Impact of IT Governance Mechanism on IT-enabled Dynamic Capabilities to Shape Agility and Firm Innovative Capability: Moderating Role of Turbulent Environment

Ilmudeen, A.

Department of MIT, Faculty of Management and Commerce, South Eastern University of Sri Lanka

ilmudeena@seu.ac.lk

Abstract

This study examines how IT governance mechanism and IT-enabled dynamic capability impact on firm performance through agility and firm innovative capability. This study hypothesized that IT governance mechanism positively affects IT-enabled Dynamic Capability (ITDC), that in turn positively impacts on business process agility and firm innovative capability subsequently; these positively impact on firm performance. The primary survey data from 188 senior IT and business executives in Sri Lanka, shows positive and a significant relationship in the proposed model. The findings suggest that IT governance mechanism and IT-enabled dynamic capabilities together drive firm performance, while turbulent environment failed to show significant moderating effects. The theoretical and practical implications are also discussed.

Keywords: IT governance mechanism, IT-enabled dynamic capabilities, Agility, Firm innovative capability, Turbulent environment

1. Introduction

Despite the few studies on IT governance – firm performance relationship, there is limited agreement on the fact that IT governance brings performance (Wu et al. 2015). The traditional perspective of IT governance may not sufficiently address today's strategic, managerial, and technological complexity in the business setting(Dong 2012). The increasing pervasiveness of IT-enabled dynamic capability in modern firm has deepened the importance of adopting IT governance mechanisms. In spite of a little awareness on the capabilities required to accomplish IT-enabled dynamic capabilities and firm performance (Mikalef and Pateli 2017; Mikalef et al. 2016), the understanding of how IT governance mechanism helps to realize IT-enabled dynamic capabilities is so far inadequate. Moreover, the past studies warrant additional examination to shed more light on the effects of IT governance with other

aspects such as structures and process (Ali and Green 2012),IT-enabled capabilities(Boh and Yellin 2006), sustainable IT-related capabilities (Prasad et al. 2012), and multifaceted nature of environmental dynamics (Xue et al. 2011).

Today, business environments have become ever more dynamic and hyper-competitive (Ravichandran 2017) due to a turbulent environment. As a result, firms are looking how to be more agile by reacting to market threats and opportunities readily to survive and succeed in the turbulent environment (Huang et al. 2012; Tallon and Pinsonneault 2011). Likewise, firms increasingly rely on IT to stay agile and engage in innovation (Lowry and Wilson 2016; Pavlou and El Sawy 2010); and swiftly respond to external changes and competitive actions that are induced by IT (Pavlou and El Sawy 2010). Due to the swiftly fluctuating technology and its consequent changes in market dynamics, it is significant to take into account the turbulent environment effect. The recent studies have shifted the emphasis to ITDC rather than on dynamic capabilities that provide an insightful perspective to shape agility and innovation (e.g., Kim et al. 2011; Mikalef and Pateli 2017; Ravichandran 2017; Tan et al. 2017; Wang et al. 2017; Yeow et al. 2017). However, limited attention has been paid on ITDC and how firm achieves firm performance from their IT-enabled dynamic capability in the turbulent environment. Hence, this study offers a distinctive context that fits on firm's agility and innovation in order to suggest valuable insights to the firms that are struggling to survive and thrive in the turbulent business environments.

