THE IMPACT OF BUSINESS PROCESS AGILITY AND INNOVATIVE CAPABILITY ON FIRM PERFORMANCE: THE MODERATING ROLE OF TURBULENT ENVIRONMENT

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ABSTRACT

Today, the business environment is highly turbulent hence, firms are becoming more agile and innovative for their survival. Despite a few studies on business process agility and innovative capability, there is a limited understanding of how agility and innovative capability impact firm performance in the context of the turbulent environment. Drawing on the dynamic capability theory, this study examines how business process agility and innovative capability under turbulent environment impact on firm performance. Using the survey data of 188 senior IT and business executives from Sri Lankan firms, we find a positive and significant link in the proposed model. This study confirms that though the aggregated turbulent environment failed to show a significant impact, the market turbulent is significant between agility - firm performance and innovative capability – firm performance relationship. Theoretical and practical implications are also discussed.

Keywords: business process agility, innovative capability, turbulence environment, firm performance

1. INTRODUCTION

Today, the business environment has emerged increasingly dynamic and highly competitive(T. Ravichandran, 2017). Organizations are encountering challenges such as hyper-competition, swiftly changing customer demand, time-to-market pressures, quick product obsolescence, and faster technological advancements (Huang, Ouyang, Pan, & Chou, 2012; Paul P. Tallon & Pinsonneault, 2011). The agility has appeared as an interesting research area (Queiroz, Tallon, Sharma, & Coltman, 2017; Raschke, 2010); thus, the scholars have started to examine the effects of agility and innovation on firm performance (Chen et al., 2014). The irregular customer demand, shorter product lifecycles, hyper-competition, and uncertain technology exemplify the dynamic market condition (Huang et al., 2012; Paul P. Tallon & Pinsonneault, 2011), in which firm's agility and innovation are the only way to stay in sustain.

Being strategically agile requires a proactive and continuous innovation of products (through R&D), processes and businesses subsequently being able to effectively deploy

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these in order to grasps opportunities, satisfy new customer needs and generate new value. As a result, modern firms are heavily investing in IT services (e.g. digital platform, web services, data warehousing, customer relationship management, or supply chain management applications) for shaping their business functionalities and enabling agility for competitive moves (Sambamurthy, Bharadwaj, & Grover, 2003). Comparatively, the impact of business process agility and innovative capability on firm performance rarely been studied together with the turbulent environment; which is an important research gap. Prior studies have concerned the turbulent environment as a moderator in relation to firm performance (e.g., Chen et al., 2014; Paul A Pavlou & El Sawy, 2011; Paul Patrick Tallon, 2008). However, There are unclear empirical evidences exist on the moderating effect of turbulent environment (Bodlaj, Coenders, & Zabkar, 2012). Against these backdrop, this study attempts to address the following research questions:

RQ1. How the impact of business process agility and firm innovative capability impact on firm performance?

RQ2. How the turbulent environment (market and technological) moderates these relationship?

Agile firms can adapt swiftly fluctuating environments by exploiting on opportunities for innovation and competitive action, such as introducing new products and services, entering into new markets, and developing strategic alliances (Roberts & Grover, 2012). Agile firms are frequently sensing opportunities for competitive action in the form of value creation, capture, and competitive performance through innovations in products, services, channels, and market segmentation (Sambamurthy et al., 2003). Firms that are in the extreme competition and unpredictable environments have to be agile to adapt their strategies and actions to be successful (T. Ravichandran, 2017; Sambamurthy et al., 2003). Hence, this study examines the impact of firm's agility and innovative capability on firm performance that are struggling to survive and succeed in the turbulent business environments.

THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1. Dynamic Capability Theory

Dynamic capabilities includes hard to imitate firm capabilities to create, deploy, and protect the intangible assets that support long-run business performance (Teece, 2007). Dynamic capability focuses actions taken by the organizations to change their resources in order to adapt to the changing business conditions (Yeow, Soh, & Hansen, 2017). The unstable environment would push firms from emerging markets to explore new opportunities and develop capabilities to compete with other firms (Cheng & Yang, 2017).

The dynamic capabilities theory offers the rational insights where the performance implication of capabilities may be subject to the environmental turbulence (Paul Patrick Tallon, 2008; Teece, Pisano, & Shuen, 1997). A firm with greater dynamic capabilities are capable of rapidly responding changes in turbulent environments, whereas firm with less dynamic capabilities are less able to swiftly respond (Leidner, Lo, & Preston, 2011). Firms can regularly attain technical fitness by revising their capacities for turbulent environments through reconfigured resource bases with the help of dynamic capabilities (Tai, Wang, & Yeh, 2018).

