



Moderating role of turbulent environment between IT dynamic capabilities, business agility, and innovative capabilities: Empirical evidence from Sri Lanka

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Abstract

Drawing on the resource-based theory and dynamic capability theory this study examines how IT-enabled dynamic capabilities impact on business capabilities (business process agility and firm innovative capability) with moderating role of turbulent environment. The purpose of this study is to test the impact of IT-enabled dynamic on business process agility and innovative capability that in turn drive firm performance under turbulent environment. This study conceptualizes that IT governance mechanism positively effect on ITDC, that in turn positively impact on business process agility and firm innovative capability to achieve firm performance. Data were collected in offline and online by using convenient and snowball sampling technique from the senior IT and business managers in Sri Lankan. Using the partial least squares (Smart PLS 3.0) hierarchical regression analysis for various model were performed. The finding from 188 senior IT and business manager's responses from Sri Lanka reveals the strong and positive relationship in the hypothesized relationship. In contrary to the expectation, the turbulent environment's both hypotheses (H6a and H6b) failed to show a significant moderating effect. This study adds to the existing literature and extends the managerial practice by focusing on the key constructs such as IT governance mechanism, ITDC, turbulent environment, and firm performance.

Keywords: *Business process agility, firm innovative capability, firm performance, IT-enabled dynamic capabilities, turbulent environment.*

1 Introduction

Businesses have invested a massive amount of money in IT; however, the payoff from IT is always a major concern for managers and executives (Ilmudeen & Bao, 2020). In spite of the growing amount of IT investment, IT governance decisions have ever more become complicated due to vague cost relationships, uncertain payoffs, rapid technological changes, and uncertain business environments (Ilmudeen, 2021a). The traditional view of IT governance may not sufficiently address today's strategic, managerial, and technological complexity and it no longer resembles with what is trendy in the real world business phenomenon. Likewise, today's business environments have become ever more dynamic and competitive hence the dominance of IT-enabled dynamic capability (ITDC) in modern firms have deepened the significance of adopting IT governance mechanisms.

Today, the business environments have become increasingly dynamic and competitive due to the turbulent environment (Ilmudeen, 2021b; Ravichandran, 2017). Further, the increasing pervasiveness of IT-enabled dynamic capability in modern firms has deepened the importance of adopting IT governance mechanisms. Hence, firms are looking for ways to be more agile by reacting to market threats and opportunities to survive and succeed in the turbulent environment (Huang, Ouyang, Pan, & Chou, 2012; Tallon & Pinsonneault, 2011). Alike, prior studies permit additional examinations on the effect of IT governance with other facets such as structures and process (Ali & Green, 2012), IT-enabled capabilities (Boh & Yellin, 2006), sustainable IT-related capabilities (Prasad, Green, & Heales, 2012), and multifaceted nature of environmental dynamics (Xue, Ray, & Gu, 2011), including call for special issue in IS journal (Tiwana, Konsynski, & Venkatraman, 2013).

Yet the effect of IT governance on firm performance has been widely examined, still a gap exists to study how IT governance effect on firm performance (Wu, Straub, & Liang, 2015). Similarly, the growing inescapability of IT-enabled dynamic capability in today's business setting has expanded the significance of adopting IT governance mechanisms. As a result, firms are seeking new ways to be more agile by responding to market threats and opportunities (Huang et al., 2012; Tallon & Pinsonneault, 2011). Scholars in information systems agree that the turbulent environment plays a significant moderating role, but the moderating role of turbulent environment is less likely examined in this research context. Though there are number of IT investments and IT-enabled business initiative in Sri Lanka (Wickramasinghe & Kumara, 2009; Wickramasinghe & Wickramasinghe, 2012), studies that examine the IT governance impact on business capabilities to drive firm performance is limited in Sri Lankan context. Hence, this study motivated from the above backdrops and reseach gap to contextualize Sri Lanka as a testing ground.

In this tenet, past studies warrant further examination on the importance of governing IT investment and call for studies with either mediation or moderator model to explain whether IT creates business value directly or indirectly with firm factors (Turel, Liu, &

Bart, 2017; Wu et al., 2015). Similarly, literature permits further studies on the effects of IT governance with other facets such as structures and process, IT-enabled capabilities, sustainable IT-related capabilities, and multifaceted nature of environmental dynamics. managers and industry leaders who are struggling to manage and govern their IT investment in Sri Lanka. Thereby, the research setting is timely needed for Sri Lankan context, and we believe that the findings of these empirical studies would be able to offer insightful information for managers and practitioners that could enable them to make managerial decisions.