2.Literature Review and hypothesis development

Regardless of the few studies on IT governance – firm performance relationship, there is a limited agreement on how exactly IT governance brings performance (Wu et al. 2015). On the other hand, these limited views no longer resemble with what is happening in the real world, where firms are executing a portfolio of different governance mechanisms (Boh and Yellin 2006). As being an important part of enterprise governance, IT governance requires a set of IT governance mechanisms to implement more effectively, to stimulate the similarity with the corporate mission, strategy, culture, value, norm, and business processes (Ali and Green 2012; Dong 2012; Van Grembergen and De Haes 2009; Wu et al. 2015).Despite a little awareness on the capabilities required to accomplish IT-enabled dynamic capabilities and firm performance (Mikalef and Pateli 2017; Mikalef et al. 2016), the understanding of how IT governance mechanism helps to realize IT-enabled dynamic capabilities is inadequate. The recent studies have shifted the emphasis to ITEDC rather than on dynamic capabilities that provide an insightful perspective to shape agility and innovation (e.g., Kim et al. 2011; Mikalef and Pateli 2017; Ravichandran 2017; Tan et al. 2017; Wang et al. 2017; Yeow et al. 2017). However, limited attention has been paid on ITDC and how firm achieves firm performance from their IT-enabled dynamic capability in the turbulent environment.

The turbulent environmental defines the instability of changes that a firm faces in its competitive environment (Leidner et al. 2011; Pavlou and El Sawy 2010). The turbulence environment covers two types: (i) market turbulence - uncertainty in customer needs and preference, and rival moves; and (ii) technological turbulence - the speed of technical advances (Leidner et al. 2011; Pavlou and El Sawy 2011). The dynamic capabilities theory provides the rational insights, hence the performance implication of capabilities may be subject to the environmental turbulence (Tallon 2008; Teece et al. 1997). Accordingly, the Teece et al. (1997) proposed a dynamic capability theory to explain why some firms are more effective than their competitors in establishing competitive advantages in dynamic markets.

The dynamic capabilities can be a strategic options, which give a firm the choice to follow new directions when the opportunities arise (Pavlou and El Sawy 2006). When the turbulence in the environment is high, comparatively these options will become valuable (Sambamurthy et al. 2003), where as in less turbulent environments, it is less likely to make opportunities for reconfiguring existing capabilities (Pavlou and El Sawy 2011). 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 rapidly respond to changes and succeed in turbulent environments, whereas a firm with less dynamic capabilities are less capable of responding rapidly(Leidner et al. 2011).

Unlike the stable environment, firms in turbulent environments face difficulties to get resources. Hence, the effective sensing and upgrading core competencies dynamically with environmental changes are musts for firms to get short-term benefits (Li and Liu 2014). On the other hand, the strategic potential of firm resources are subject to the firm's market conditions (Nevo and Wade 2011). Accordingly, the innovative firms are more likely to involve in learning, investigating, and able to cope with high uncertainty while these firms leverage digital platforms to respond to opportunities and threats (Ravichandran 2017). Highly innovative firms are possible 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). The higher growth rate of market offers a firm range of opportunities to gain benefits from innovation, thus increases the effect of innovation on competitive performance (Xue et al. 2011). When customer needs change, firms need to respond timely by changing their products, services and processes. Under these conditions, firms with the superior innovative capability can accomplish better than those with lower capability (Wang et al. 2017).

2.1. IT governance mechanism and IT-enabled dynamic capability

Organizations are using a mixture of different structures, processes, and relational

mechanisms that outline a layered system in order to provide higher levels of capabilities(De Haes and Van Grembergen 2013; Peterson 2004). IT governance mechanisms facilitate to achieve intellectual IS strategic alignment which explains 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).

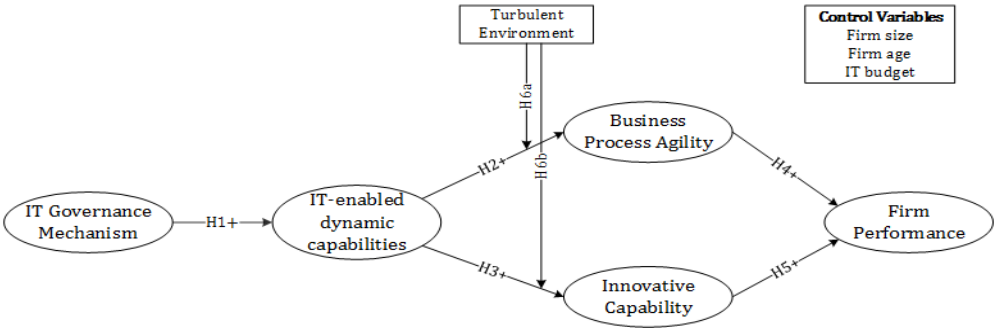

Figure 01: Research model

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 et al. 2016). On the other hand, the effective IT governance doesn't happen by accident (Weill and Ross 2005). To have 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.