In this study, the turbulent environment contains two types: *market turbulence* - changes in consumer needs, and competitors' new products; and *technological turbulence* - denotes changes in new technologies and technological innovations (Paul A Pavlou & El Sawy, 2010)**.** During the turbulent environment, firms are ready to become more flexible in reconfiguring their resources, processes, and strategies to offer more effective responses (Chen, Wang, Nevo, Benitez, & Kou, 2017). In turbulent environment the technology updates are quicker, faster product/service obsolescence, rivals' moves, and frequently changing customer demand (Chen et al., 2014; N. Wang, Liang, Zhong, Xue, & Xiao, 2012). Hence, firm's innovative capability provides the flexibility of responding rapidly changing markets and customers' demand by exploiting on innovation-driven growth (Yang, 2012).

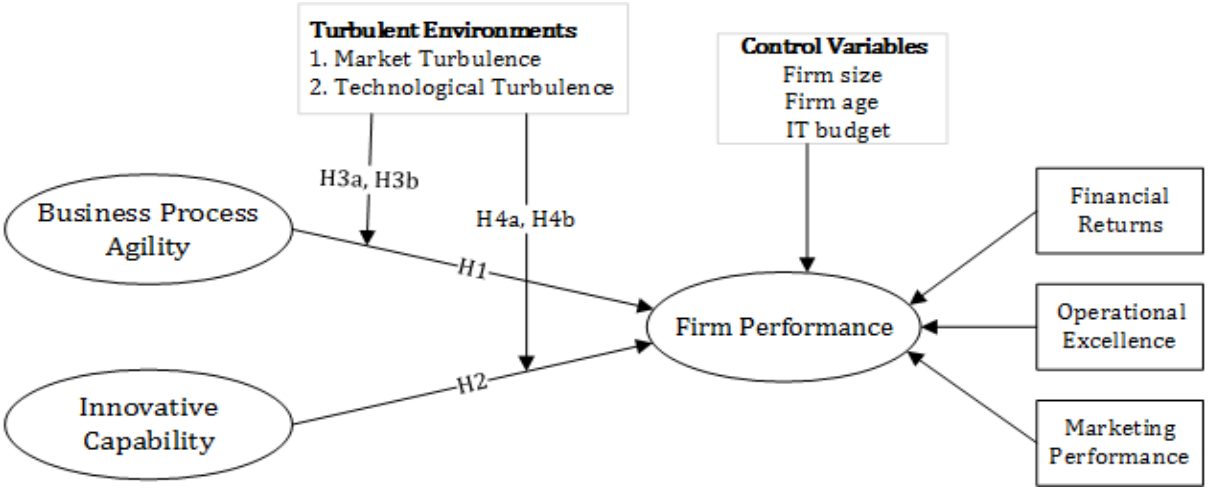

Figure 1: Research Model

2.2. Business Process Agility and Firm Performance

Agility is one of the several concepts suggested to overcome the issue of how firms can flourish in dynamic environments (Roberts & Grover, 2012). Prior studies evidenced that agility is the insightful enabler that affect firm performance (Tan, Tan, Wang, & Sedera,

2017). Modern firms are seriously capitalizing on many IT resources (e.g., digital platform, web services, data warehousing, customer relationship management, supply chain management applications) with the confidence of increasing business agility for competitive actions (Lowry & Wilson, 2016; Sambamurthy et al., 2003; Yang, 2012). For the irregular customer demand, rapid product outmodedness, hyper-competition, and changing technological development in turbulent environment, the agility is the best solution for firm's survival (Huang et al., 2012; Paul P. Tallon & Pinsonneault, 2011). As a result, the firm agility is the ability to cope with rapidly changing business conditions and succeed in a competitive environment by exploiting emerging business opportunities (Lu & Ramamurthy, 2011; Mikalef & Pateli, 2017).

H1: The firms in turbulent environment their business process agility will positively influence on firm performance.

2.3. 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 successfully deploy to exploit opportunities, fulfill customer demands and create new value (Battistella, De Toni, De Zan, & Pessot, 2017). 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 (Paul P. Tallon & Pinsonneault, 2011). Even though the 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 (T. Ravichandran, 2017). Hence the hypothesis is stated as follows.

H2: The firms in turbulent environment their innovative capability will positively influence on firm performance.

