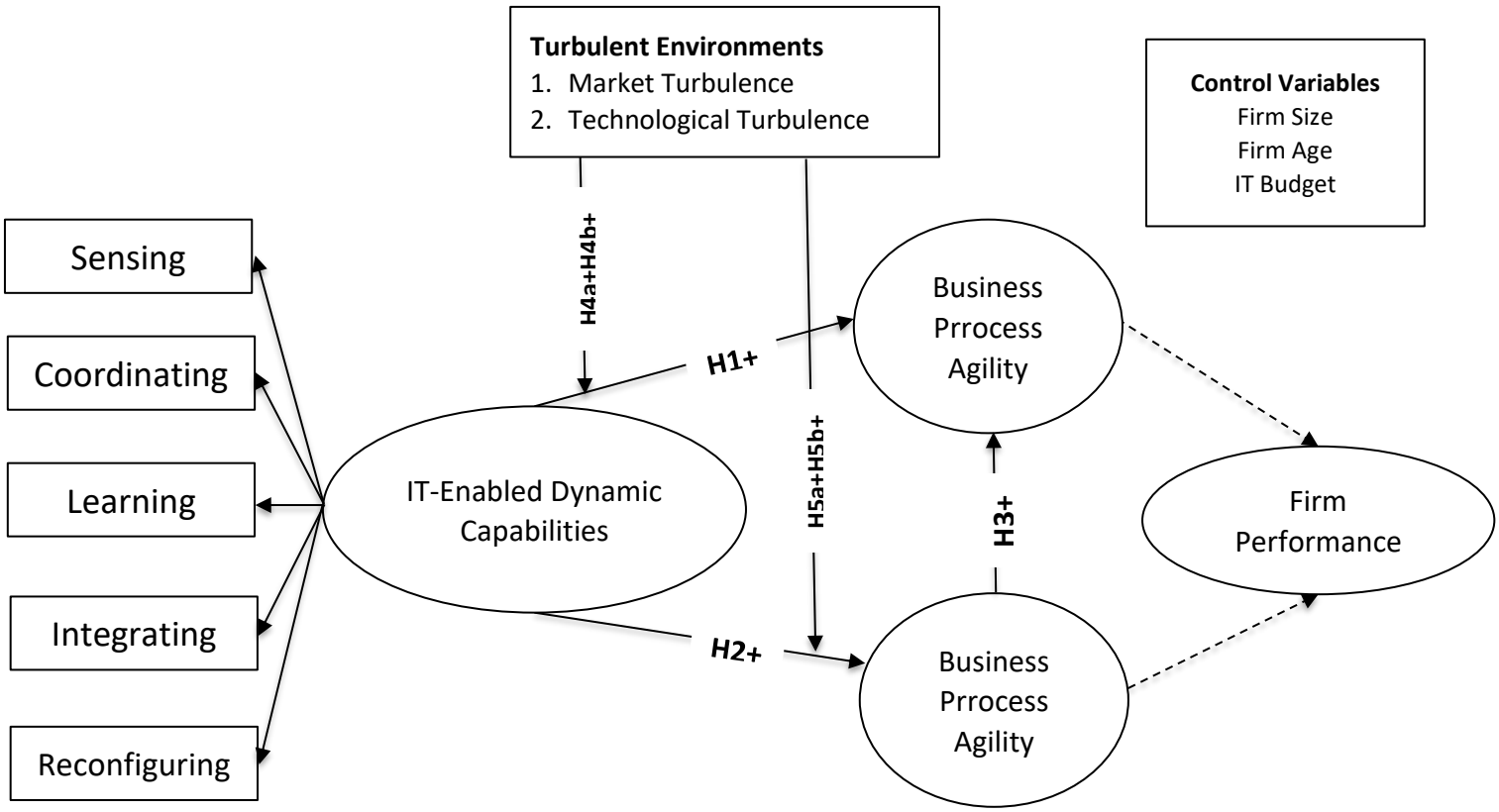

Fig. 1 Research Model

DEVELOPMENT OF RESEARCH MODELS AND HYPOTHESES

Five dynamic capabilities—sensing, coordinating, learning, integrating, and reconfiguring—are conceptualized in this study's research paradigm (see Fig. 1). Each capability is triggered by a series of firm activities. Multitheoretic lenses like RBV, dynamic capacity theory, and contingency theory have been synthesized, standing on the theoretical foundation. In order to improve business performance, this study empirically explores the underlying effects of ITDC on inventive capacity and agility in the face of technical and market volatility. Two links in this suggested model are not hypothesized because it has previously been established that they have a significant relationship. Thus, the relationship between agility and firm performance is examined in the first place in Chen et al. (2014), Raschke (2010), Tallon and Pinsonneault (2011), and Wang et al. (2017) in relation to firm inventive capability and firm performance. business age, business size, and IT budget were the study's control variables for each dependent variable. The sections that follow go over each of the theories.

Agile Business Processes and Dynamic Capabilities Made Possible By It

In a highly turbulent market, a company must react quickly to consumer expectations and fulfill them; therefore, it needs to be more agile in order to maintain the complex business

environment. A company can recognize and anticipate potential opportunities made available by advancements in information technology and upcoming technologies. According to Huang et al. (2012), the firm achieves operational agility through its dynamic capabilities, which include sensing and responding to grab possibilities for innovation and competitive action. Research demonstrates that utilizing IT to its full potential has a direct positive impact on dynamic capacities, enhancing the capacity of new product development units to detect their surroundings, learn more, integrate resources, and plan operations (Pavlou and El Sawy 2010). According to this study, ITDC enables a company to feel its business environment, plan its operational operations, learn from its successes and mistakes, integrate routines and procedures, and reorganize resources. For example, a firm's ability to sense and respond in chaotic settings depends on its strong IT-enabled capabilities (Roberts and Grover 2012). Similar to this, IT-enabled market scanning and interpretation tools are employed to identify underserved markets and find new goods and services (Xue et al. 2012). Agility can be attained in large part through the use of IT capabilities (Nazir and Pinsonneault, 2021). Allocating resources to tasks, matching the appropriate person to the proper work, improving task synchronization, and leading group activities are all aspects of the coordinating skill (Pavlou and El Sawy 2011). Lastly, the capacity to reconfigure allows for the replacement of outdated operating capabilities or resource bases with new ones that are more environment-appropriate. As a result, the following is the theory.

H1: Business process agility of a company is strongly correlated with its IT-enabled dynamic capability.