2.2. IT-enabled dynamic capabilities and business process agility

In a turbulent environment,firms need to respond and fulfill customer requirements promptly, hence it necessitates a greater level of agility and innovative capability to sustain in the complicated business environment. 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 and 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 et al. 2003). The IT-leveragingcapability 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 and El Sawy 2010). In this study, we propose ITDC that permits 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:FirmIT-enabled dynamic capability is positively influencing on their business process agility.

2.3. IT-enabled dynamic capabilities and firm innovative capability

Firms invest in IT to pursue fast and innovative initiatives in response to frequently changing market conditions. When customer demands change, new market opportunities arise; thus firm's innovative capability lets to promptly detect and seize these opportunities, quickly configure the assets, resources to renew the value offer for their customers (Battistella et al. 2017). In a turbulent environment, technology updates are fast, product obsolescence, competitors' moves, and customer preferences frequently change(Chen et al. 2014; Wang et al. 2012)**.** Therefore, a firm's innovative 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). According to Ravichandran's (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 second hypothesis is stated as follows.

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

2.4. Firm business process agility and firm performance

Prior studies evidenced that agility is the insightful enabler through which IT-enabled capabilities affect firm performance (Tan et al. 2017). Today's modern firms are heavily investing on IT resources and IT services (e.g., digital platform, web services, data warehousing, customer relationship management, supply chain management applications) with the confidence of growing business agility for competitive actions (Lowry and Wilson

2016; Sambamurthy et al. 2003; Yang 2012). In the turbulent business environment, the ever-fluctuating customer demand, rapid product obsolescence, hyper-competition, and uncertain technological development (Huang et al. 2012; Tallon and Pinsonneault 2011), 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 and Ramamurthy 2011; Mikalef and Pateli 2017).

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

2.5. Firm innovative capability and firm performance

To be strategically agile, firm necessitates the constant and proactive innovation of products (through R&D) and processes in order to successfully deploy to exploit opportunities, fulfill customer demands and create new value (Battistella et al. 2017). The proactive use of IT supports the firm to quickly diagnose and exploit opportunities for IT innovation (Lu and Ramamurthy 2011).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. A firm's innovation capacity gives the flexibility to configure resources,andthese 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.

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

The turbulence environment increases the knowledge intensity; hence the turbulent environments necessitate the effective use of IT functionality to support business processes and rapid communications. In this tenet, the higher turbulent environments would create greater need and more pronounced IT leveraging competence (IT functionalities to support IT-related activities) to support knowledge flows (Pavlou and 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 and Pinsonneault (2011) study shows that the environmental volatility positively moderates the link between firm agility and its performance. Tallon (2008) study found the link between managerial IT capabilities and agility where environmental dynamism positively moderates this link. Similarly, environmental turbulence moderated the relationships between competitive process capabilities (process alignment and process flexibility) and competitive

performance, and found positive moderating effects (Rai and Tang 2010). Therefore, the following hypothesis was formulated.

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

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 and Tang 2010). Firms encountering turbulent environment not only necessitate to superior streamline in the external environment, but also internal processes like continuous change, adapt, innovate, or reinvent; hence firms can upgrade existing products or improve the new products to increase performance (Sheng 2017). Prior studies evidence that the link between dynamic capabilities and firm performance is insignificant in a stable environment but significant in a turbulentenvironment, signifying a moderating role (Li and 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 hypotheses are formulated as follows.