2.4. The Moderating Effect of Turbulent Environment Between Business Process Agility and Firm Performance

When the turbulent environmental is high, relatively the strategic options will become valuable (Sambamurthy et al., 2003), where as in less turbulent environments less likely to make opportunities for reconfiguring existing capabilities (Paul A Pavlou & El Sawy, 2011)**.** The turbulent environments increase the possibility that dynamic capabilities would

reconfigure the new product development functional competencies **(Paul A. Pavlou & El Sawy, 2006)**. The turbulence environment improves the knowledge intensity; thus the turbulent environments requires the effective use business processes and rapid communications. In this view, the greater the turbulence environment would produce greater the need and more distinct competencies (IT functionalities to support IT-related activities) to support knowledge flows (Paul A. Pavlou & El Sawy, 2006). Prior studies evidence that the environmental volatility positively moderates the link between firm agility and its performance (Paul P. Tallon & Pinsonneault, 2011). Paul Patrick Tallon (2008)) study found the link between managerial IT capabilities and agility where environmental dynamism is positively moderate 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 & Tang, 2010). Hence, this study posits that the impact of agility on firm performance is positively moderated by turbulent environment. Hence the hypothesis is stated as follows.

H3a and H3b: The higher the market and technological turbulent environment the stronger the relationship between firm business process agility and firm performance.

Highly innovative firms are perhaps 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). When customer need changes, firm has to react timely by changing their products, services and processes. Thus, firms with the greater innovative capability can achieve better than those of with lower capability (F. Wang, Zhao, Chi, & Li, 2017). The higher growth rate of market offers firm a range of opportunities to gain benefits from innovation, thus increases the effect of innovation on competitive performance (Xue, Ray, & Gu, 2011)**.** Firms facing turbulent environment not only require to 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). The innovative firms are more likely to involve in learning, investigating, and able to cope with high uncertainty (T. Ravichandran, 2017). **D**uring the higher technological turbulence, the relationship between resource orientation and innovation was reinforced (Paladino, 2008). Hence the hypothesis is formulated as follows.

H4a and H4b: The higher the market and technological turbulent environment the stronger the relationship between firm innovative capability and firm performance.

RESEARCH DESIGN AND METHODOLOGY

2.1. Research Design and Sampling

For the data collection key informant method was used as it common method in the previous IS research (Chi, Zhao, George, Li, & Zhai, 2017; Ilmudeen & Yukun, 2018; Nevo & Wade, 2011; S. P.-J. Wu, Straub, & Liang, 2015). The data collection started from mid of July to mid of September 2017. 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 research purpose is an explanatory study in which studying a situation or a problem to explain or to establish causal relationships between variables (Saunders et al., 2009). The collected data analyzed quantitatively with descriptive and inferential statistics.

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 research 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). The convenient and snowball sampling technique was 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 describe 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 5.1 shows the data collection profile.

2.2. Measurement Development

All the constructs for this study were adopted from the prior studies. For agility, the items adopted from the prior studies (Chen et al., 2014; Queiroz et al., 2017; Paul P. Tallon & Pinsonneault, 2011). The innovation capability items were adopted in prior studies (Lin, 2007; T. Ravichandran, 2017; Yang, 2012). The items for marketing turbulence and technological turbulence were adopted from Chung, Yang, and Huang (2015)). The firm performance contains three first-order formative constructs which fulfill the criteria recommended by Diamantopoulos (2011)). Firm performance's first-order formative constructs are financial return (Prasad, Heales, & Green, 2010; F. Wu, Yeniyurt,

Kim, & Cavusgil, 2006; S. P.-J. Wu et al., 2015), operational excellence, (Thiagarajan Ravichandran, Lertwongsatien, & LERTWONGSATIEN, 2005; S. P.-J. Wu et al., 2015), and marketing performance (F. Wu et al., 2006) that better reflect firm's total performance in relation to its competition (S. P.-J. Wu et al., 2015). All the items in the construct were measured using a five-point Likert-type scale ranging from 1 = "strongly disagree" to 5 = "strongly agree". This study includes firm size, firm age, and IT budget as control variables in the model.