Dynamic Capabilities and Firm Innovative Capability Enabled By IT

The ability of the company to innovate dynamically and to adjust and reorganize its resources and capabilities is what gives it a durable competitive edge (Camisón and Villar-López 2014). IT competence becomes even more important in a turbulent environment because, in contrast to a stable environment, it allows enterprises to successfully build a variety of IT assets and capabilities (Chen et al. 2014). Businesses spend money on IT to take quick, creative action in response to the ever-evolving market. Proactive IT use enables businesses to quickly identify and seize IT innovation possibilities (Lu and Ramamurthy 2011). According to Teece (2007), businesses possessing robust dynamic capacities exhibit strong entrepreneurial traits by using innovation and partnering with other businesses and institutions. Therefore, a company's capacity for innovation gives it the adaptability to respond quickly to rapidly shifting markets and customer expectations in order to achieve innovation-driven success (Yang 2012). A firm's ability to innovate can depend on how innovative it is as well as how IT-enabled new initiatives are integrated with the rest of the company, according to a study by Ravichandran (2018).

IT can encourage innovative behavior, which improves an individual's capacity to generate new ideas in practice (Nevo et al. 2020). The five dynamic characteristics listed in this study work well together to create synergies that enhance businesses' capacity for innovation. As a result, companies with a strong ITDC would be able to reorganize resources and assets, integrate processes and routines, coordinate operational operations, learn from mistakes and successes, and continuously sense from the dynamic environment. As a result, the following is the theory.

H2: A firm's IT-enabled dynamic capability positively relates to its innovative capability.

Business Process Agility and The Firm's Capacity For Innovation

A company must continuously and proactively innovate products through research and development in order to be strategically agile. These goods must then be successfully deployed in order to take advantage of opportunities, satisfy client wants, and generate new value (Battistella et al. 2017). According to Zheng et al. (2010), companies that possess exceptional inventive capabilities are better suited to allocate resources and incorporate external information. In a similar vein, inventive capability enhances the company's ability to absorb and use outside resources to achieve better market performance, which leads to agility (Wang et al. 2015a). According to Battistella et al. (2017), a company's innovative competence enables it to quickly identify and capture new market opportunities that develop when customer demand changes and to instantly configure assets, resources, etc. to renew the value offer for their customers. Businesses that possess advanced inventive skills are more likely to take advantage of technology advancements and adjust to shifting market conditions in order to increase their business value (Zheng et al. 2010). The expertise of external partners, such as competitors, clients, and service providers, can accelerate internal innovation, improving the firm's agility and adaptability to changes in the context (Cepeda and Arias-Pérez 2019b). Proactive IT involves methods for investigating and utilizing technology in response to advancements that enable a company to quickly restructure its business operations in response to the changes (Cepeda and Arias-Pérez 2019a). According to Tallon and Pinsonneault (2011), a company that has a broad range of options for responding to the market, such as flexible IT infrastructure, firm structure, or resources, is more likely to innovate and actively respond to new market opportunities. This can lead to future benefits like profitability, cost reduction, or market expansion. Furthermore, modern innovations like utility computing, web services, and other technologies enhance the flexibility of corporate processes and the responsiveness of the market (Tallon 2008). Therefore, a company's ability to innovate gives it the freedom to arrange its resources, and inventive companies are more likely to be agile

(Ravichandran 2018). Thus, this is how the hypothesis is put forward.

H3: The inventiveness of a company positively affects the speed of its business processes.

The Moderating Effect Of A Tumultuous Surroundings

One significant element that has been shown to affect a firm's competitive performance, strategies, and capabilities is a turbulent environment (Rai and Tang 2010). Compared to stable environments, IT capacity allows businesses to more efficiently combine various IT assets and resources in dynamic ones (Chen et al. 2014). Agile businesses can thrive in extremely volatile environments by taking advantage of chances for innovation and competitive action, launching new goods and services, breaking into untapped markets, and developing strategic partnerships (Roberts and Grover 2012). Similar to this, a company can get operational agility by having dynamic capabilities including the capacity to recognize and seize chances for innovation and competitive action (Huang et al. 2012). While internally focused IT capabilities are likely to produce larger benefits in stable circumstances, the ideal organization possesses the externally focused IT capabilities that sense the market and react to changes that will be more beneficial during turbulent environments (Stoel and Muhanna 2009). When the level of environmental turbulence increases, the importance of IT-enabled resources increases (Nevo and Wade, 2011). Previous research indicates that market turbulence has a moderating effect. For example, Tallon's (2008) study demonstrates that environmental dynamism positively moderates the relationship between managerial IT competencies and agility. At increasing degrees of market instability, marketing capacity has a stronger impact on business performance (Su et al. 2013). Market turbulence is observed to positively reduce the enabling impacts of innovation and information capabilities on the effectiveness of external collaboration (Wang et al. 2015a). Likewise, Bodlaj et al. (2012) postulate that the proactive market orientation effect on innovation success increases with a higher degree of perceived market instability. Therefore, we postulate the following:

H4a: Market turbulence positively moderates the relationship between ITDC - agility thus, higher market turbulence enables ITDC of the firm to be more agile.

Firm resources are hard to come by in a tumultuous environment, therefore for businesses to reap short-term rewards, they must effectively sense and update their key skills in response to environmental change (Li and Liu 2014). Businesses constantly reconfigure their various IT resources, create new knowledge, and seize opportunities by gathering market data, transferring and analyzing data from clients and rivals, and quickly sharing the most recent information with partners and internal departments in order to remain agile in turbulent environments (Chen et al.

2014). According to Teece (2007), dynamic capabilities which require businesses to mix various inventions and recombine existing technologies are crucial at increasing levels of technological turbulence. The business processes of the company are more uncertain and risky due to the fierce rivalry and technological upheaval, and there is a causal relationship between strategy and firm performance (Wang et al. 2015a). As a result, a company should implement modifications to its offerings of goods and services (Rai and Tang 2010); this is because new products must be developed in order to replace outdated ones due to advancements in technology (Ashrafi et al. 2019). When environmental complexity is significant, business process agility and IT capabilities are linked (Chen et al. 2014). According to Pavlou and El Sawy (2011), environments with less technological turbulence are less likely to present chances for reconfiguring current capabilities. Conversely, situations with greater technological turbulence would necessitate and emphasize the requirement for IT leveraging expertise to support knowledge flows. According to Nevo and Wade (2011), the degree of turbulence in the environment has a favorable impact on IT-enabled resources, which would become more crucial in turbulent situations. Here is how the hypothesis is put forward.

H4b: Higher technological turbulence makes the firm's ITDC more agile since it positively moderates the link between ITDC and agility.