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

3. Research Methodology

3.1. Research design, participants, sampling, and data collection procedure

The key informant approach is used for the data collection, which is a common method in prior IS research (Chi et al. 2017; Ilmudeen and Yukun 2018; Nevo and Wade 2011; Wang et al. 2017; Wu et al. 2015). The data collection process started from mid of July to mid of September 2017. The self-administered questionnaires were distributed where the respondent read and answer the same set of questions in a fixed order(Saunders et al. 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 was distributed among currently working professionals who are pursuing MBA, MSc and doctoral degrees from different universities and institutes in Sri Lanka. The researcher 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 the working professionals (e.g., LinkedIn) were targeted; and convenient and snowball sampling technique was used to reach online respondents. For the onlinequestionnaire, the researcher set the 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 describe the survey objectives, targeted respondents, and the role of the expected respondents as the senior managers from IT and business positions. 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 5.1 shows the data collection profile for study 1 &2 in Sri Lanka.

Table1: Sample collection procedure and respondent type

University / Institute and Online	Type of Institute	Degree offer	No of issued questionnaire	Received Questionnaire	Valid response
University of Moratuwa	State	MSc in IT, MBA in IT	45	23	16
University of Colombo, School of computing	State	MSc in IT	43	32	21
University of Sri Jayewardenepura	State	MBA	86	49	38
University of Kelaniya	State	MBA	73	59	47
		Ph.D. - Doctor of business administration	24	19	14
Sri Lanka Institute of Information Technology (SLIIT)	Private	MSc in IT, IS & IM	37	26	18
Informatics Institute of Technology	Private	MSc in IT	33	28	21
The British School of Commerce	Private	MBA	06	01	01

Online electronic version of the questionnaire	Private and state	-	12	12

Table 2: Demographic profile of the study

Position	*N*	%	*Total sales in Last year*	*N*	%
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	39	20.7	> 2,000 million $	26	13.8
Department Manager	43	22.9			
Marketing Manager	39	20.7	*Employees*	*N*	%
Experience	*N*	%	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	*Org Age*	*N*	%
18.1 – 20 years	3	1.6	< 4.9 Years	16	8.5
> 20 years	3	1.6	5 - 9.9 Years	18	9.6
IT budget in annual sales	*N*	%	10 - 14.9 Years	42	22.3
< 1 %	23	12.2	15 - 19.9 Years	38	20.3
1.1%–2%	19	10.1	> 20 years	74	39.3
2.1%–3%	41	21.8			
3.1%–4%	31	16.6			
4.1%–5%	32	17			
>5%	42	22.3			

N = 188

This study collected the data across different industry sectors such as IT and technology 35.6%, manufacturing 25.5%, trade and business 15.9 %, banking, finance, and insurance 10.1%, transport and logistics 4.8 %, communication services 4.3 %, construction 2.7%, hotel and restaurants 1.1 %.

4. Results and Findings

Table 3: Descriptive statistics, correlations, and reliability

	Mean	Std. Dv	ITGM	ITDC	BPA	FIC	TE	FP	Age	Size	IT-budget
ITGM	3.495	1.088									
ITDC	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.

Table 4: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			
R^2	0.632	0.512	0.680	0.685	0.646	0.737	0.740	0.681	0.699	0.769
ΔR^2			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

