ORGANISATIONAL LEARNING, ORGANISATIONAL AMBIDEXTERITY, ENVIRONMENTAL TURBULENCE, AND NPD PERFORMANCE OF MALAYSIAN'S MANUFACTURING SECTOR

MOHAMAD FAIZAL BIN AHMAD ZAIDI

DOCTOR OF PHILOSOPHY
UNIVERSITI UTARA MALAYSIA
August 2014

ORGANISATIONAL LEARNING, ORGANISATIONAL AMBIDEXTERITY, ENVIRONMENTAL TURBULENCE, AND NPD PERFORMANCE OF MALAYSIAN'S MANUFACTURING SECTOR

By

MOHAMAD FAIZAL BIN AHMAD ZAIDI

Thesis Submitted to
Othman Yeop Abdullah Graduate School of Business,
Universiti Utara Malaysia
in Fulfillment of the Requirement for the Degree of Doctor of Philosophy

PERMISSION TO USE

In presenting this thesis in fulfillment of the requirements for a Post Graduate degree from the Universiti Utara Malaysia (UUM), I agree that the Library of this university may make it freely available for inspection. I further agree that permission for copying this thesis in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor(s), or in their absence, by the Dean of Othman Yeop Abdullah Graduate School of Business where I did my thesis. It is understood that any copying or publication or use of this thesis or parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the UUM in any scholarly use which may be made of any material in my thesis.

Request for permission to copy or to make other use of materials in this thesis in whole or in part should be addressed to:

Dean of Othman Yeop Abdullah Graduate School of Business
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman

ABSTRACT

Despite numerous studies proving that environmental turbulence was moderating the new product development (NPD) performance of manufacturing firms, it is however, still less stressed upon in Malaysia. Motivated by the current NPD issues on organisational capability from the dynamic capability (DCs) perspective, this study aimed to empirically determine the relationships between organisational capability and NPD performance, and sequentially examine the moderating effects of environmental turbulence in those relationships. A survey was randomly conducted among 123 product/production managers from various manufacturing industries in Malaysia. The data was analysed with the SPSS v.19 statistical technique. Prior to the analysis, the data was cleaned, inspected for outliers, normality, factor analysis, and reliability test to meet the assumptions for the parametric test. The results of correlation and hierarchical multiple regression analyses found 22 (out of 48) hypotheses were supported. In detail, the exploitation capability, exploration capability, and contextual ambidexterity were found to be significantly correlated to NPD performance. It was also found that market turbulence was giving a pure moderation to all types of organisational capability (exploitation capability, exploration capability, structural ambidexterity, and contextual ambidexterity) on NPD financial performance. Meanwhile, the moderating effects of technological turbulence, and competitive intensity were varied across different relationships. All-in-all, the findings indicated that the concept of DCs was useful for building a firm's ability to deploy organisational capabilities under different types of environmental turbulence to achieve better NPD performance. It can be achieved by creating balance in the firm's NPD portfolio and is useful in the NPD strategy for decision-making process. Besides these contributions, the limitations of the study, and future research agenda were also discussed.

Keywords: dynamic capability, environmental turbulence, Malaysian manufacturing sector, NPD performance, organisational capability