According to Xue et al. (2011), the market's growth presents a multitude of opportunities for innovation to yield benefits, hence amplifying its impact on competitive performance. In order to deal with a high degree of uncertainty and maintain a high degree of firm innovative capabilities, highly innovative organizations typically acquire and integrate knowledge (Lin 2007). Businesses must adapt quickly to changing client needs by making necessary changes to their operations, services, and product offerings. Businesses with greater capacity for innovation can do better in these circumstances than those with less capacity (Wang et al. 2017). Businesses find it difficult to adapt to shifting market trends, which motivates them to look for novel and lucrative ideas for their own gain. This leads to a significant risk of opportunism (Wang et al., 2015a). Because of the turbulent environment they operate in, businesses must not only improve their internal processes through constant change, adaptation, innovation, and reinvention, but also enhance their external processes through superior streamlining (Sheng 2017). As a result, businesses can enhance their new or existing products to boost performance. Moreover, innovation has been acknowledged as a useful strategy for enhancing competitive advantage in the face of extreme uncertainty as a prompt reaction to market volatility (Chu et al. 2018). The relationship between business relationships and the capacity for technical innovation is positively moderated by the turbulent environment (Cheng and Yang 2017). Furthermore, in a very turbulent environment, (Wang et al. 2015a) discovered that market turbulence

positively moderates the impacts of innovation capability on the effectiveness of external collaboration. As a result, the following is the theory.

H5a: The relationship between ITDC and business innovative capability is favorably moderated by market turbulence; so, greater market turbulence encourages greater innovation from the firm's ITDC.

Technology changes, product obsolescence, competitor moves quickly, and customer demand fluctuates frequently in a dynamic environment (Chen et al. 2014; Wang et al. 2012). As a result, a company's capacity for innovation gives it the adaptability to respond quickly to shifting consumer demands and market conditions through innovative products (Yang 2012). A firm's ability to innovate is dependent on its level of innovation as well as how IT-enabled new initiatives are disseminated throughout the business, according a study by Ravichandran (2018). The necessity for a focus on the development and application of business resources increases when technical innovations allow a firm to attain a competitive advantage (Paladino 2008). In order to stay competitive, businesses build more technology-related capabilities and spend more in technological competences due to the higher turbulence, which shortens cycles of technological innovation and product creation (Wang et al., 2015a). Similarly, IT asset portfolios are associated with a greater rise in creativity in situations with higher levels of complexity (Xue et al. 2012). The moderating effect of technological turbulence has been previously noted; for example, frequent sensing, scanning, and reconfiguration which have stronger relationships with technological environments than in stable ones become more crucial in high technological turbulence (Wilden and Gudergan 2015). When compared to a less turbulent environment, the highly turbulent environment would yield innovative rent-generating processes and convincing items that could affect the businesses' success (Prajogo 2016). Furthermore, Bodlaj et al. (2012) proposed that the favorable impact of proactive market orientation on innovation success increases with the perceived level of technical instability. Thus, our hypothesis is as follows:

H5b: Technological turbulence positively moderates the relationship between ITDC innovative capability thus, higher technological turbulence enables ITDC of the firm to be more innovative.

RESEARCH METHODOLOGY AND DATA ANALYSIS

For the following reasons, the research setting of Indonesia was deemed suitable. First off, for millions of entrepreneurial firms in Indonesia, the local private sector provides a "natural experimental setting to examine both agility and innovations" (Damanpour and Aravind 2012). Second, studies on innovation are useful and applicable because of the intricate and unstable corporate settings in Indonesia (Huang et al. 2012). Thirdly, Indonesias experience can provide insight into

other emerging economies, as Indonesia's expanding role in the global economy and improving understanding of the country have significant practical consequences for Western businesses (Su et al. 2013). In a similar vein, Chinese research increases corporate expectations' worldwide relevance (Ilmudeen and Bao 2020). Indonesia was our choice for the empirical testing site because of this.

Development of Measurements

Every construct used in this investigation was taken from earlier research (see Table 1). Consequently, ITDC is made up of five first-order constructs: sensing, coordinating, organizing, integrating, and reconfiguring. It is a first-order reflecting and second-order formative framework. The criteria proposed by Diamantopoulos (2011) serve as the foundation for the first-order reflective structures. The reflecting component known as agility is where items from earlier studies are included. Both the technological and commercial turbulence are reflecting creations. The creative capability of the company is likewise a reflective build. Three first-order formative constructs found in the company performance meet Diamantopoulos (2011)'s recommendations. According to Wu et al. (2006), financial return, operational excellence, and marketing success are the first-order formative constructs of business performance. These constructions more accurately represent the firm's overall performance in comparison to its competitors (Wu et al. 2015). Firm performance is generally a multifaceted concept, and only the accounting measurements themselves have the potential to be deceptive because of "their (1) improper valuation of sources of competitive advantage and (2) inadequate handling of intangibles."(Morgan and Strong 2003; Bharadwaj et al. 1993). Furthermore, this study employed objective measurements for firm performance because it appears that getting financial data is challenging and most organizations are not prepared to provide their genuine data (Ilmudeen and Yukun 2018; Li and Liu 2014). A five-point Likert-type scale, with 1 denoting "strongly disagree" and 5 denoting "strongly agree," was utilized for each topic. Firm age, firm size, and IT budget are included in this study's model as control variables. The possible effects that control variables may have are the rationale behind their inclusion. For instance, a major company with an abundance of IT resources and capabilities may be able to significantly influence their present performance (Wang et al. 2012). It is thought that older companies may benefit from experience-based growth, which enables them to maintain growth more successfully than younger companies (Chen et al. 2014).

Procedure for Collecting Samples and Data

As is common in IS research, our study used a key informant strategy to gather data (Ilmudeen et al. 2019; Ilmudeen and Yukun 2018; Nevo and Wade 2011; Wu et al. 2015). The first week of July to the latter week of October 2017 saw the

start of data collection. This study's sampling frame consists of top IT and business executives from Indonesia companies. The aforementioned targeted respondents hold present employment and are graduates of Huazhong University of Science and Technology's School of Management, which offers this program in Indonesia's major cities. The Center for Modern Information Management, which maintains a database of former students at this institution, provided the researcher with the email addresses of these experts. In order to prevent a single respondent from providing multiple responses, the respondent is only allowed to answer one questionnaire. Although it may not be the best approach for firm-level research at this time, studies that have recently been conducted (such as Ilmudeen and Yukun 2018 and Mao et al. 2016) have employed this strategy. The electronic questionnaire's opening paragraph outlines the goals of the survey, who the intended respondents are, and their duties. To better achieve this study's goal, it is anticipated that these respondents will be more involved in business, IT operation, and decision-making activities. 150 working professionals in each city who were alumni of the 2015 and 2016 batches of working professionals received an invitation letter via email along with a link to the questionnaire. 43.3% of respondents held IT roles (IT Controller and Head of IT / MIS), and 44.1% held business positions (Department manager and marketing manager), suggesting that the study sample accurately represents the population of interest. The others are senior executive positions like MD, CIO, and CEO. Of the respondents, 63.1% had worked for more than six years, and 22.9% had worked for more than twelve years.