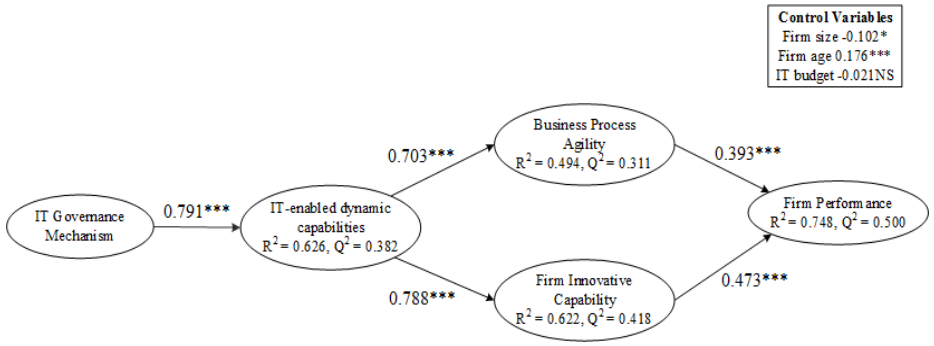

Figure2:Base model results of this study

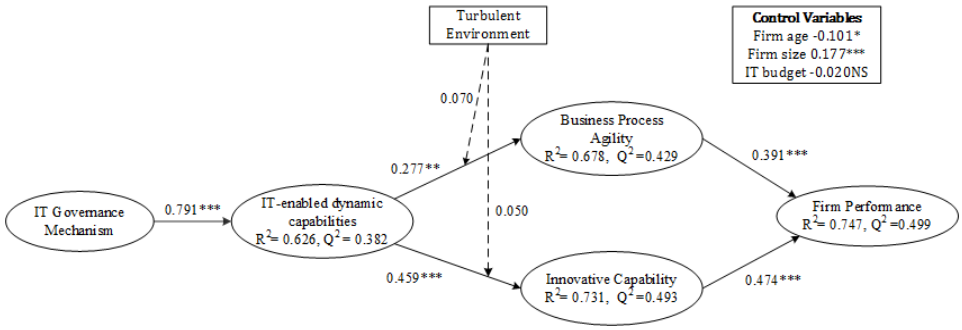

Figure 3:Moderation effect model of this study

Table 5: Path coefficient and significance for the structural models.

Hypothesized path and controls	Path coefficient and T statistics		Hypotheses support?
	Base model	Moderated model	
ITGM →ITDC	0.791 (18.729)	0.791 (18.770)	H1 Strongly supported
ITDC → Business process agility	0.703 (11.109)	0.277 (2.989)	H2 Strongly supported
ITDC → Firm innovative capability	0.788 (18.473)	0.459 (5.319)	H3 Strongly supported
Business process agility → Firm performance	0.393 (4.781)	0.391 (4.910)	H4 Strongly supported
Innovative capability → Firm performance	0.473 (5.464)	0.474 (5.541)	H5 Strongly supported
TE * ITDC → Business process agility	-	0.070 (1.024)	H6a Not supported
TE * ITDC → Firm innovative capability	-	0.050 (1.080)	H6b Not supported
Firm age	-0.102 (2.259)	-0.101 (2.278)	Significant
Firm size	0.176 (4.550)	0.177 (4.661)	Significant
IT budget	-0.021 (0.471)	-0.020 (0.446)	Not Significant

Table 6: Reflective constructs and measurement items

Items	Loading	T Statistics
ITDC Sensing (SNS) CA = 0.973; rho _A =0.973; CR =0.975; AVE=0.662	0.945	101.334
SNS1 Scanning the environment and identifying new business opportunities		
SNS2 Reviewing our product development efforts to ensure they are in line with customers want	0.888	47.156
SNS3 Implementing ideas for new products and improving existing products or services	0.913	57.909
SNS4 Discontinuities arising in our business by developing greater reactive and proactive strength	0.948	112.126
Coordinating (CRD)	0.893	47.141