Table 01: 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 Sample

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

RESULTS AND FINDINGS

2.1. Data Analysis

For the data analysis, PLS SEM (Smart PLS 3.2.8) was used (Ilmudeen, Bao, & Alharbi, 2019; Ilmudeen & Yukun, 2018). The data analysis includes two steps. First step assesses the measurement model for the proper psychometric properties. Second step assesses the structural model. The reliability, convergent validity, and discriminant validity were measured to check for the quality of measurement item (Hair Jr, Hult, Ringle, & Sarstedt, 2016), and then the hypotheses were tested using hierarchical regression analysis and path analysis. For the composite reliability (CR) the value of Cronbach's Alpha (CA) is above 0.7, and AVE also higher than 0.5 (Fornell & Larcker, 1981). In addition, the value of square roots of AVE greater than all other cross-correlations, confirm the sufficient discriminant validity. (see Table 3). The loadings of the item with its primary construct should be higher than 0.7 and those of the item to the other constructs should be lower than 0.6 (Gefen & Straub, 2005). Thus demonstrating that the variance shared between the primary construct and each item exceeded the error variance (Chin, Marcolin, & Newsted, 2003) (see figure 2).

For the hypothesis testing, the hierarchical regression analysis was done as it shown in prior studies (Chen et al., 2014; F. Wang et al., 2017). In which the author systematically introduced predictors to determine the explained variance on the dependent variables. Hence, several models (M1 – M9) were tested in PLS, beginning with control variables to the primary and moderating effects (see Table 4).

Table 3: Descriptive statistics, Correlations, and Reliability

	Mean	Std.Dv	BPA	IC	TE	FP	F_size	Fage	IT_budget
BPA	3.608	0.963	**0.826**						
IC	3.532	1.045	0.805	**0.852**					
TE	3.602	1.055	0.795	0.79	**0.847**				
FP	3.489	1.052	0.799	0.814	0.668				
F_size			0.053	0.046	0.012	0.184	1		
Fage			-0.194	-0.218	-0.221	-0.217	0.338	1	
IT_budget			0.209	0.292	0.231	0.235	0.132	-0.12	1
CA			0.933	0.946	0.944				
Rho_A			0.937	0.947	0.945				
CR			0.945	0.955	0.953				
AVE			0.683	0.727	0.717				

Note: CA – Cronbach's Alpha, **CR –** Composite Reliability, **AVE -** Average Variance Extracted, Bolded diagonal values are the square root of AVE; off-diagonal

elements are correlations. For discriminant validity, diagonal elements should be higher than off-diagonal elements.