RESULTS

Measurement Model

For the data analysis, clever PLS 3.0 was used to calculate partial least squares (PLS), taking into account the following factors. It has higher statistical power and manages tiny datasets effectively (Hair Jr et al. 2016). Numerous benefits come with the PLS-SEM, including increased statistical power for complex models (Ratzmann et al. 2016), the ability to monitor error terms and prevent multi-collinearity problems (Bouncken and Kraus 2013), and the ability to test heterogeneity using various PLS-SEM techniques even in the absence of solid theoretical bases. Furthermore, PLS provides more reliable estimations than SEM while allowing data to be subject to less stringent normalcy distribution constraints (Chin 2010). PLS-SEM estimates' forecasting ability can be improved by using a technique to identify and detect heterogeneity (Ratzmann et al. 2016). The researchers also suggested that the PLS is a good choice for multi-stage modeling that tests mediating effects (Gefen et al., 2011; Lowry and Gaskin, 2014). When the data is not normally distributed, PLS can outperform covariance-based SEM, even if this study has a sizable sample size and satisfies the normalcy requirements (Chin 2010; Hair et al. 2011; Ringle et al. 2012). Therefore, the

data analysis in this work uses the PLS variance-based technique.

There are two steps in the analysis. First, the appropriate psychometric parameters of the assessment model were evaluated. The structural model is measured in the second stage. The formative and reflective constructs independently. After measuring the measurement items' reliability, convergent validity, and discriminant validity (Hair Jr et al. 2016), the hypotheses were examined using path analysis and hierarchical regression analysis. Every cross-loading was higher than 0.726 and greater than the loadings between the items and other constructs. According to Gefen and Straub (2005), an item's loadings with its principal construct should be more than 0.7, while its loadings with the other constructs should be lower than 0.6. indicating that each item's variation shared with the main construct was greater than the error variance (Chin et al. 2003). The loading between the item to create is shown in Appendix C. A construct is considered to have convergent validity if its estimated rho value, which is a coefficient that resembles the Cronbach alpha, is equal to or greater than 0.70 (Croteau and Bergeron 2001). Each construct's rho value in this study ranges from 0.787 to 0.939. According to Fornell and Larcker (1981), the values for composite reliability are Cronbach's Alpha above 0.7 and AVE exceeding 0.5 (see Appendix A). If the square roots of AVE are higher than the values of all other cross-correlations, then the discriminant validity is sufficiently strong. In summary, these metrics validate the study's adequate discriminant validity and convergent validity.

We assessed the item weights, multicollinearity between items, and discriminant validity in relation to the formative construct (Hair Jr et al. 2016). Firm performance and ITDC items have a suitable weight, as shown in Appendix B. Variance inflation factor (VIF) for formative constructs (Appendix B) ranges from 2.250 to 3.255 (< 5), indicating a non-critical degree of multicollinearity. This is the correlation diagnostic used to examine the multicollinearity issue (Hair Jr et al. 2016). According to Wang et al. (2017), intra-construct item correlations should be higher than inter-construct item correlations in order to support the formative construct's discriminant validity. For measuring item-to-item and item-to-construct correlations, we generated composite construct scores using PLS item weights for each indicators. Individual items exhibited stronger correlations with their composite scores than with other constructs, and it is observed that intra-construct item correlations were higher than inter-construct item correlations. All things considered, this data demonstrates that the formative constructs used in this investigation have adequate measurement qualities.

DISCUSSION AND IMPLICATIONS

Discussion

There is a great deal of interest in learning how a company tailors its IT capability to shape agility and inventive

capability in order to stay ahead of its competitors given the expanding competitive competition and uncertain client expectations (Mikalef and Pateli 2017; Ravichandran 2018). Due to the widespread use of digital technologies into daily business operations, businesses are evolving to include a variety of inventive and flexible company processes (Qiu and Pesch 2019). According to recent research on IT capabilities, IS research aims to evaluate business model redesign in terms of dynamic capabilities (Battistella et al. 2017; Teece 2017) as well as IT-enabled artifacts, such as agility, innovation, and IT resources (Nevo and Wade 2011; Tan et al. 2017; Wang et al. 2017). Therefore, this study makes an empirical attempt to quickly assess how ITDC affects business process agility as well as innovative capability in light of shifting market and technologically volatile settings.

In order to enhance performance, the company's valuable, rare, unique, and non-substitutable (VRIN) resources can be mediated by the dynamic capabilities, claim Lin and Wu (2014). This study shows how ITDC indirectly affects business performance and suggests that agility and inventive skills are intermediate notions that lead to performance outcomes. Strong dynamic capabilities can be a firm's foundation for long-term competitive advantage, according to researchers, who also claimed that because they are based on the distinctive qualities of innovation, dynamic capabilities are hard for rivals to copy (Teece 2017). Our theoretical analysis revealed that companies with higher levels of innovation capability may be better equipped to shape their agility by making the most of their dynamic capabilities.

The study's conclusions are consistent with current research on the function of IT competence in turbulent environments (Li and Liu 2014; Teece 2017). The results of this study are compatible with other research, since it was proposed that IT capability improves agility in turbulent contexts (e.g., Chen et al. 2014; Mikalef and Pateli 2018). Furthermore, this study is consistent with previous findings as well, showing that inventive capability is favorable when market turbulence is strong (Wang et al. 2015a). This study supports recent research by confirming a significant association between inventive capability and agility (Ravichandran 2018). Moreover, agility's mediating function is in line with earlier research. Mikalef and Pateli (2017) discovered that operational adjustment agility and market capitalizing agility operate as a mediating factor between the influence of ITDC on competitive performance. Business process agility fully mediates the effect of IT competence on firm performance (Chen et al. 2014). The mediation of inventive capability also validates earlier research. For example, functional abilities related to new product development completely mitigate the effect of IT leveraging competency on competitive advantage (Pavlou and El Sawy 2006).
Furthermore, technological innovation capability acts as a positive mediator in the relationship between business ties and performance (Cheng and Yang 2017).