ABSTRAK

Meskipun pelbagai kajian telah membuktikan ketidaktentuan persekitaran merupakan penyederhana kepada prestasi pembangunan produk baru (NPD) bagi firma pengilangan, namun ia didapati kurang diberikan penekanan di Malaysia. Motivasi didorong oleh isu-isu semasa NPD ke atas keupayaan organisasi dari sudut pandangan keupayaan dinamik (DCs). Kajian ini bertujuan untuk menentukan hubungan secara empirikal di antara keupayaan organisasi dan prestasi NPD, seterusnya mengkaji kesan penyederhanaan oleh ketidaktentuan persekitaran ke atas hubungan tersebut. Satu tinjauan rawak dilakukan ke atas 123 pengurus keluaran/pengeluaran daripada pelbagai industri pengilangan di Malaysia. Data tersebut dianalisis dengan menggunakan teknik statistikal SPSS v.19. Sebelum analisis dilakukan, data dibersihkan, diperiksa untuk *outliers*, normaliti, analisis faktor, dan ujian kebolehpercayaan untuk memenuhi hipotesis bagi ujian parametrik. Hasil analisis korelasi dan regresi pelbagai peringkat mendapati bahawa 22 (daripada 48) hipotesis telah disokong. Secara khususnya, keupayaan eksploitasi, keupayaan eksplorasi, dan kedwicekatan berkontek didapati mempunyai hubungkait secara signifikan dengan prestasi NPD. Dapatan kajian juga menunjukkan bahawa ketidaktentuan pasaran memberikan penyederhanaan penuh ke atas semua jenis keupayaan organisasi (keupayaan eksploitasi, keupayaan eksplorasi, kedwicekatan berstruktur, dan kedwicekatan berkontek) dan prestasi kewangan NPD. Sementara itu, kesan penyederhanaan oleh ketidaktentuan teknologi dan ketegasan persaingan adalah berbeza mengikut jenis hubungan. Secara keseluruhannya, dapatan kajian menunjukkan bahawa konsep DCs adalah berguna untuk membina keupayaan firma dalam mengatur kedudukan keupayaan organisasi di bawah jenis ketidaktentuan persekitaran yang berbeza untuk mencapai prestasi NPD yang terbaik. Ia boleh dicapai dengan mewujudkan keseimbangan dalam portfolio NPD dan seterusnya berguna kepada strategi NPD untuk proses membuat keputusan. Selain daripada sumbangan dan kekangan kajian, agenda kajian pada masa hadapan juga dibincangkan.

Kata kunci: keupayaan dinamik, ketidaktentuan persekitaran, sektor pengilangan Malaysia, prestasi NPD, keupayaan organisasi

ACKNOWLEDGEMENT

Alhamdulillah, first and foremost, I would like to give my deepest gratitude to Associate Professor Dr. Siti Norezam bt. Othman who has supervised the progress of my study for over four years. I would like to extend my gratitude to the Associate Professor Dr. Hartini bt. Ahmad, and Dr. Mohamed Najib Salleh for their valuable comments on my proposal defense. I would also like to thank the OYA School of Business for providing all the information and assistance that have eased my study. Next, to the experts who have shared their opinions to improve the validity and reliability of the survey instruments, I would like to thank them very much for their valuable comments on the questionnaire. Not to forget, I would also like to sincerely thank all my colleagues who have shared their experiences on the related issues. In addition, I would also like to thank all those who have assisted me in completing my thesis. Most importantly, to my family especially my parents Ahmad Zaidi and Biti, my wife Suhaini, and children Faris and Firas, thank you very much for giving me the source of inspiration and motivation to face all of the unexpected challenges during the study period. And lastly, to the Greatest and Almighty Allah and our Prophet Muhammad, without You in my mind Who have guided me during the good and bad time, I would have totally failed in completing of this thesis. As such, I am highly grateful to You through my deepest heart.

TABLE OF CONTENTS

LIST OF TABLES

Table		**Page**

Table		Page

LIST OF FIGURES

LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
DCs	Dynamic Capabilities
DV	Dependent Variable
ETP	Economic Transformation Programme
FMM	Federation of Malaysian Manufacturing
GDP	Gross Domestic Product
GNI	Gross National Income
ICT	Information and Communication Technology
IV	Independent Variable
KMO	Kaiser-Meyer-Olkin
MIDA	Malaysian Investment Development Authority
MITI	Ministry of International Trade and Industry
MOSTI	Ministry of Science, Technology and Innovation
MSA	Measure of Sampling Adequacy
NIC	National Innovation Council
NKEAs	National Key Economics Areas
NPD	New Product Development
OYA	Othman Yeop Abdullah
PCA	Principal Component Analysis
R&D	Research and Development
RBV	Resource-based View
RMK-9	The Ninth Malaysia Plan
RMK-10	The Tenth Malaysia Plan
ROI	Returns on Investment
SMEs	Small and Medium Enterprises
UUM	Universiti Utara Malaysia
VIF	Variance Inflation Factor

CHAPTER ONE:
INTRODUCTION

1.0 Introduction

This study was initiated to investigate the deployment of organisational capabilities in achieving higher levels of new product development (NPD) performance in the context of Malaysian manufacturing sector. In doing so, the researcher was interested in determining and examining the relationships of four types of organisational capability, namely exploitation and exploration capabilities (organisational learning), and structural and contextual ambidexterity (organisational ambidexterity) to NPD performance under moderating effects of environmental turbulence. The discussion begins with research background and current issues surrounding the relationships between organisational capabilities, environmental turbulence, and NPD performance, which is then proceeded with the establishment of problem statement, research questions and objectives, the definitions of key terms, as well as the significance, justification, scope, limitations, and organisation of thesis.