2 Literature review

In recent years, a large number of foreign investment and international business operations have increased in Sri Lanka, because of growing global competition, low labor costs and government incentives (Wickramasinghe & Wickramasinghe, 2012). Sri Lankan government has recognized IT services as a way to attain competitive advantage, hence it moves towards operating in a global market offering a substantial and dynamic business environment (Wickramasinghe, 2009). The government initiatives have made Sri Lanka to become one of the South Asian countries where IT-enabled business process outsourcing firms have been located (Wickramasinghe & Kumara, 2009). In the past, a few empirical studies have been done and focused on business sector development (Wickramasinghe, 2009), IT contribution (Hosman, 2011; Wickramasinghe & Kumara, 2009), need for managerial competency (Wickramasinghe & Zoyza, 2009), addressed issues in ERP implementation (Rajapakse & Seddon, 2005; Wickramasinghe & Gunawardana, 2010a, 2010b) in Sri Lankan context. Similarly, some prior studies have addressed on IT-enabled business process outsourcing issues (e.g., Wickramasinghe & Kumara, 2009). However, the IT governance impact on firm performance studies are limited in Sri Lankan context. For example, the extend search of research articles that are included for IS related research in popular databases such as ABI/Inform, Emerald, Business Source Premier, Science Direct, and Wiley Blackwell has been unable to find any single studies conducted on managing IT / IT governance impact on firm performance in Sri Lankan context.

In Sri Lanka, the ICT services are the 4th largest export earner and the Sri Lankan ICT sector serves a number of Industry verticals with over 300 companies at present (Board, 2021). The Sri Lankan government believes that it can be transformed to an IT savvy nation within 5-10 years as its literacy rate is high (Gunawardana, 2007). Sri Lanka is emerging as a world's ICT destination of choice as it progressively transforming into the most desired ICT hub in Asia (Board, 2021). Currently, The local IT industry is well placed to exploit on a stream of public and private sector renovation efforts, and Sri Lanka's position as an outsourcing destination in the region (Solutions, 2021). The Sri Lankan companies that have invested in direct software exports have often had little or no success, with few exceptions (Gunawardana, 2007).

2.1 Resource-based view (RBV) and dynamic capability view (DCV)

The resource-based view refers that the valuable, rare, inimitable and non-substitutable resources (VRIN) are the basis of firm competitive advantage (Barney, 1991). The RBV is more effective to explain how resources and capabilities drive firm performance. Thus this theory yet has been criticized for weakening to detect how capabilities might realize in the turbulent environmental conditions (Tallon, 2008; Teece, Pisano, & Shuen, 1997). In the turbulent environment, the mere presence of bundles of resources is insufficient to gain the sustainable competitive advantage (Helfat & Peteraf, 2003; Teece et al., 1997; Wu, 2010). Hence, the question arises how to configure IT resources to fulfill customer demand, market changes, and respond to turbulence. The fundamental proposition of the RBV as being static and ignoring the influence of market turbulence, scholars proposed to adopt the dynamic view of resources that would be more appropriate (Helfat & Peteraf, 2003; Li & Liu, 2014; Wu, 2010). As a result to meet the demands in practice and the limitations found in RBV, (Teece et al., 1997) extended RBV and suggested that firms should frequently adapt, reconfigure and renovate their resources and capabilities to address dynamic environmental changes (Li & Liu, 2014). In this similar view, the evolutionary firm capabilities based recent research proposed the dynamic resource-based perspective (Helfat & Peteraf, 2003). The dynamic capabilities are a firm's ability to adapt its resource base to sense and seize opportunities, thus, it allows firms to integrate, build and reconfigure resources and competencies with regard to changing conditions. In sum, dynamic capabilities are the only valuable competence in turbulent environments (Pavlou & El Sawy, 2011).