CRD1 Providing more effective coordination among different functional activities		
CRD2 Providing more effective coordination with customers, business partners and distributors	0.905	57.733
CRD3 Ensuring that the output of work is synchronized with the work of other functional units or business partners	0.902	60.657
CRD4 Reducing redundant tasks, or overlapping activities performed by different operational units	0.894	45.617
Learning	0.927	83.101
LRN1 Identify, evaluate, and import new information and knowledge		
LRN2 Transform existing information into new knowledge	0.941	92.465
LRN3 Assimilate new information and knowledge	0.923	62.346
LRN4 Use accumulated information and knowledge to assist decision making	0.881	31.961
Integrating (INT)	0.894	47.955
INT1 Easily accessing data and other valuable resources in real time from business partners		
INT2 Aggregating relevant information from business partners, suppliers and customers. (e.g. operating information, business customer performance)	0.903	53.521
INT3 Collaborating in demand forecasting and planning between our firm and our business partners	0.903	53.245
INT4 Streamlining business processes with suppliers, distributors, and customers	0.887	41.791
Reconfiguring (RCF)	0.879	41.601
RCF1 Adjusting for and responding to unexpected changes easily		
RCF2 Easily adding an eligible new partner that you want to do business with or removing ones that you have terminated your partnership	0.912	60.753
RCF3 Adjusting our business processes in response to shifts in our business priorities	0.901	57.9
RCF4 Reconfiguring our business processes in order to come up with new productive assets	0.894	55.796
Business process agility *CA = 0.933; rho _A = 0.935; CR = 0.945; AVE=0.683*	0.776	20.991
BPA1 Respond to changes in aggregate consumer demand.		
BPA2 Customize a product or service to suit an individual customer.	0.765	18.285
BPA3 React to new product or service launches by competitors.	0.832	23.301
BPA4 Introduce new pricing schedules in response to changes in competitors' prices.	0.823	25.761
BPA5 Expand into new regional or international markets.	0.837	26.482
BPA6 Change the variety of products/services available for sale.	0.858	41.044
BPA7 Adopt new technologies to produce better, faster and cheaper	0.865	40.126

products and services.		
BPA8 Switch suppliers to avail of lower costs, better quality, or improved delivery times.	0.85	34.313
Turbulent Environment *CA = 0.944; rho _A = 0.944; CR = 0.953; AVE = 0.717*	0.817	26.369
TE1 Our customer product preference change quickly		
TE2 Our customers looking new product/service all the time.	0.851	34.979
TE3 We are witnessing there is a demand for our products and services from new customers	0.845	34.791
TE4 New customer product need differ from existing customers	0.828	27.896
TE5 The technology in our industry is changing rapidly.	0.846	39.629
TE6 Technological changes provide big opportunities in our industry	0.88	51.108
TE7 A large number of new product ideas have been made possible through technological innovations in our industry.	0.883	52.927
TE8 It is very difficult to forecast where the technology in our industry will be in next 2 to 3 years.	0.823	27.979
Firm innovation capability *CA = 0.946; rho _A = 0.946; CR = 0.955; AVE = 0.727*	0.855	41.191
FIC1 Our knowledge and skill base is building up at the right pace		
FIC2 Our firm management actively seeks innovative ideas	0.848	30.57
FIC3 Our firm frequently tries out new ideas	0.869	45.866
FIC4 Our firm is often first to market with new products and services	0.837	29.472
FIC5 Our firm is able to identify and create new value for customers.	0.882	41.504
FIC6 Our firm encouragecreativity and invest substantial investment in R&D	0.854	28.382
FIC7 Our firm is creative in its operating methods	0.851	38.569
FIC8 Our new product introduction has increased during the last five years	0.822	22.696

Note. CA: Cronbach's Alpha, CR: Composite Reliability, AVE: Average Variance Extracted, All loadings are significant at α = 0.001

Table 07: Formative construct items and measures

Constructs and measurement items	Weight	Loading	STDEV	T Statistics
Decision Making Structure VIF = 3.111	0.247	0.869	0.084	2.947
DMS1 Our company has a steering committee at executive or senior management level responsible for determining IT development prioritization				
DMS2 Our company has a steering committee	0.492	0.931	0.086	5.706