1.1 Background of the Study

Innovation is a critical driver for economic growth (Torun & Cicekci, 2007; Segerstrom, 1991) and importance for the well-being of developing nations (Chandra & Neelankavil, 2008). It is commonly characterises world-class manufacturing firms (Jaruzelski & Mainardi, 2011). For instance, service and innovation activities of manufacturing firms have contributed up to 70% of the gross domestic product (GDP) for developed countries (Mohamed, 2011), which have turned them into world economic powers. As for Malaysia, even though manufacturing is only ranked second after service sector in terms of investment values, it remains one of the main contributors to the national GDP (MITI, September 16, 2009). For instance, oil and gas industry contributed approximately 20% to the Malaysia gross national income (GNI), while electronics and electrical industry contributed 41% to the nation total exports, provided half a million jobs, and contributed 6% of GNI in 2009 (PEMANDU, 2011). As evidenced through recent surveys, Malaysian manufacturing sector that was ranked 13th in the Global Manufacturing Competitiveness Index 2013 (Deloitte, 2012), and ranked 32nd in the Global Innovation Index 2013 (Dutta & Lanvin, 2013) has implied the importance of Malaysian manufacturing sector being competitive and innovative as the engine for economic growth (Nicholas, 2012) that enable them to outperform others (Robbins & O'Gorman, 2014).

With majority of innovators are located in the manufacturing sector (MASTIC, 2011), Malaysia has targeted the manufacturing sector to produce high value-added innovative products, and grouped them into (1) the non-resource based industries, such as electrical and electronic, medical devices, textiles and apparel, machinery and equipment, metals industry, and transport equipment, and (2) the resource based industries, such as petrochemicals, pharmaceuticals, wood-based products, rubber and rubber products, oil palm-based industry, and food processing (MITI, September 16, 2009). By realising the potential of innovation towards economic growth, Malaysia has also transformed itself from the agriculture-based economy (1950-1970s), to the resource-led economy (1980-1990s), and recently to the innovation-led economy that places emphasis on knowledge and know-how as the main drivers for sustainable economic growth in the efforts to achieve Vision 2020 (MOSTI, 2011). The transformation also takes place as a response over previous economic crises to accelerate economic growth (Aun, 2004) and increase innovation towards escaping middle income trap (Zeufack, Yoong, & Nadaraja, 2011).

Since the contributions of innovation are critical for economic growth, the innovation culture must be developed within Malaysian manufacturing sector. To encourage this culture, the Ministry of Science, Technology, and Innovation (MOSTI) have provided technology (MOSTI, August 8, 2011) and innovation (MOSTI, August 17, 2011) funds for pre-commercialisation of innovative products, focusing mostly on the high-tech areas in the manufacturing sector such as electrics and electronics, and advanced manufacturing (MIDA, 2011). Besides MOSTI, the Ministry of International Trade and Industry (MITI), the Ministry of Finance, the Ministry of Higher Education, and the Small and Medium Enterprises (SME) Corporation Malaysia are also the key institutions for the execution of innovation initiatives (which is to encourage innovation culture by providing funds and/or technical assistance). Meanwhile, as globalisation and liberalisation are taking place under the Asian Free Trade Agreement (AFTA), firms are also encouraged to upgrade their manufacturing capacities and capabilities to achieve sustainability in business and competitiveness environment, where the fund to encourage them to modernise and automate the manufacturing processes is provided under the Ninth Malaysia Plan (RMK-9) (MITI, 2011). These incentives and encouragements were extended under the Tenth Malaysia Plan (RMK-10) to support economic growth leads by innovation. Under this plan, innovation was encouraged by providing more funds and supporting institutions (e.g., NIC, MOSTI, MITI) (RMK-10, 2010).

Nevertheless, based on a series of reports from the Global Innovation Index, Malaysia’s innovation rank has consistently dropped from 25th (Dutta, 2009), to 28th (Dutta, 2010), to 31st (Dutta, 2011), and recently to 32nd in the world (Dutta, 2012; Dutta & Lanvin, 2013). In a similar vein, the Global Manufacturing Competitiveness Index has forecasted the Malaysia’s manufacturing competitiveness rank to drop from 13th to 14th in the next five years (Deloitte, 2012). Besides these indexes, Malaysia is left behind by South Korea, Singapore, and Taiwan in terms of the numbers of patents registered, research and development (R&D) expenditure in percentage over GDP, number of researchers in R&D, information and communication technology (ICT) expenditure and infrastructure, and high-tech exports (Tuah, Nadaraja, & Jaafar, 2009). This situation may happen due to the fact that more than 90% of Malaysian firms are consisted of SMEs that lack of skills, knowledge, training, and funds for innovative NPD (Yahya, Othman, Othman, Rahman, & Moen, 2011). This illustrates the challenge of manufacturing sector in transforming Malaysia into an innovatively competitive nation.