The moderating effect in this study demonstrates a complex effect, in contrast to previous research. The moderating effect of this study is therefore comparable to that of Xue et al. (2012), who discovered that an IT asset portfolio is associated with increased operational efficiency in fewer dynamics while also increasing the rate of new product and process innovations in more complex environments. The present investigation validates the noteworthy moderating influence of technical turbulence and the market (H4a, H4b & H5a) in the suggested correlation. This is because, in reaction to volatile market conditions, modern organizations are getting smarter by bolstering their agility and innovative capability from IT capabilities (Ravichandran 2018; Sambamurthy et al. 2003; Tallon 2008). Conversely, the H5b is negligible as, in comparison, there is less likelihood that technological upheaval will have an impact on ITDC and creative capacity in Indonesia enterprises.

IMPLICATIONS FOR THEORY

The following significant theoretical implications are provided by this study. First, earlier research has shown that the DCV outperforms the RBV in terms of explanatory power (Wu 2010). This study makes up for the RBV's shortcomings by conceptually expanding upon it. Furthermore, it makes it apparent how strong the ITDC is in addressing environmental turbulence in light of RBV. As one of the first studies to identify the fundamental elements of each capability measure, conceptualize, benchmark, and operationalize IT dynamic capability this research also helps to illuminate the inner workings of ITDC business agility and ITDC innovation capability.

Second, an analytical operationalization of the ITDC capabilities namely, sensing, coordinating, integrating, learning, and reconfiguring has been made. Further research integrating dynamic capacities and creativity is needed in light of the previous studies' insufficient findings in these domains (e.g. Mikalef and Pateli 2017). By extending and conceptualizing that a firm with ITDC can develop abilities to shape the firm's agility and innovative capability in a turbulent environment setting, this study contributes to the body of work along these lines. Furthermore, by creating and testing multi-item scales within the framework of IT capabilities, this study contributes to future research by the ITDC.

Third, leaders who see ITDC's strategic importance need to lead other executives in quickly rearranging IT capabilities. The capacity of businesses to develop and set up sophisticated ITDC to take advantage of new market opportunities is a major concern in the current chaotic environment. Modern IT capabilities can be fostered and explored by executives seeking to achieve better performance outcomes. These capabilities can allow for agility and innovative thinking in the face of market volatility. Because of this, great care should be taken to find ITDCs that facilitate the collection of customer and market data, the use of business intelligence and analytics tools, the

sharing of synchronized data with business partners, and the exploitation of the information to foster innovation and firm agility. Business managers should also be in charge of auditing and streamlining in order to promptly detect and identify IT applications that have lost their value. This could result in a valuable portfolio of IT capital and infrastructure that can be used to better develop strategic IT capabilities for tumultuous business conditions in the future.

CONCLUSION AND LIMITATIONS

Future Directions and Constraints for Research

The results of this study raise a number of issues that may be investigated in further research.

First, the measurements in this study might be improved and expanded upon to highlight how well-conceived and broadly applicable they are to different paradigms of information system research, like cross-country analysis and longitudinal studies. Additionally, a longitudinal study may reveal possible consequences that are difficult to quantify through cross-sectional or empirical research. Second, there are other notions in the literature in addition to the constructs studied in this study, particularly business process agility and ITDC.

Therefore, incorporating notions like process-oriented dynamic capability, IT-enabled operational agility (Tan et al. 2017), IT agility (Lowry and Wilson 2016), and so on could lead to a variety of spontaneous results and contributions in future studies. Thirdly, future research might concentrate on the strategic value of IT in the model to measure company agility and innovative capability that might have shifting aspects in the turbulent environment, which is consistent with the study's theoretical framework. Fourth, it appears that using objective metrics to assess company performance has limitations because it may not be reasonable to assume that subjective metrics based on financial indications will show superior performance. Therefore, the subjective measures for financial performance may be taken into account in future research. Lastly, because this study was among the first on the subject, the data comes from a variety of industry sectors. Therefore, in order to gain more insightful knowledge and deduce conclusions that are more precise, it is advised that future research focus on a single industry or a cross-sectoral industry where the pattern of agility and innovation may be more uniform. Future research therefore considers these constraints in order to do a thorough analysis in comparison to the body of existing knowledge.

CONCLUSION

Examining how businesses adapt their IT capabilities to foster agility and innovation in order to stay ahead of the competition is of significant importance in light of the increasingly volatile business environment. It is therefore crucial and relevant to comprehend the impact of ITDC in a volatile environment as businesses rapidly transition to IT-enabled capabilities. Even though the impact of IT capability has been studied lately, the ITDC and how it influences

business process agility and inventive capabilities in relation to firm performance are briefly discussed. This study examines the underlying impact of ITDC on business process agility and innovative capability in a turbulent environment by using a multi-theoretic lens. We find a positive and significant relationship in the proposed model using survey data from top IT and business executives in 254 Indonesia enterprises. This study provides more evidence that the relationship between ITDC and business success is mediated by inventive capacity and agility. The relationship between ITDC and agility is significantly moderated by marketing and technological volatility. Additionally, the association between ITDC and company inventive capabilities is marginally moderated by technological turbulence, whereas it is strongly moderated by marketing turbulence.

REFERENCES

Ahammad MF, Basu S, Munjal S, Clegg J, Shoham OB (2021) Strategic agility, environmental uncertain ties and international performance: the perspective of indian firms. J World Business 56(4):101218

Armstrong JS, Overton TS (1977) Estimating nonresponse bias in mail surveys. J Marketing Res 14(3):396–402

Ashrafi A, Zare Ravasan A, Trkman P, Afshari S (2019) The role of business analytics capabilities in bolstering firms' agility and performance. Int J Inf Manage 47:1–15

Ashurst C, Freer A, Ekdahl J, Gibbons C (2012) Exploring It-enabled innovation: a new paradigm? Int J Inf Manage 32(4):326–336

Autio E, Mudambi R, Yoo Y (2021) Digitalization and globalization in a turbulent world: centrifugal and centripetal forces. Glob Strateg J 11(1):3–16

Battistella C, De Toni AF, De Zan G, Pessot E (2017) Cultivating business model agility through focused capabilities: a multiple case study. J Bus Res 73:65–82

Berente N, Lyytinen K, Yoo Y, Maurer C (2019) Institutional logics and pluralistic responses to enter prise system implementation: a qualitative meta-analysis. MIS Q 43(3):873–902