consisting of IT and business people on prioritizing and managing IT projects				
DMS3 CIO has a direct reporting line to the CEO and/or COO.	0.386	0.847	0.07	5.526
Formal Process VIF = 3.226	0.431	0.939	0.091	4.723
FP1 Our company has established a formal prioritization process for IT investments and projects in which business and IT is involved				
FP2 Our company has established formal processes to define and update IT strategies.	0.283	0.921	0.101	2.807
FP3 Our company has established formal processes to govern and manage IT projects.	0.354	0.943	0.103	3.435
Communication Approach VIF = 3.168	0.337	0.881	0.077	4.388
CA1 CIO is a full member of the executive committee.				
CA2 Our company has a committee at level of broad of directors to ensure IT is a regular agenda item and reporting issue for the board of directors	0.411	0.912	0.072	5.718
CA3 The CIO or similar role in our company is able to clearly articulate a vision for IT's role in the company	0.359	0.915	0.091	3.955
Financial Returns (FR) VIF = 3.279	0.435	0.956	0.104	4.184
FR1 Our company's return on investment (ROI) is better compared to other companies in the same industry.				
FR2 Our company's return on equity (ROE) is better compared to other companies in the same industry.	0.377	0.947	0.085	4.419
FR3 Our company's return on asset (ROA) is better compared to other companies in the same industry	0.252	0.901	0.094	2.677
Operational Excellence (OE) VIF = 3.294	0.546	0.951	0.097	5.622
OE1 Our company has better productivity improvements compared to other companies in the same industry				
OE2 Our company has better timeline of customer service compared to other companies in the same industry.	0.297	0.854	0.069	4.288
OE3 Our company has better production cycle time compared to other companies in the same industry	0.256	0.891	0.08	3.202
Marketing Performance (MP) VIF = 3.26	0.449	0.946	0.102	4.41

MP1 Our company performs much better than competitors in sales growth.				
MP2 Our company performs much better than competitors in market share.	0.296	0.938	0.111	2.658
MP3 Our company performs much better than competitors in product development and market development.	0.321	0.929	0.096	3.344

Note. STDEV and T Statistics are from weight

5. Discussion and Implications

In today's increasing competitive rivalry and unstable customer demands, there is a significant interest in understanding how firm tailor their IT capability to shape agility and innovative capabilityin order to stay ahead of their competitors (Mikalef and Pateli 2017; Ravichandran 2017). Firms are ever more dependent on IT and their ability to effectively integrate IT resources with other firm level and managerial processes (Zhang et al. 2016); hence pursuing dynamic capabilities that are strongly assorted to stay competitive and respond swiftly to the market changes.

In prior studies, the notion of agility and innovation are abstracted, but the salient features of ITDC with their underlying mechanism in the turbulent environment has received limited attention. Yet the literature elusively suggests that dynamic capabilities can potentially promote firm's innovation, prior studies call for research not only dynamic capability (Pavlou and El Sawy 2011) but also in dynamiccapabilities and innovation(eg. Mikalef and Pateli 2017). Accordingly, this study filled this gap by incorporating agility ad firm innovative capabilities with dynamic capabilities perspective. This study's mediation and moderation model does not simply explain how ITDC impact on agility or firm innovation capability, but shows exclusively the comprehensive picture that how varying effect of environmental turbulence in firm's agility and innovative capability enriches firm performance.

Recent studies on IT capabilities have highlighted that IS research wants to test both IT-enabled artifact example agility, innovation, IT resources (Nevo and Wade 2011; Tan et al. 2017; Wang et al. 2017) and redesigning the business model with regard to dynamic capabilities.Dynamic capabilitiesare considered as a transformer for converting resources into improved performance. ThusLin and Wu (2014) found that dynamic capabilities can mediate the firm's valuable, rare, inimitable and non-substitutable (VRIN) resources to improve performance. Both agility and innovative capabilities are intermediate concepts that lead to performance outcomes and offers a complete understanding of how ITDC indirectly contributes to firm performance.

This study's hypotheses such as H1 – H5 are supported with significant path cofficient and t-value. Further, it consist the sufficient explained varience (R^2) and the predictive relevance (Q^2) values for the reseach model. The findingof this study is consistent with the recent studies on the role of IT capability in environmental turbulence (Li and Liu 2014; Teece 2017). As this study theorized that IT capability leads to better agility in turbulent environments and the findings are consistent with prior studies (Chen et al. 2014; Mikalef and Pateli 2017).Unlike the prior studies, the moderating role of turbulent environment does not show the significant effect. This is consistent with the prior study where environmental dynamism had insignificant impact between IT capability - business process agility relationship (Chen et al. 2014).The reason for the insignificant turbulent environment in 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.