In addition to the above challenge, although NPD is an important source of competitiveness (Salomo, Talke, & Strecker, 2008) and critical for the survival of manufacturing firms, the challenge faced by Malaysian manufacturing sector is increasing with a risky venture of NPD (Droge, Calantone, & Harmancioglu, 2008). As such, while an innovative new product is the means for which a firm creates value for customers (Patterson, 1998), creating a new product is not a straightforward process (Katila & Ahuja, 2002). This happens since NPD involved a series of stages influenced by the industry competitiveness and firm characteristics that at the end affect innovation productivity (Harmancioglu, McNally, Calantone, & Durmusoglu, 2007). To make it more difficult, although repetition in innovation is important to achieve market leadership, the innovation efforts themselves do not automatically and necessarily guarantee business success (Teece, 2010; Chakravarthy, 1997). All of these have elevated the challenges faced by the Malaysian manufacturing firms.

Meanwhile, it was found that the potential sources of competitive advantage are coming from the exploitation and exploration streams of product innovation activities (Ireland & Webb, 2007) for the creations of incremental and radical new products (Hohenegger, Bufardi, & Xirouchakis, 2007). Since exploitation capability enhances incremental innovation, while exploration capability enhances radical innovation (Andriopoulos & Lewis, 2009), from this point onwards this study refers product innovation activities equivalently to exploitation and exploration capabilities.

The terms exploitation and exploration capabilities also consistent with the concept of organisational capability from dynamic capabilities (DCs) perspective. DCs concept is critical for dealing with the challenges addressed above as a previous study has found evidence that organisational learning (exploitation and exploration capabilities) and proprietary technology can increase the performance of Malaysian manufacturing firms and lead to better competitive advantage with a resource-based strategy (e.g., DCs) (Ramayah, Sulaiman, Jantan, & Ching, 2004). Accordingly, a study with DCs concept that taking place in Malaysian SMEs has suggested technological and structural capabilities did influence business performance (Zulkiffli, 2009). These studies were suggesting the relevant of DCs concept for investigating the problems addressed in this study.

1.2 Current Issues in New Product Development

NPD is a most important single factor that not just drives the success and failure of a firm (Cooper, 2005; Griffin, 1997) but also maintains its level of competitiveness (Zaaimuddin, Gan, & Eze, 2009). However, since "NPD is a high-risk enterprise behaviour" (Cao, Zhao, & Nagahira, 2011, p. 102) it cannot necessarily guarantee success. Based on the challenges addressed earlier, the NPD interrelated issues surrounding the topics of organisational capability, environmental turbulence and DCs concept were identified, which are discussed as follows:

Firstly, exploitation capability that is related to the refinement and production, and exploration capability that is related to the flexibility and innovation capabilities, are the two types of organisational learning (Rodan, 2005; March, 1991). In relation to NPD, these organisational capabilities are two categories of NPD (Greve, 2007), where exploitation in NPD (e.g., market-driven) is used for upgrading existing products, and exploration in NPD (e.g., technology-driven) is used for developing new product concepts (Mohammadjafari, Dawal, Ahmed, & Zayandehroodi, 2011). Since focusing too much on exploitation of existing product can cause a success trap, and focusing too much on exploration of new product opportunities can cause a failure trap (Gupta, Smith, & Shalley, 2006; Levinthal & March, 1993), previous study had suggested these organisational capabilities should work well if deployed in balance (Kim & Atuahene-Gima, 2010). However, the appropriate balance is difficult to reach as conflicts exist at various levels of capabilities from the individual to organisation level, and up to the entire social system (Cohen, McClure, & Angela, 2007; March, 1991). Meanwhile, even if a clear gap exists in the way to best manage the incongruence between them (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011), only a few empirical studies were done to prove their interaction effects (He & Wong, 2004), which has become a first issue of this study.