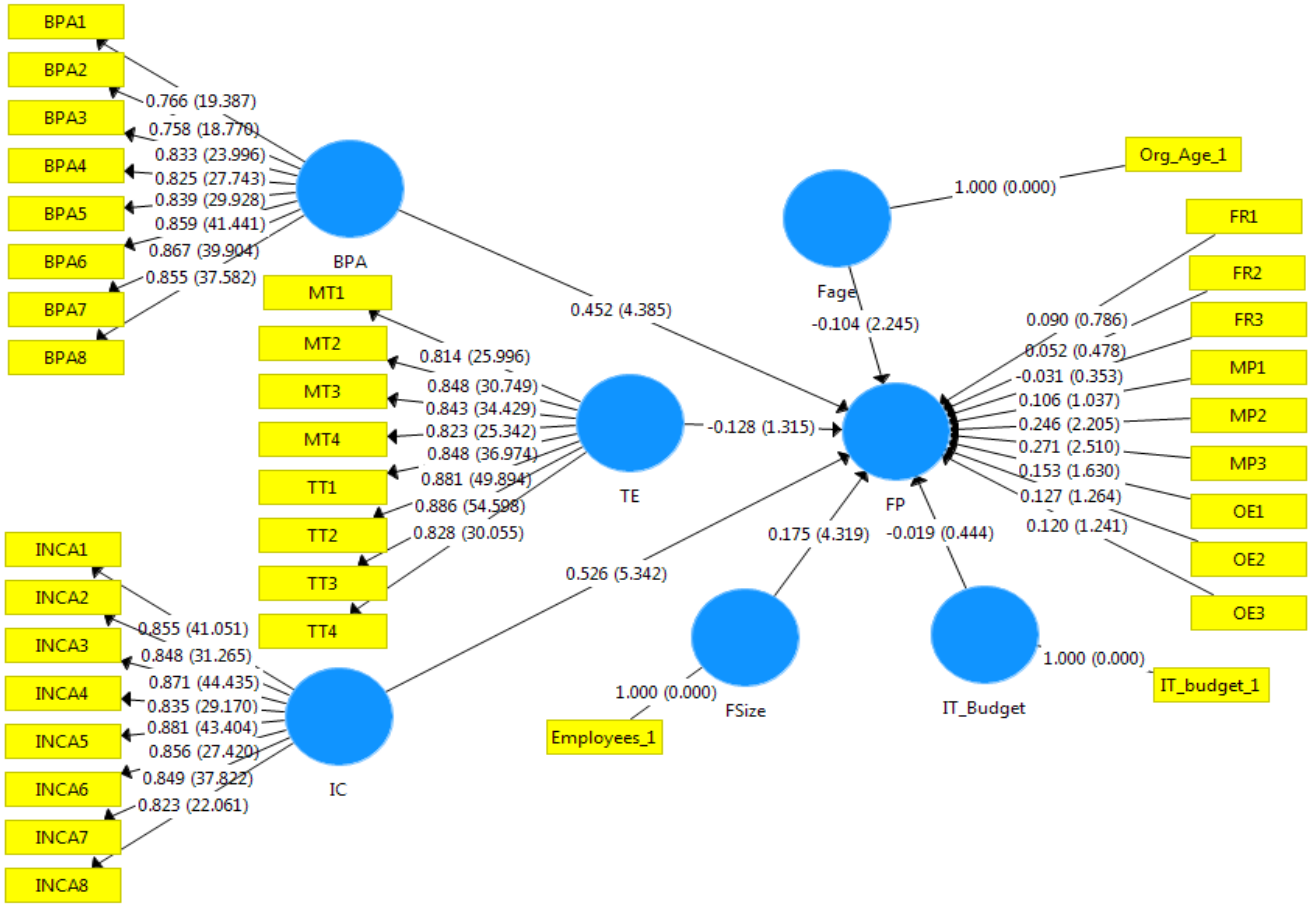

Figure 2: Base Model

Note: For inner model: Path coefficient and T-Values; outer model: Outer weights/loadings and T-Values

Table 4: Hierarchical Regression Analysis Results

	M1: BPA → FP	**M2 :** BPA * TE	**M3 :** BPA * MT	**M4 :** BPA * TT	**M5**: IC → FP	**M6 :** IC * TE	**M7 :** IC * MT	**M8 :** IC * TT	**M9 :** BPA, IC → FP
Control variables									
AGE	-0.124 *	-0.124 *	-0.126 *	-0.121 *	-0.117 *	-0.114 *	-0.116 *	-0.112 *	-0.101 *
SIZE	0.174 ***	0.173 ***	0.173 ***	0.175 ***	0.192 ***	0.191***	0.193 ***	0.192 ***	0.396 ***
IT-BUDGET	0.040	0.028	0.031	0.029	-0.039	-0.140	-0.042	-0.036	-0.021
Independent									

variables									
BPA	0.762 ***	0.719 ***	0.780 ***	0.687 ***					0.396 ***
IC					0.793 ***	0.748 ***	0.789 ***	0.723 ***	0.471 ***
TE		0.084				0.080			
MT			0.008				0.024		
TT				0.130				0.117	
Interaction									
BPA * TE		0.053† (1.716)							
BPA * MT			0.065 * (1.973)						
BPA * TT				0.046 (1.355)					
IC * TE						0.056 † (1.840)			
IC * MT							0.061* (1.994)		
IC * TT								0.047 (1.579)	
R^2	0.681	0.687	0.686	0.689	0.699	0.704	0.704	0.705	0.749

Note: BPA – Business process agility, IC – innovative capability, TE – Turbulent environment, MT- Market turbulence, TT – Technological turbulence, FP – Firm performance, Values in () are T-Values

DISCUSSION AND IMPLICATIONS

2.1. Discussion

In fast-paced, globally competitive business setting, customer needs, technological opportunities, and competitor actions are frequently changing. There is an increasing interest to understand how agility and innovative capability can be used to stay ahead of hyper-competition (Chen et al., 2014; Mikalef & Pateli, 2017; T. Ravichandran, 2017). Further, prior IS research wants to examine agility and innovation in the context of firm performance (Nevo & Wade, 2011; Tan et al., 2017; F. Wang et al., 2017). Hence, this study attempts to empirically assess how business process agility and innovative capability impact on firm performance with the varying effect of market and technological turbulent environments.