2.2 The role of IT in turbulent environment: theorizing from IT-enabled dynamic capabilities

Today the business environment is ever more becoming competitive and dynamic. Hence firms have to be agile and innovative to respond the challenges and turbulence they face. Firm face the turbulence and environmental uncertainty because of hyper-competition, time-to-market pressures, unstable customer demand, rapid product obsolescence, and technological advancements (Huang et al., 2012; Tallon & Pinsonneault, 2011) where firm agility and innovation are the sole retorts to its survival. With the present increase in environmental turbulence, firms are looking for ways to be more agile for identifying and reacting to market threats and opportunities readily to sustain and succeed (Huang et al., 2012; Tallon & Pinsonneault, 2011). Accordingly, modern firms are seeking to distinguish themselves by positioning IT to develop dynamic IT capabilities and respond to competitors' actions to preserve these capabilities (Lim, Stratopoulos, & Wirjanto, 2011; Pavlou & El Sawy, 2010). Likewise, firms are ever more depend on IT to stay agile and innovative (Lowry & Wilson, 2016; Pavlou & El Sawy, 2010); and promptly react to external changes and competitive actions that are induced by IT (Pavlou & El Sawy, 2010). The recent industry cases, for example, Haier's IT leveraging competence was improved by information processing to achieve operational agility (Huang et al.,

2012). In Boeing 787 the strategic IT architecture generated IT-enabled virtually integrated network for global design, manufacture, and operation of its commercial airplanes (Nolan, 2012). Dell developed a custom graphical user interface (GUI) for Ubuntu on Dell netbooks to sense and respond to IT-enabled external partnerships for innovation and competitive action (Roberts & Grover, 2012). The strategic sense making abilities of senior managers to evaluate the long-term business value is linked with modularity in the Asia-based call center case study (Ravishankar & Pan, 2013). All of these industry cases signify that IT-enabled capabilities in the dynamic business environment certainly improve firm performance through agility and innovation. In today's turbulent business environment, firms must frequently reconfigure practices considerably to respond to unexpected environmental shifts or opportunities brought by various digital technologies (Chen, Guo, & Zhao, 2021).

3 Research model and hypotheses development

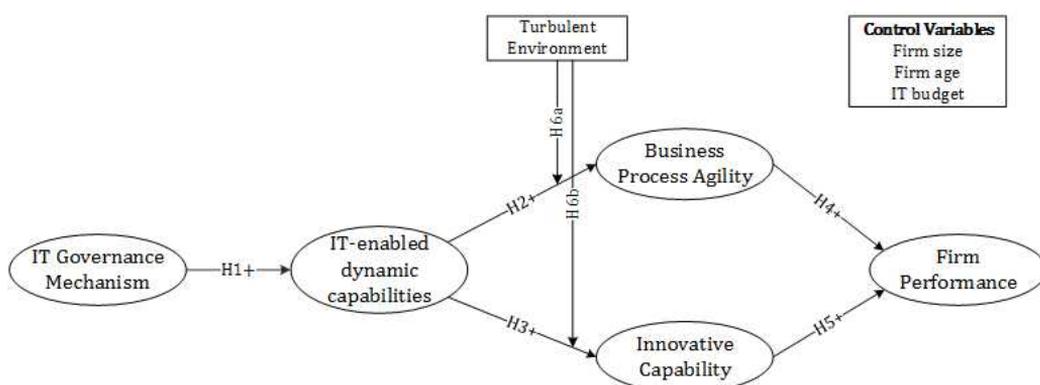


Figure 1 Research model

3.1 IT governance mechanism and IT-enabled dynamic capability

IT governance mechanisms facilitates to achieve intellectual IS strategic alignment which explain the roles and responsibilities of the stake holders, how the authority for IT is shared between business partners, IT management, and service providers (Wu et al., 2015). The more established IT governance mechanisms facilitate collaboration between IT and business people (Héroux & Fortin, 2018; Wu et al., 2015) which consecutively build synergy for business-IT alignment, causing in more capability. IT governance signifies the strategic importance of IT so the firm can enrich IT resources, sustain its operations, and extend its businesses thus improve its' ability to leverage IT resources with other corporate resources (Zhang, Zhao, & Kumar, 2016). To be an effective IT governance, it should focus on horizontal integration capabilities - the ability to coordinate and integrate formal and informal IT decision-making required for sustaining business value from IT in a complex and dynamic environment (Peterson, 2004). In the

literature, past studies claimed that there is a positive link between IT governance and the possibility that the firm will nurture greater IT capability (Zhang et al., 2016). Hence, the first hypothesis is stated as follows:

Hypothesis 1: IT governance mechanism has a positive impact on firm IT-enabled dynamic capabilities.