Bharadwaj SG, Varadarajan PR, Fahy J (1993) Sustainable competitive advantage in service industries: a conceptual model and research propositions. J Market 57(4):83–99

Bharadwaj AS (2000) A resource-based perspective on information technology capability and firm per formance: an empirical investigation. MIS Quart 24(1):169–196

Bhatti SH, Santoro G, Khan J, Rizzato F (2021) Antecedents and consequences of business model inno vation in the it industry. J Bus Res 123:389–400

Bodlaj M, Coenders G, Zabkar V (2012) Responsive and proactive market orientation and innovation success under market and technological turbulence. J Bus Econ Manag 13(4):666–687

Bouncken RB, Kraus S (2013) Innovation in knowledge-intensive industries: the double-edged sword of coopetition. J Bus Res 66(10):2060–2070

Cai Z, Liu H, Huang Q, Liang L (2019) Developing organizational agility in product innovation: the roles of it capability, km capability, and innovative climate. R&D Manag 49(4):421–438

Camisón C, Villar-López A (2014) Organizational innovation as an enabler of technological innovation capabilities and firm performance. J Bus Res 67(1):2891–2902

Cepeda J, Arias-Pérez J (2019a) Information technology capabilities and organizational agility. Multinatl Bus Rev 27(2):198–216

Cepeda J, Arias-Pérez J (2019b) Information technology capabilities and organizational agility: the medi ating effects of open innovation capabilities. Multi Bus Rev 27(2):198–216. https://doi.org/10.1108/MBR-11-2017-0088

Chen Y, Wang Y, Nevo S, Jin J, Wang L, Chow WS (2014) It capability and organizational performance: the roles of business process

agility and environmental factors. Eur J Inf Syst 23(3):326–342

Chen Y, Wang Y, Nevo S, Benitez-Amado J, Kou G (2015) It capabilities and product innovation perfor mance: the roles of corporate entrepreneurship and competitive intensity. Inf Manag 52(6):643–657

Chen Y, Wang Y, Nevo S, Benitez J, Kou G (2017) Improving strategic flexibility with information tech nologies: insights for firm performance in an emerging economy. J Inf Technol 32(1):10–25

Chen J, Guo X, Zhao H (2021) Cross-fertilization for routine reconfiguration in IT-enabled organizational transformation. Inf Manag 58(2):103414

Cheng C, Yang M (2017) Enhancing performance of cross-border mergers and acquisitions in developed markets: the role of business ties and technological innovation capability. J Bus Res 81:107–117

Cheng C, Zhong H, Cao L (2020) Facilitating speed of internationalization: the roles of business intel ligence and organizational agility. J Bus Res 110:95–103

Chin WW, Marcolin BL, Newsted PR (2003) A partial least squares latent variable modeling approach for measuring interaction effects: results from a monte carlo simulation study and an electronic mail emotion/adoption study. Inf Syst Res 14(2):189–217

Chin WW (2010) How to write up and report pls analyses, Handbook of Partial Least Squares. Springer, pp 655–690

Chirumalla K (2021) Building digitally-enabled process innovation in the process industries: a dynamic capabilities approach. Technovation

Chu Z, Xu J, Lai F, Collins BJ (2018) Institutional theory and environmental pressures: the moderat ing effect of market uncertainty on innovation and firm performance. IEEE Trans Eng Manag 65(3):392-403

Chung HF, Yang Z, Huang P-H (2015) How does organizational learning matter in strategic business per formance? The contingency role of guanxi networking. J Bus Res 68(6):1216–1224

Croteau A-M, Bergeron F (2001) An Information technology trilogy: business strategy, technological deployment and organizational performance. J Strateg Inf Syst 10(2):77–99

Damanpour F, Aravind D (2012) Managerial innovation: conceptions, processes and antecedents. Manag Organ Rev 8(2):423–454

Diamantopoulos A (2011) Incorporating formative measures into covariance-based structural equation models. MIS Quart 35(2):335–358

Fornell C, Larcker DF (1981) Evaluating structural equation models with unobservable variables and measurement error. J Market Res 18(1):39–50

Gaskin J (2011) Pls common method bias (Cmb), In: Gaskination's statistics [Online] Available: https:// www.youtube.com/watch?v=pUKT-QvQYhM (Accessed 12 May 2017)

Gefen D, Straub D (2005) A practical guide to factorial validity using pls-graph: tutorial and annotated example. Commun Assoc Inf Syst 16(1):5

Gefen D, Rigdon E, Straub D (2011) An update and extension to sem guidelines for administrative and social science research. Editorial comment. MIS Q 35(2):1–7

Ghezzi A, Cavallo A (2020) Agile business model innovation in digital entrepreneurship: lean startup approaches. J Bus Res 110:519–537

Hair JF, Ringle CM, Sarstedt M (2011) Pls-sem: indeed a silver bullet. J Marketing Theory Practice 19(2):139–152

Hair JF Jr, Hult GTM, Ringle C, Sarstedt M (2016) A primer on partial least squares structural equation modeling (Pls-Sem). Sage Publications, California

Helfat CE, Peteraf MA (2003) The dynamic resource-based view: capability lifecycles. Strateg Manag J 24(10):997–1010

Hopkins MS, Brynjolfsson E (2010) The four ways it is revolutionizing innovation. Sloan Management Review Assoc, Mit Sloan School Management 77 Massachusetts Ave, E60–100, Cambridge, MA 02139–4307 USA

Huang P-Y, Ouyang TH, Pan SL, Chou T-C (2012) The role of it in achieving operational agility: a case study of haier, China. Int J Inf Manage 32(3):294–298

Ilmudeen A, Bao Y (2020) It strategy and business strategy mediate the effect of managing it on firm performance: empirical

analysis. J Enterp Inf Manag 33(6):1357–1378

Ilmudeen A, Yukun B (2018) Mediating role of managing information technology and its impact on firm performance: insight from China. Ind Manag Data Syst 118(4):912–929

Ilmudeen A, Bao Y, Alharbi IM (2019) How does business-it strategic alignment dimension impact on organizational performance measures: conjecture and empirical analysis. J Enterp Inf Manag 32(3):457–476

Ilmudeen A, Bao Y, Alharbi IM, Zubair N (2021) Revisiting dynamic capability for organizations' inno vation types. Eur J Innov Manag 24(2):507–532

Karimi-Alaghehband F, Rivard S (2020) IT outsourcing success: a dynamic capability-based model. J Strat Inf Syst 29(1):101599

Kock N (2015) Common method bias in Pls-Sem: a full collinearity assessment approach. Int J e-Collab (IJeC) 11(4):1–10