5.1. Theoretical Contribution

These studies offer several noteworthy theoretical contributions to IS literature. Firstly, 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. Besides, this study is one of the first to theorize; thus it helps to shed light on their inner-working by detecting the underlying components of each capability to measure, conceptualize, benchmark, and operationalize ITDC. To the best of our knowledge, the ITDC constructs in this study having dynamic capabilities example sensing, coordinating, integrating, learning and reconfiguring have been analytically operationalized.

Secondly, the past studies have tested 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. Thus, this study integrates turbulent environment and suggests that environmental turbulence has a multifaceted and nuanced impacts. Therefore, the inclusion of environmentalturbulence shows the firm's actual behavior where managers can determine significant implications and actionable decisions to readily act upon to manage resources in the turbulent environments.

Thirdly, past studies warrant additional examination on the emergence and the consequences of IT governance and environmental dynamics (Tiwana et al. 2013). Likewise, a large number of practitioner and research articles highlighted the potential benefits of IT governance and IT capability in the turbulent environment context (Kude et al. 2017; Tallon 2008; Turel et al. 2017). However, empirical studies confirming these claims is less in number in IS literature. As a result, study 2 addresses these gaps 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.

5.2. Practical and Managerial Contribution

These studies have several notable practical and managerial implications for business practitioners and industry leaders. First, this study offers the practical guide to the boards, executive management, and corporate leaders in making IT investment decisions to generate business value from IT. 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. In this aspect, self-assessment (strengths vs weaknesses), comparing themselves with other competitors in the industry, and benchmarking are the potential ways to build strong dynamic IT capability. Secondly, the finding of this study confirms that 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 outcomes can consider to nature firm agility, and innovative capability; thus adding to the growing call for firms to foster agility and innovation. In this aspect, 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 a 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 as to 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 innovative capability.

6. Conclusion

This study examines the impact of IT governance mechanism on IT-enabled dynamic capability to achieve firm performance through agility and firm innovative capability. Though, a little understanding exists about the ITDC, how the performance outcomes in business process agility and innovation, affects firm performance in the turbulent environment is not well explored. The primary survey data from senior IT and business executives in Sri Lanka reveal positive and significant relationships in the proposed model. The findings suggest that IT governance mechanism and IT-enabled dynamic capabilities together drive firm performance. However, the moderating effect of turbulent environment failed to show the significant effect. This study further confirms that agility and innovative capability mediates the impact of ITDC and firm performance relationship. The theoretical and practical implications of this study contribute to multiple streams of literature and offer a practitcalguide on IT governance mechanism, and IT-enabled dynamic capability to achieve firm performance in Sri Lanka.

7. Limitations and Future Research Avenue

Given the aforementioned contributions, these studies' limitations are noteworthy and merit consideration. First, testing of longitudinal data from industries either for cross-industry comparison or selected enterprises, and archival data to confirm the key construct of this study may provide a richer and better understanding for the contemporary business phenomenon. Similarly, future rigorous studies can be designed and conducted in comparing across multiple countries including world-leadingeconomies will produce superior insights. Secondly, these studies can be extended to generalize its findings to other areas of IT governance. Especially, instead of the conceptualization for the IT governance in this present study, other aspect of IT decision making such as IT architecture, IT orchestration, IT conversion, and strategic IT planning and implementation may have various features. Thirdly, in these studies we limited one respondent to represent the whole organization, while, it requires multiple respondents who are knowledgeable about their functional areas; for example, board level executive, directors, steering committee members, and functional managers. Further, if these studies could have collected data from multiple respondents from top level executives and different functional areas, the findings would have been more valuable.

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