Secondly, there are already many claims about organisational ambidexterity as the answer to the incongruence between exploitation and exploration of new products (Gibson & Birkinshaw, 2004), which can be deployed to create a balance between them (Andriopoulos & Lewis, 2009). Hence, in relation to the first issue, the concept of organisational ambidexterity that is designed to deal with the incongruence between exploitation and exploration of new products (Raisch, Birkinshaw, Probst, & Tushman, 2009) has gained popularity, but the number of studies that have empirically and explicitly measured organisational ambidexterity is still considered to be limited (Andriopoulos & Lewis, 2009). For instance, the interaction term between exploitation and exploration of new products cannot be used to measure two specific types of organisational ambidexterity, namely the structural and contextual ambidexterity. This is because while structural ambidexterity refers to the creation of dual structures to manage trade-off between conflicting demands (exploitation versus exploration of new products), contextual ambidexterity refers to the behavioural ability where individuals make their own judgment on how to divide time between alignment (exploitation) and adaptability (exploration) activities (Gibson & Birkinshaw, 2004). Thus, since organisational learning (exploitation and exploration capabilities), and organisational (structural and contextual) ambidexterity are different concepts of organisational capabilities, they should be empirically examined with different measures, which has become a second issue of this study.

Thirdly, even though organisational ambidexterity enables the firm to deploy simultaneously the exploitation and exploration of new products, pursuing them to the higher limits can also create incongruence that will be difficult to manage (He & Wong, 2004). Thus, it would be interesting to observe how well organisational ambidexterity fairs with organisational learning in their respective relationships with NPD performance. Hence, as for a third issue of this study, it would be important to know how far the usefulness of structural and contextual ambidexterity when compared to exploitation and exploration capabilities for NPD projects.

Fourthly, previous studies had shown changes in environment with a combination of intense competition, and use of advanced and automated technology with shorter product lifecycle have forced firms to rethink the way they develop new products. This is because even though quality, cost, and differentiation strategies had been the focus of past NPD studies, speed and flexibility are becoming pertinent in today's competition where exploitation capability increases NPD speed and exploration capability increases NPD flexibility (Zhou & Wu, 2010; Takeuchi & Nonaka, 1986). Since firm capabilities (e.g., exploitation and exploration) are becoming central issue in NPD for achieving competitive success under increasing rates of environmental change (Gonzales & Palacios, 2002), numerous scholars have called for researchers to consider the influence of environmental turbulence in NPD projects (Atuahene-Gima & Li, 2004). In addition, as firm's capabilities are positively related to performance but with different strengths (Zhou & Wu, 2010; Kusunoki, Nonaka, & Nagata, 1998), the literature had suggested the nature of a dynamic market should be examined in the relationships between capability and performance. This happens due to the effects of different capabilities to firm's performance may vary according to dynamism of the market, such as where the effects of capabilities in complementary may be different from the effects of individual capabilities (Krasnikov & Jayachandran, 2008). Unfortunately, there were only few studies that had investigated the effect of environmental turbulence on NPD performance (Calantone, Garcia, & Droge, 2003), which has become a fourth issue of this study.

Fifthly, numerous scholars had suggested the use of DCs (Pavlou & Sawy, 2011) as contemporary theory when investigating the effects of environmental turbulence on NPD performance. This is because DCs enable a firm to respond to environmental change and develop new respective products and processes (Pavlou & Sawy, 2011; Teece & Pisano, 1994), which are highly relevant for this study as the previous theories were more on assuming a stable state condition. For instance, as there was a lack of attention on change factors, previous theories have become less relevant nowadays since successful firms preferred a more radical strategy under turbulence environment (Mason, 2007; Takeuchi & Nonaka, 1986). As a result, previous study had suggested a possible solution to these issues is to rethink and develop a new approach that capable of addressing new problems and generate new solutions in dealing with discontinuous innovation (Mason, 2007; Wind & Mahajan, 1997). This fifth issue of the study should be addressed with DCs concept that is a focal point for the creation of firm's product innovation (Liao, Kickul, & Ma, 2009). As a result of these interrelated issues, the problem statement for this study is addressed next.