3.2 IT-enabled dynamic capabilities and business process agility

IS scholars advocate that dynamic capabilities are the viable means for reacting to the turbulent environments by helping managers to extend, modify, and reconfigure present operational capabilities into new ones that better fit the environment (Pavlou & El Sawy, 2011). In this tenet, firms in the highly competitive and uncertain environments have to be more agile to adapt their strategies and actions to succeed (Ravichandran, 2017; Sambamurthy, Bharadwaj, & Grover, 2003). According to Leidner, Lo and Preston (2011), a constant pursuit of an innovative IS strategy enable the firm to improve dynamic capabilities, which is then used to grasp the changes, turn them into opportunities. The IT-leveraging capability has a direct positive effect on dynamic capabilities because it enhances the ability of new product development unit to sense the environment, enhance learning, integrate resources, and coordinate activities (Pavlou & El Sawy, 2010). In this study, we propose ITDC that permit a firm to sense from the business environment, coordinate firm's operational activities, learn from failures and success, integrate processes and routines, and reconfigure assets and resources. Thus, the first hypothesis is stated as follows.

Hypothesis 2: Firm IT-enabled dynamic capability is positively influencing in their business process agility.

3.3 IT-enabled dynamic capabilities and firm innovative capability

In a turbulent environment, technology updates are fast, product obsolescence, competitors' moves, and customer preferences frequently change (Chen et al., 2014; Wang, Liang, Zhong, Xue, & Xiao, 2012). Therefore, a firm's innovation capability provides the flexibility of responding to rapidly changing markets and customers' expectations in realizing innovation-driven growth (Yang, 2012). Scholars highlighted that, firms with solid dynamic capabilities are strongly entrepreneurial by shaping through innovation and collaborating with other enterprises and entities (Teece, 2007). The firm's sustainable competitive advantage depends on its dynamic capabilities to innovate, and the ability to adapt and reconfigure resources and capabilities (Camisón & Villar-López, 2014). According to Ravichandran (2017) study, a firm's innovation capacity to be a function of both its innovativeness and how IT-enabled new initiatives are combined with the rest of the firm. Hence, the hypothesis is stated as follows.

Hypothesis 3: IT-enabled dynamic capability positively influence on firm innovative capability.

3.4 Firm business process agility and firm performance

Given the indispensable role of business process agility in the turbulence business environments, it is believed vital to the innovation and competitive performance and firms are ever more depend on IT, together with process, knowledge, and communication technologies to enrich their agility (Sambamurthy et al., 2003). Firms which are suffering in agility will not be capable to adapt their actions and business processes in response to changes (Bhatti, Santoro, Khan, & Rizzato, 2021). Prior studies evidenced that agility is the insightful enabler through which IT-enabled capabilities to affect firm performance (Tan, Tan, Wang, & Sedera, 2017). In the turbulent business environment, the ever-fluctuating customer demand, rapid product obsolescence, hyper-competition, and uncertain technological development (Huang et al., 2012; Tallon & Pinsonneault, 2011) in which agility is the sole mechanism for firm's survival. Hence, the firm agility is the ability to cope with rapidly fluctuating business contexts and succeed in a competitive environment by exploiting emerging business opportunities (Lu & Ramamurthy, 2011; Mikalef & Pateli, 2017).

Hypothesis 4: Firm business process agility will positively influence their firm performance.

3.5 Firm innovative capability and firm performance

A firm with a wide range of market-response options like flexible IT infrastructure, firm structure, or resources more likely to innovate and actively respond to new market prospects that in turn enjoy the future benefit in the form of profitability, cost reduction or market growth (Tallon & Pinsonneault, 2011). Hence, the speed of innovation has been found significant for the corporate growth opportunities in emerging industries. Even though innovative firms might have the incentives to configure firm resources to create new activity systems or business models; this process is easier when the resources are inherently flexible. As noted earlier, the inherent flexibility of firm resources are enhanced by digitization. Hence, a firm's innovation capacity gives the flexibility to configure resources, and these innovative firms are more likely to be agile when they have higher IT competence (Ravichandran, 2017). Hence the hypothesis is stated as follows.

Hypothesis 5: Firm innovative capability positively influences their firm performance.

3.6 The moderating effect of turbulent environment between ITDC - business process agility relationship

According to Pavlou and El Sawy (2006) turbulent environments increase the possibility that dynamic capabilities would reconfigure the new product development functional competencies. A firm with superior dynamic capabilities capable of rapidly respond to

changes and succeed in turbulent environments, whereas a firm with less dynamic capabilities are less able to rapidly respond (Leidner et al., 2011). In this tenet, the higher turbulence environment would create greater the need and more pronounced IT leveraging competence (IT functionalities to support IT-related activities) to support knowledge flows (Pavlou & El Sawy, 2006). This study theorizes that the impact of ITDC in agility is positively moderated by environmental turbulence and it has been found in the past studies also. For instance, (Tallon & Pinsonneault, 2011) study shows the environmental volatility positively moderates the link between firm agility and its performance. Therefore, the following hypothesis is formulated.