As this study confirmed that agility leads to better firm performance during the turbulent environments and it support with the prior study's' finding (e.g., Chen et al., 2014; Mikalef & Pateli, 2017). This study also proves that the innovation capability is positive when market turbulence is high and consistent with previous study finding (G. Wang, Dou, Zhu, & Zhou, 2015). In addition, There are evidences in prior study that the impact of product innovation on business performance is higher in more dynamic environments than in less dynamic environments **(Prajogo, 2016).**

This study has sufficient explained variance (R^2) for the proposed research model. The hypotheses are such as H1 and H2 are statistically significant with sufficient path cofficient and T-Value. Thue, the business process agility and firm innovative capability of a firm who is in the turbulent environment will positively influence on firm performance. Unlike the prior studies, the aggregated turbulent environment does not show the significant moderating effect at 5% significant level. But it shows the significant moderating effect at 10% significant level (Table 4: M2 and M6). Further, when the turbulent environment is tested market and technological turbulence as separately, the market turbulent has significant moderating effect at 5% significant level (M3 and M7). Hence, when the market turbulence is high the stronger between agility – firm performance and innovative capability - firm performance relationship.

The reason for the insignificant turbulent environment in Sri Lankan context is the 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, growing nature of technology and business enterprises, lack of innovations, underdeveloped infrastructure and business sector, political instability and unstable economic growth. Besides, Sri Lankan government and state authorities have taken number of initiatives to develop the business sector, to attract foreign investments, government supports for new business start-up and massive infrastructural development. As a result, the market conditions are becoming more developed in nature and market turbulence has considering impact on the business.

2.2. Theoretical Implications

This study proposes notable theoretical implications as follows. First, the concept of agility and innovative capability are abstracted in the turbulent environment condition that has paid limited attention in the past studies. But this study comprehensively takes agility, innovative capability under turbulent environment to empirically test its impact on firm performance. This will add to the growing body of IS literature as the findings are from an emerging economy's context. Second, the turbulent environment has noteworthy intuitions and its moderating effect rarely been tested in the past IS research. This study combines marketing and technological turbulence as a single construct to demonstrate

its multifaceted and nuanced moderating impact. Therefore, the presence of turbulent environment in this study is notable as it conveys many theoretical contributions for IS research. Third, it has been noted that most of the past studies based on Western countries and data is from their firms (i.e., America, Europe, and Australia). It is obvious that there might be dissimilarities from the findings in different country's context owing to different aspect such as culture, region, and economic condition…etc. This may bring some noteworthy theoretical contribution to other firms and countries not only in the region but also for other emerging economies around the world.

2.3. Practical Implications

This study has the following practical implications for industry practitioners. First, business managers and corporate leaders must consider the external pressure (i.e., environmental turbulence) and assess their impact with regard to other endogenous factors such as agility and innovativeness. By doing so they can easily take measures to formulate their strategies to reshape their agility and innovative capability to the extend they face market and environmental turbulence. Second, the managers who are seeking for realizing greater firm performance, can exploit from firm's agility and innovative capability during the turbulent market conditions. In this regard they can involve activities such as collect data from customers and market, exchange information and collaborate with stake holders, use analytics for better decision making, take advantage on the valuable data and information they possess. Third, there are several factors which determine the performance outcomes of the firm. Among these the firm agility and innovative capabilities are identified as the key enablers for the superior firm performance. Hence manages should formulate strategies to shape agility and increase the innovation through new joint ventures, new products development, new channels, and markets.

CONCLUSION AND LIMITATIONS

2.1. Future Research Avenue and Limitations

There are limitations which can be considered as merit for the future studies. First, a longitudinal study could also open-up potential outcomes that cannot easily be measured using empirical or cross-sectional study. Hence, future studies can be designed for secondary and longitudinal data that can bring more insights. Second, the constructs in this study, particularly business process agility, and innovative capability are not the only construct exist in the literature. Thus, it might bring different spontaneous findings and contribution if the concept incorporates other conceptualizations such as IT-enabled

operational agility, IT agility, business process reengineering, IT ambidexterity …. etc. Third, this study data is from multi-sectoral industries. The author suggests for the future studies to target a single industry or cross-sectoral industry where the pattern of agility and innovation could be more homogeneous in order to understand sharper insights and inferences.

2.2. Conclusion

With the ever-growing turbulent business setting, there is a great interest to examine how agility and innovation capability support to stay ahead of the competition. Though, the effect of business process agility and innovative capability towards firm performance is examined, there is a limited documentation in the context of turbulent environment. Hence, this study examines how business process agility and innovative capability under turbulent environment impact on firm performance. Using the survey data from senior IT and business executives in 188 Sri Lankan firms, we discover a positive and significant link in the proposed model. This study further confirms that though the aggregate turbulent environment is not significant the market turbulent is significant and positively moderate. Hence, market turbulent is significant between agility – firm performance and innovative capability – firm performance relationship.

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