1.3 Problem Statement

It was emphasised that NPD is important to Malaysia for improving the levels of innovativeness and competitiveness of manufacturing sector, achieving economic growth, and realising Vision 2020. However, as NPD performance is affected through innovation (exploitation and exploration) activities and NPD planning under uncertainty of market and technological turbulences (Cao, Zhao, & Nagahira, 2011), it was found that NPD is a complex and challenging efforts with high rate of failures (Yahaya & Abu-Bakar, 2007). As there is no single strategy that fits for all conditions, depending on various factors (e.g., environmental turbulence) firms should deploy the relevant tools of innovation (e.g., exploitation capability) to ensure a successful NPD projects (Islam, Doshi, Mahtab, & Ahmad, 2009).

The deployment of relevant organisational capabilities for NPD is critical because focusing too much on exploitation of new products has led to the reduction of NPD contributions on firms' revenues and profits (Cooper, 2005). This situation is currently occurring the Malaysian manufacturing firms that emphasis on the deployment of exploitation of new products (Mat & Jantan, 2009; Jamaliah & Zain, 1999). This was indicated in the study on cross-functional NPD teams of manufacturing firms in Malaysia (Mat & Jantan, 2009). As a result of this imbalance deployment of organisational capabilities, the NPD performance of Malaysian manufacturing firms may not sustain for long periods of time particularly under turbulence environment.

The dynamic effects of environmental turbulence on the deployment of organisational capabilities and NPD performance is critical due to "NPD is a system encompassing the dynamic interaction between internal and external factors ... [where a] delay in action for a firm possessing distinctive competencies may inhibit success" (Harmancioglu, McNally, Calantone, & Durmusoglu, 2007, p. 421). Nevertheless, the relationships between organisational capabilities and environmental turbulence are still rarely researched in NPD projects (Page & Schirr, 2008) especially in manufacturing sector of Malaysia. As a result of less emphasis on environmental turbulence, recent study on R&D firms in Malaysia has shown the NPD performance of local firms is lower than multinational firms, which may affect their adaptation to change under market and technological turbulences for achieving competitive advantage (Kowang, Rasli, & Long, 2014).

Apart from environmental turbulence, the need to deploy a balanced capability between exploitation and exploration of new products with organisational ambidexterity was also emphasised to Malaysian manufacturing firms. As suggested by previous study, the alignment (e.g., with organisational ambidexterity) between formality and informality is one of NPD management issues that need to be focused by the technology-based firms in Malaysia (Yahaya & Abu-Bakar, 2007). For this reason, a previous study that focused on organisational learning and NPD of Malaysian manufacturing firms had suggested the importance of doing differentiation to create more innovative new products (exploration capability) rather than just becoming the adaptors (exploitation capability) of existing innovation and technology (Jabar, Soosay, & Santa, 2011). In contrast, another study on Malaysian manufacturing firms has suggested deploying organisational ambidexterity way too high for creating balance between exploitation and exploration of new products can be difficult to manage (He & Wong, 2004). This implies focusing too much on organisational ambidexterity (similar to focusing too much on exploitation or exploration of new products) can also be difficult to translate NPD into performance.

For these reasons, the right deployment of organisational capability need to be further investigated especially under environmental turbulence since “there has been no study conducted on how manufacturing firms in Malaysia develop [or deploy] their [organisational] capabilities and resources in pursuit for better [NPD] performance and competitive advantage” (Ramayah, Sulaiman, Jantan, & Ching, 2004, p. 2). As such, a problem statement of this study refers to “what are the types of organisational capability (exploitation capability, exploration capability, structural ambidexterity, and/or contextual ambidexterity) to be deployed in order to achieve better NPD performance under environmental turbulence?”

In a search for the right types of organisational capability to be deployed under environmental turbulence to achieve better NPD performance, a resource-based perspective with a concept of DCs has caught attention. This concept explains the source of competitive advantage through reconfiguration of organisational capability under environmental turbulence (Teece, 2007; Teece, Pisano, & Shuen, 1997). For instance, previous study in Malaysia has posited that the use of DCs through organisational learning with knowledge complexity was influencing the success of innovative NPD implementation (Mat & Razak, 2011). As such, in response to the problem statement, firm that is capable of deploying relevant types of organisational capability under environmental turbulence to achieve better NPD performance should be considered as possessing DCs.

1.4 Research Questions

As shown in a study of Malaysian manufacturing firms, knowing the relationships between organisational capabilities and NPD performance is not just critical to decide the most relevant capabilities to be deployed, but also crucial to provide evidence on the superiority of structural and/or contextual ambidexterity when compared to the individual deployment of exploitation and/or exploration of new products in achieving better NPD performance (He & Wong, 2004). In addressing of the problem statement, four interrelated questions need to be answered:

i Does the deployment of each types of organisational learning relate to NPD performance?

ii Does the deployment of each types of organisational ambidexterity relate to NPD performance?

iii Do different types of environmental turbulence moderate the deployment types of organisational learning and NPD performance?, and

iv Do different types of environmental turbulence moderate the deployment types of organisational ambidexterity and NPD performance?