Hypothesis 6a: The higher the turbulent environment the stronger the relationship between IT-enabled dynamic capabilities and business process agility.

Highly innovative firms are possibly to gather and integrate knowledge as to cope with high uncertainty and has the potential to stand high levels of firm innovative capability (Lin, 2007). A firm should execute better by making changes to its product and service offerings and implement these changes more efficiently in the turbulent environment (Rai & Tang, 2010). Prior studies evidence that the link between dynamic capabilities and firm performance is insignificant in a stable environment but significant in a turbulent environment, signifying a moderating role (Li & Liu, 2014; Wu, 2010). Pavlou and El Sawy (2011) viewed dynamic capabilities as options where the higher the degree of environmental turbulence, the more likely these options will become valuable markets as new opportunities are likely to arise. Similarly, during high technological turbulence, the relationship between resource orientation and innovation was reinforced (Paladino, 2008). Hence the next hypothesis formulated as follows.

Hypothesis 6b: The higher the turbulent environment the stronger the relationship between IT-enabled dynamic capabilities and firm innovative capability.

4 Research design, methodology and data analysis

4.1 Research design, participants, sampling, and data collection procedure

The key informant approach is used for the data collection, as it was a common method in prior IS research (Ilmudeen & Bao, 2020; Ilmudeen, Bao, & Alharbi, 2019; Nevo & Wade, 2011; Wu et al., 2015). The data collection process started from mid of July to mid of September 2019. The self-administered questionnaires distributed in which the respondent read and answer the same set of questions in a fixed order (Saunders, Lewis, & Thornhill, 2009). The sampling frame for this study is currently working senior IT and business managers in Sri Lankan firms. The researcher used on-site and online methods to collect the data. For on-site data collection, the printed version of the questionnaire distributed among currently working professionals who are pursuing MBA, MSc and doctoral degree program from different universities and institutes in Sri Lanka. The

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researcher physically visited these universities and institutes in Sri Lanka with the prior approval for the data collection and used the convenient sampling method. The same questionnaire was converted into an electronic version (Google doc) and targeted working professionals (e.g., LinkedIn) and convenient and snowball sampling technique used to reach online respondents. For online questionnaire, the researcher set option that one respondent can answer only one questionnaire to avoid the multiple responses from a single respondent. The researcher posted the questionnaire link with the opening paragraph that describes the survey objectives, targeted respondent, and the role of expected respondents as the senior managers from IT and business position. In both the online and off-line, the questionnaire was converted into the English language as it is the 2nd official language in Sri Lanka. The table 1 shows the demographic profile of this study. The researcher issued 347 printed questionnaires in offline to the above universities and institutions. The 237 filled questionnaires returned by the above respondents and among these only 176 valid questionnaires were considered. In online 12 questionnaires were received as the valid responses. Totally, 188 (online and offline) valid responses are considered as the final sample for this study. During the data collection the researcher faced issues like difficult to find intended professionals, less number of IT and business managerial professionals in the MBA class, physically visited to the respondents' University during their having MBA lecture session, and getting approval from MBA coordinator for the data collection.

This study includes the variables which are extracted from the following prior studies. Accordingly, the IT governance mechanism (Wu et al., 2015; Zhang et al., 2016), IT-enabled dynamic capabilities (Mikalef & Pateli, 2016), Business process agility (Raschke, 2010; Tallon, 2008), Innovative capability (Yang, 2012), Turbulent environment (Leidner et al., 2011), and the Firm performance (Wu, Yenyurt, Kim, & Cavusgil, 2006; Wu et al., 2015)