Kohtamäki M, Heimonen J, Sjödin D, Heikkilä V (2020) Strategic agility in innovation: unpacking the interaction between entrepreneurial orientation and absorptive capacity by using practice theory. J Bus Res 118:12–25

Leidner DE, Lo J, Preston D (2011) An empirical investigation of the relationship of is strategy with firm performance. J Strateg Inf Syst 20(4):419–437

Li D-Y, Liu J (2014) Dynamic capabilities, environmental dynamism, and competitive advantage: evi dence from China. J Bus Res 67(1):2793–2799

Li H, Wu Y, Cao D, Wang Y (2021) Organizational mindfulness towards digital transformation as a pre requisite of information processing capability to achieve market agility. J Bus Res 122:700–712

Lim J-H, Stratopoulos TC, Wirjanto TS (2011) Path dependence of dynamic information technology capability: an empirical investigation. J Manag Inf Syst 28(3):45–84

Lin H-F (2007) Knowledge sharing and firm innovation capability: an empirical study. Int J Manpow 28(3/4):315–332

Lin Y, Wu L-Y (2014) Exploring the role of dynamic capabilities in firm performance under the resource based view framework. J Bus Res 67(3):407–413

Lowry PB, Gaskin J (2014) Partial least squares (Pls) structural equation modeling (Sem) for building and testing behavioral causal theory: when to choose it and how to use it. IEEE Trans Prof Com mun 57(2):123–146

Lowry PB, Wilson D (2016) Creating agile organizations through it: the influence of internal it service perceptions on it service quality and it agility. J Strateg Inf Syst 25(3):211–226

Lu Y, Ramamurthy K (2011) Understanding the link between information technology capability and organizational agility: an empirical examination. Mis Quart 35(4):931–954

Majchrzak A, Shepherd DA (2021) Can Digital innovations help reduce suffering? A crowd-based digital innovation framework of compassion venturing. Inf Organ 31(1):100338

Mao H, Liu S, Zhang J, Deng Z (2016) Information technology resource, knowledge management capa bility, and competitive advantage: the moderating role of resource commitment. Int J Inf Manage 36(6):1062–1074

Mehran (2015) How to perform mediation test in smartpls, in: How to perform mediation test in Smart PLS. Youtube

Melián-Alzola L, Fernández-Monroy M, Hidalgo-Peñate M (2020) Information technology capability and organisational agility: a study in the canary islands hotel industry, Tourism Manag Perspect. 33

Mikalef P, Pateli A (2016a) Developing and validating a measurement instrument of it-enabled dynamic capabilities, In: Proceedings of the 24th European conference on information systems (ECIS)

Mikalef P, Pateli AG (2016b) Developing and validating a measurement instrument of it-enabled dynamic capabilities, ECIS, p. ResearchPaper39

Mikalef P, Pateli A (2017) Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: findings from Pls-Sem and Fsqca. J Bus Res 70:1–16

Mikalef P, Pateli A, van de Wetering R (2016). It flexibility and competitive performance: the mediating role of it-enabled dynamic capabilities, In: Proceedings of the 24th

European conference on infor mation systems (ECIS)

Mikalef P, van de Wetering R, Krogstie J (2021) Building dynamic capabilities by leveraging big data analytics: the role of organizational inertia. Inf Manag 58(6):103412

Mithas S, Ramasubbu N, Sambamurthy V (2011) How information management capability influences f irm performance. MIS Quart 35(1):237–256

Morgan RE, Strong CA (2003) Business performance and dimensions of strategic orientation. J Bus Res 56(3):163–176

Nazir S, Pinsonneault A (2021) Relating agility and electronic integration: the role of knowledge and process coordination mechanisms. J Strat Inf Syst 30(2):101654

Nevo S, Wade MR (2010) The formation and value of it-enabled resources: antecedents and conse quences of synergistic relationships. MIS Quart 34(1):163–183

Nevo S, Wade M (2011) Firm-level benefits of it-enabled resources: a conceptual extension and an empir ical assessment. J Strateg Inf Syst 20(4):403–418

Nevo S, Nevo D, Pinsonneault A (2020) Exploring the role of it in the front-end of innovation: an empiri cal study of IT-enabled creative behavior. Inf Organ 30(4):100322

Paladino A (2008) Analyzing the effects of market and resource orientations on innovative outcomes in times of turbulence. J Prod Innov Manag 25(6):577–592

Pavlou PA, El Sawy OA (2006) From it leveraging competence to competitive advantage in turbulent environments: the case of new product development. Inf Syst Res 17(3):198–227

Pavlou PA, El Sawy OA (2010) The “third hand”: it-enabled competitive advantage in turbulence through improvisational capabilities. Inf Syst Res 21(3):443–471

Pavlou PA, El Sawy OA (2011) Understanding the elusive black box of dynamic capabilities. Decis Sci 42(1):239–273

Podsakoff PM, MacKenzie SB, Lee J-Y, Podsakoff NP (2003) Common method biases in behavioral research: a critical review of the literature and recommended remedies. J Appl Psychol 88(5):879

Prajogo DI (2016) The strategic fit between innovation strategies and business environment in delivering business performance. Int J Prod Econ 171:241–249

Prasad A, Heales J, Green P (2010) A capabilities-based approach to obtaining a deeper understanding of information technology governance effectiveness: evidence from it steering committees. Int J Account Inf Syst 11(3):214–232

Preacher KJ, Hayes AF (2008) Asymptotic and resampling strategies for assessing and comparing indi rect effects in multiple mediator models. Behav Res Methods 40(3):879–891

Protogerou A, Caloghirou Y, Lioukas S (2012) Dynamic capabilities and their indirect impact on firm performance. Ind Corp Chang 21(3):615–647

Qiu Y, Pesch R (2019) The impact of digitalisation on organisations–-a review of the empirical literature. Acad Manag Proc Acad Manag Briarcliff Manor, NY 10510:19324

Queiroz M, Tallon PP, Sharma R, Coltman T (2018) The role of it application orchestration capability in improving agility and performance. J Strat Inf Syst 27(1):4-21

Rai A, Tang X (2010) Leveraging it capabilities and competitive process capabilities for the management of interorganizational relationship portfolios. Inf Syst Res 21(3):516–542

Ranta V, Aarikka-Stenroos L, Väisänen J-M (2021) Digital technologies catalyzing business model inno vation for circular economy—multiple case study. Resour Conserv Recycling 164:105155