Table 1
Demographic profile of the study 2 sample in Sri Lanka

Position	<i>N</i>	%	Total sales in Last year	<i>N</i>	%
Chief Executive Officer	07	3.7	< 100 million \$	77	41
Chief Information Officer	9	4.9	100 - 499 million \$	27	14.4
Chief Financial Officer	04	2.1	500 - 999 million \$	27	14.4
Managing Director	05	2.7	1000 -1499 million \$	17	9
IT Controller	42	22.3	1500 - 1999 million \$	14	7.4
Head of IT / MIS Department	39	20.7	> 2,000 million \$	26	13.8
Manager	43	22.9			
Marketing Manager	39	20.7			
Experience	<i>N</i>	%	Employees	<i>N</i>	%
			Less than 100	54	28.7
< 3 years	90	47.9	100 – 500	45	23.9
3.1– 6 years	46	24.5	500 - 1000	37	19.7
6.1–9 years	20	10.6	1000–1500	9	4.8
9.1 - 12 years	14	7.4	1500 - 2000	10	5.3
12.1 - 15 years	7	3.7	More than 2000	33	17.6
15.1 - 18 years	5	2.7			
18.1 – 20 years	3	1.6			
> 20 years	3	1.6			
IT budget in annual sales	<i>N</i>	%	Org_Age	<i>N</i>	%
< 1 %	23	12.2	< 4.9 Years	16	8.5
1.1%–2%	19	10.1	5 - 9.9 Years	18	9.6
2.1%–3%	41	21.8	10 - 14.9 Years	42	22.3
3.1%–4%	31	16.6	15 - 19.9 Years	38	20.3
4.1%–5%	32	17	> 20 years	74	39.3
>5%	42	22.3			

4.2 Data analysis methods and procedures

The partial least squares (Smart PLS 3.0) used because it efficiently analyzes the small dataset and has superior statistical power (Hair Jr, Hult, Ringle, & Sarstedt, 2016). The data analysis consists of two steps. In the first step, the measurement model assessed for the proper psychometric properties. In the second step, the structural model measured. The reliability, convergent validity, and discriminant validity were measured to check for the quality of measurement item (Hair Jr et al., 2016); and then the hypotheses were tested using hierarchical regression analysis and path analysis.

5 Results and findings

Table 2
Descriptive statistics, correlations, and reliability

	Mean	Std.Dv	ITGM	ITEDC	BPA	FIC	TE	FP	Age	Size	IT-budget
ITGM	3.495	1.088									
ITEDC	3.574	0.994	0.791	0.814							
BPA	3.608	0.963	0.673	0.702	0.826						
FIC	3.532	1.045	0.757	0.788	0.805	0.852					
TE	3.602	1.055	0.681	0.712	0.797	0.791	0.847				
FP	3.489	1.052	0.688	0.702	0.797	0.813	0.669				
Age			-0.236	-0.134	-0.196	-0.218	-0.221	-0.219	1		
Size			0.055	0.046	0.052	0.046	0.013	0.182	0.338	1	
IT-budget			0.331	0.259	0.209	0.292	0.232	0.235	-0.12	0.132	1

Note: Diagonal elements are the square root of AVE; off-diagonal elements are correlations. For discriminant validity, diagonal elements should be higher than off-diagonal elements.

The convergent and discriminant validities are used to confirm the survey items. For convergent validity, we measured the following with their satisfying criteria suggested by Straub, Boudreau, and Gefen (2004) such as Cronbach's α (CA) (>0.7), composite reliability (CR) (>0.7), and Average Variance Extracted (AVE) (>0.5). This study's variable meets these threshold values and confirm the convergent and discriminant validities.

Table 3
Hierarchical regression results

	ITDC		Business Process Agility		Firm Innovative Capability			Firm Performance		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Control variables										
AGE	0.065	-0.124	-0.047	-0.044	-0.122*	-0.064	-0.062	-0.124*	-0.117*	-0.101*
SIZE	-0.022	0.061	0.048	0.043	0.042	0.032	0.029	0.174***	0.192***	0.176***
IT-BUDGET	-0.000	0.010	-0.013	-0.017	0.076	0.060**	0.057	0.040	-0.039	-0.021
Independent variables										
ITGM	0.810***									
ITDC		0.684***	0.274**	0.279**	0.753***	0.488***	0.451***			
TE			0.597***	0.622***		0.444***	0.460***			
BPA								0.762***		0.396***
FIC									0.793***	0.471***
Interaction										
ITDC * TE				0.065						
ITDC * TE							0.044			
R²	0.632	0.512	0.680	0.685	0.646	0.737	0.740	0.681	0.699	0.769
ΔR²			0.168	0.005		0.091	0.003		0.018	0.070

Note ITGM: IT governance mechanism, ITDC: IT-enabled dynamic capability, BPA: Business process agility, FIC: Firm Innovative Capability, TE: Turbulent environment; *p <0.05; **p <0.01; ***p<0.001

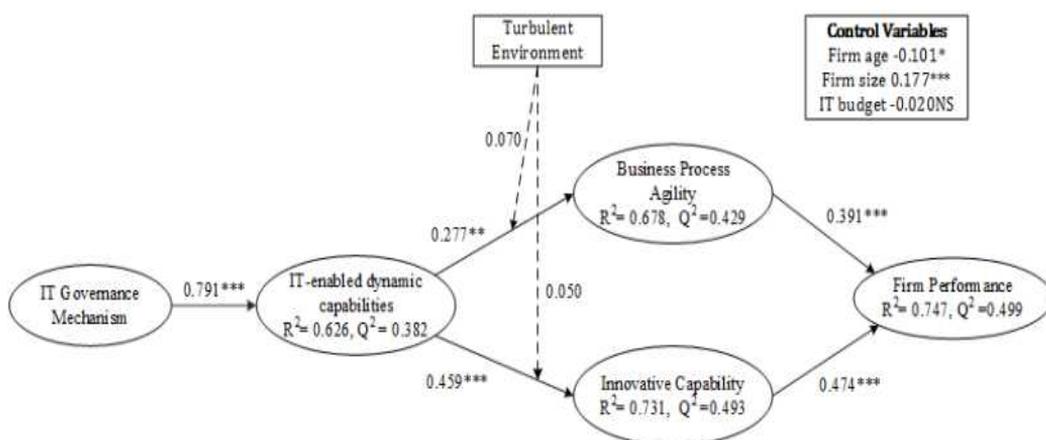


Figure 2 Moderation effect model

5.1 Hypotheses testing

In model 1 ITGM has significant effect on ITDC ($\beta = 0.810, p < 0.001$) thereby H1 is supported. In model 2, ITDC has a significant impact on business process agility ($\beta = 0.684, p < 0.001$); hence the H2 is supported. The Model 3 demonstrates that the turbulent environment has a positive and significant relationship with business process agility ($\beta = 0.597, p < 0.001$). In contrary to the expectation, in Model 4 turbulent environment did not show significant moderating effect between ITDC – business process agility relationship. Hence, the higher the turbulent environment did not make stronger the relationship between IT-enabled dynamic capabilities and business process agility. Therefore, it did not decrease the impact of ITDC on business process agility; as a result, the H6a is not supported. In Model 1 – 4, none of the control variable has the significant relationship. In Model 5, ITDC has significant impact on firm innovative capability ($\beta = 0.753, p < 0.001$) hence the H3 is supported. Model 6 demonstrates that the turbulent environment has positive and significant relationship with firm innovative capability ($\beta = 0.444, p < 0.001$). In Model 7, turbulent environment moderating effect is not significant ($\beta = 0.044$). Hence, the higher the turbulent environment did not make stronger the relationship between IT-enabled dynamic capabilities and firm innovative capability. Hence, H6b is not statistically supported. In model 8, the impact of business process agility on firm performance is significant ($\beta = 0.762, p < 0.001$) hence the H4 is supported. In Model 9, the impact of firm innovative capability on firm performance is significant ($\beta = 0.793, p < 0.001$) thus, H5 is supported. In Model 10 the two independent variables such as business process agility ($\beta = 0.396, p < 0.001$) and firm innovative capability ($\beta = 0.471, p < 0.001$) have significant relationship and satisfactory explained variance on firm performance $R^2 = 0.571$.

6 Discussion and implications

Despite the plenty of studies which have been examined the impact of IT capabilities on firm performance, yet the significant gaps exist. The recent theorizing such as IT-enabled inter-firm collaboration (Wang, Zhao, Chi, & Li, 2017), IT-enabled operational agility (Tan et al., 2017), and IT application orchestration capability (Queiroz, Tallon, Sharma, & Coltman, 2017) have focused how IT-enabled capabilities drive performance outcomes in the turbulent environment. Recent studies on IT capabilities have highlighted that IS research wants to test both IT-enabled artifact example agility, innovation, IT resources (Nevo & Wade, 2011; Tan et al., 2017; Wang et al., 2017) and redesigning the business model with regard to dynamic capabilities (Battistella, De Toni, De Zan, & Pessot, 2017; Teece, 2017). Despite, the prior studies examined how IT impact on firm performance (Chen et al., 2014; Lowry & Wilson, 2016) this study attempts to empirically examine how ITDC impact both business process agility and innovative capability with the varying effect of environmental turbulence.

This study demonstrate significant and impactful relationships in the proposed model and hypotheses are supported except for the moderating impact of turbulent environment. The reason for the insignificant turbulent environment is the Sri Lankan business industry does not face huge turbulence as the economy is just booming after the 30 years of civil war, less number of business firms, average level of managing IT and IT governance implementation practices, growing nature of technology and business enterprises, lack of innovations, underdeveloped infrastructure and business sector, political instability and unstable economic growth. Moreover, Sri Lankan government and state authorities have taken number of initiatives to develop the business sector, attract foreign investments, government supports for new business start-up and massive infrastructural development. As it contextualized and revalidated in Sri Lankan context, it offers significant implications and insights for the developing countries firm in the similar context.