Raschke RL (2010) Process-based view of agility: the value contribution of it and the effects on process outcomes. Int J Account Inf Syst 11(4):297–313

Ratzmann M, Gudergan SP, Bouncken R (2016) Capturing heterogeneity and Pls-Sem prediction ability: alliance governance and innovation. J Bus Res 69(10):4593–4603

Ravichandran T, Lertwongsatien C, Lertwongsatien C (2005) Effect of information systems resources and capabilities on firm performance: a resource-based perspective. J Manag Inf Syst 21(4):237–276

Ravichandran T (2018) Exploring the relationships between it competence,

innovation capacity and organizational agility. J Strat Inf Syst 27(1):22–42

Raymond L, Uwizeyemungu S, Fabi B, St-Pierre J (2018) It capabilities for product innovation in smes: a configurational approach. Inf Technol Manage 19(1):75–87

Ringle CM, Sarstedt M, Straub DW (2012) Editor's comments: a critical look at the use of Pls-Sem in ``Mis Quarterly''. MIS Quart 36(1):iii–xiv

Roberts N, Grover V (2012) Leveraging information technology infrastructure to facilitate a firm's cus tomer agility and competitive activity: an empirical investigation. J Manag Inf Syst 28(4):231–270

Sambamurthy V, Bharadwaj A, Grover V (2003) Shaping agility through digital options: reconceptual izing the role of information technology in contemporary firms. MIS Q 27(2):237–263

Sheng ML (2017) A dynamic capabilities-based framework of organizational sensemaking through com binative capabilities towards exploratory and exploitative product innovation in turbulent environ ments. Ind Mark Manage 65:28–38

Stoel MD, Muhanna WA (2009) It Capabilities and firm performance: a contingency analysis of the role of industry and it capability type. Information & Management 46(3):181–189

Su Z, Peng J, Shen H, Xiao T (2013) Technological capability, marketing capability, and firm perfor mance in turbulent conditions. Manag Organ Rev 9(1):115–138

Su Z, Yang H (2018) Managerial ties and exploratory innovation: an opportunity-motivation-ability per spective. IEEE Trans Eng Manag 65(2):227–238

Tai JC, Wang ET, Yeh H-Y (2018) A study of is assets, is ambidexterity, and is alignment: the dynamic managerial capability perspective, Inf Manag

Tallon PP (2008) Inside the adaptive enterprise: an information technology capabilities perspective on business process agility. Inf Technol Manage 9(1):21–36

Tallon PP, Pinsonneault A (2011) Competing perspectives on the link between strategic information technology alignment and organizational agility: insights from a mediation model. MIS Q 35(2):463–486

Tan FTC, Tan B, Wang W, Sedera D (2017) It-Enabled operational agility: an interdependencies perspec tive. Inf Manag 54(3):292–303

Teece DJ (2007) Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strateg Manag J 28(13):1319–1350

Teece DJ (2017) Business models and dynamic capabilities. Long Range Plan 51(1):40–49

Teece DJ, Pisano G, Shuen A (1997) Dynamic capabilities and strategic management. Strat Manag J 18(7):509–533

Tenenhaus M, Vinzi VE, Chatelin Y-M, Lauro C (2005) Pls path modeling. Comput Stat Data Anal 48(1):159–205

Wang N, Liang H, Zhong W, Xue Y, Xiao J (2012) Resource structuring or capability building? An empirical study of the business value of information technology. J Manag Inf Syst 29(2):325–367

Wang G, Dou W, Zhu W, Zhou N (2015a) The effects of firm capabilities on external collaboration and performance: the moderating role of market turbulence. J Bus Res 68(9):1928–1936

Wang Y, Shi S, Nevo S, Li S, Chen Y (2015b) The interaction effect of it assets and it management on f irm performance: a systems perspective. Int J Inf Manage 35(5):580–593

Wang F, Zhao J, Chi M, Li Y (2017) Collaborative innovation capability in it-enabled inter-firm collabo ration. Ind Manag Data Syst 117(10):2364–2380

van de Wetering R, Besuyen M (2021) How it-enabled dynamic capabilities add value to the develop ment of innovation capabilities, in Encyclopedia of Organizational Knowledge, Administration, and Technology. IGI Global, pp 999–1016

van de Wetering R, Mikalef P, Pateli A (2017) Managing firms' innovation capabilities through strategi cally aligning combinative it and dynamic capabilities

Wetzels M, Odekerken-Schröder G, Van Oppen C (2009) Using pls path modeling for assessing hierar chical construct models:

guidelines and empirical illustration. MIS Quart 33(1):177–195

Wiesböck F, Hess T, Spanjol J (2020) The dual role of IT capabilities in the development of digital prod ucts and services. Inf Manag 57(8):103389

Wilden R, Gudergan SP (2015) The Impact of dynamic capabilities on operational marketing and technological capabilities: investigating the role of environmental turbulence. J Acad Mark Sci 43(2):181–199

Wu L-Y (2010) Applicability of the resource-based and dynamic-capability views under environmental volatility. J Bus Res 63(1):27–31

Wu F, Yeniyurt S, Kim D, Cavusgil ST (2006) The impact of information technology on supply chain capabilities and firm performance: a resource-based view. Ind Mark Manage 35(4):493–504

Wu SP-J, Straub DW, Liang T-P (2015) How information technology governance mechanisms and stra tegic alignment influence organizational performance: insights from a matched survey of business and it managers. MIS Q 39(2):497–518

Xue L, Ray G, Gu B (2011) Environmental uncertainty and it infrastructure sgovernance: a curvilinear relationship. Inf Syst Res 22(2):389–399

Xue L, Ray G, Sambamurthy V (2012) Efficiency or innovation: how do industry environments moderate the effects of firms' it asset portfolios?, MIS Quarterly, pp 509–528

Yang J (2012) Innovation capability and corporate growth: an empirical investigation in China. J Eng Tech Manage 29(1):34–46

Yeow A, Soh C, Hansen R (2017) Aligning with new digital strategy: a dynamic capabilities approach. J Strat Inf Syst 27(1): 43–58

Yoo Y, Henfridsson O, Lyytinen K (2010) Research commentary—the new organizing logic of digital innovation: an agenda for information systems research. Inf Syst Res 21(4):724–735

Yoo Y, Boland RJ Jr, Lyytinen K, Majchrzak A (2012) Organizing for innovation in the digitized world. Organ Sci 23(5):1398–1408

Zheng Y, Liu J, George G (2010) The dynamic impact of innovative capability and inter-firm network on firm valuation: a longitudinal study of biotechnology start-ups. J Bus Ventur 25(6):593–609