6.1 Theoretical contributions

This study has several noteworthy contributions. First, the conceptualization and empirical validation of IT dynamic capability and the complementary nature between agility and innovative capability highlight the rareness, thus contributing to the growing body of knowledge in this significant research area. This study further helps to shed light on their inner-working by detecting the underlying components of each capability to measure, conceptualize, benchmark, and operationalize ITDC. This study focuses on the dynamic capabilities that includes sensing, coordinating, integrating, learning and reconfiguring have been analytically operationalized.

Second, the prior studies have examined the exogenous factors' impact on IT capability and firm performance relationship (e.g. Chen et al., 2014). Yet, turbulent environment has significant intuitions about endogenous factors' impact and its moderating effect received very limited attention. With that this study integrates turbulent environment and suggesting that environmental turbulence has a multifaceted and nuanced impact. Therefore, the inclusion of environmental turbulence shows the firm's actual behavior in which the managers can determine significant implications and actionable decisions to readily act upon to manage resources in the turbulent environments.

Third, past studies warrant additional examination on the emergence and the consequences of IT governance and environmental dynamics (Tiwana et al., 2013). Similarly, a large number of practitioner and research articles highlighted the potential benefits of IT governance and IT capability in the turbulent environment context (Kude, Lazic, Heinzl, & Neff, 2017; Tallon, 2008; Turel et al., 2017). However, empirical studies confirming these claims is less in number in IS literature. Hence, this study addresses these gap by investigating how IT governance mechanism supports to IT-enabled dynamic capabilities, and its subsequent effect to achieve firm performance in the context of the turbulent environment.

6.2 Practical and managerial contributions

The followings are the practical and managerial contribution from this study. First, the corporate leaders and practitioners recognize that IT investment decision should be headed not only to IT executives but also considering the multifaceted nature of the dynamic environment. As a result, executives should identify the ways to build a firm-wide dynamic IT capability and should do much more than merely investing in IT by systematically examining business goals and environmental conditions. This would help to improve the business agility and firm innovative capability to achieve firm performance.

Second, the business leaders should not only look at IT capabilities but also be aware of the effect of ITDC under turbulent environment. This study delivers a diagnostic tool that managers can use to measure the strategic potential of a firm's ITDC for the environmental turbulence. What is serious for firms in the turbulent environment is, their ability to build and configure sophisticated ITDC to exploit on new market opportunities. Executives looking for achieving IT to gain superior performance outcome can consider to nature firm agility, and innovative capability thus adds to the growing call for firms to foster agility and innovation.

Third, the cooperate managers need to oversee auditing or streamlining processes for quickly detecting and separating IT applications that are no longer valuable as they once were. This could nurture valuable portfolio of IT infrastructure and IT capital that could be better positioned to develop strategic IT capability for future turbulent business conditions. Hence the finding suggests the actionable plans that how managers can sense and respond to environmental opportunities, coordinate tasks, process activities and resources, learn to renovate present capabilities, integrate the knowledge to reconfigure the capabilities towards business agility and innovation capability.

6.3 Limitations and future research

This study has the following limitations which can be considered for the future research. Firstly, this study focuses on single country's perspective, hence the future research can extend this study's context to other countries that are in the similar condition. Secondly, comparatively this study's sample size is low and did not represent considerable amount of IT and business managers in the country. Hence, the future research can increase the sample size, extend its wide coverage of representative for the sample collection, hence explore more insights. Thirdly, as this study focuses on the single country's context, thus, the generalizability is limited. So this study can be extended into multi-country, regions or comparing multiple countries to widen its generalizability.

6.4 Conclusion

This study focuses how IT governance mechanism and IT-enabled dynamic capabilities drive firm performance in the turbulent environment. Using 188 senior IT and business manager's responses from Sri Lanka proved the strong and positive relationship in the hypothesized relationship. This study shows significant impact of IT-enabled capabilities on business capabilities that in turn drives firm performance. In contrary, to the expectation, the turbulent environment's both hypotheses (H6a and H6b) did not show the significant moderating effect. This study adds value to the existing IS literature on the theories employed in this study and extends managerial implications for business and IT managers for their organization's decision making.

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