The first two questions are asked in assuring each of the related organisational capabilities has the relationship (correlation) with NPD performance, which is important (as part of parametric assumptions) in assuring the analysis on moderated relationship as addressed in the latter two questions can be usefully performed.

1.5 Research Objectives

In answering of the research questions, the following objectives need to be achieved:

i To determine the relationships between each types of organisational learning and NPD performance, ii To determine the relationships between each types of organisational ambidexterity and NPD performance,

iii To examine the moderating effects of each types of environmental turbulence in the relationships between organisational learning and NPD performance, and

iv To examine the moderating effects of each types of environmental turbulence in the relationships between organisational ambidexterity and NPD performance.

1.6 Definitions of Key Terms

The following are the definitions of the most common key terms used in this study (the details of operational definitions will be addressed in Chapter Two):

i NPD performance refers to the financial and nonfinancial criteria to measure the firm's performance relating to NPD (Wang, Lee, Wang, & Chu, 2009; Page, 1993).

ii NPD financial performance refers to the measurement criteria for NPD performance with the typical accounting measures (Kihn, 2005; Ittner & Larcker, 1998).

iii NPD nonfinancial performance refers to the measurement criteria for NPD performance that cannot be precisely measured with the typical accounting measures (Kihn, 2005; Ittner & Larcker, 1998).

iv Organisational learning refers to the active process for acquiring and processing information and knowledge for better decision making in NPD projects either with the exploitation or exploration capability (Saban, Lanasa, Lackman, & Peace, 2000).

v Exploitation capability refers to the firm's ability to exploit existing products with current knowledge (Andriopoulos & Lewis, 2009; March, 1991).

vi Exploration capability refers to the firm's ability to explore new product opportunities with new knowledge (Andriopoulos & Lewis, 2009; March, 1991).

vii Organisational ambidexterity refers to the firm's ability to simultaneously pursue the exploitation and exploration of new products in NPD projects (Andriopoulos & Lewis, 2009).

viii Structural ambidexterity refers to the firm's ability to create and manage dual/separate structures for simultaneously exploiting and exploring new products in NPD projects (O'Reilly & Tushman, 2004).

ix Contextual ambidexterity refers to the collective individual ability to divide and manage time (shifting backward and forward) between the contradicted activities of the exploitation and exploration of new products in NPD projects (Birkinshaw & Gibson, 2004).

x Environmental turbulence refers to the frequency and unpredictability of the market, technology, and competitive intensity that influence NPD performance (Calantone, Garcia, & Droge, 2003).

xi Market turbulence refers to the continuous change in customer preferences, and/or cost and price structures in which firms need to constantly build products to address the change (Calantone, Garcia, & Droge, 2003).

xii Technological turbulence refers to the rate of change of technology that is used in NPD projects and it affects NPD performance (Chen, Reilly, & Lynn, 2005).

xiii Competitive intensity refers to the degree of competition among firms and areas in the product market (Beiner, Schmid, & Wanzenried, 2009; Miller, 1987).

xiv Dynamic capability refers to the firm's ability to deploy organisational capabilities in response of environmental turbulence in achieving better NPD performance (Teece, 2007; Teece, Pisano, & Shuen, 1997).

1.7 Significance of the Study

This study that interested on the deployment of organisational capabilities under moderation of environmental turbulence to achieve better NPD performance is imperative from the theoretical, knowledge, and practical perspectives.

Firstly, most studies in DCs had addressed the environmental turbulence either in general, or if specific, in terms of highly technological and/or market change only. Meanwhile, there are only a few studies in DCs that have compared the moderating effects of different types of environmental turbulence on the relationship between organisational capabilities and NPD performance. As such, previous studies had rarely investigated different types of environmental turbulence under one research. For these reasons, the level of understanding on environmental turbulence with the concept of DCs needs to be improved. In order to close this theoretical gap, the study aimed at specifying the moderating effects of environmental turbulence into three types, which are market turbulence, technological turbulence, and competitive intensity. By doing this, the meaning of environmental turbulence can be better understood as the effects of different environmental turbulence can be compared. Furthermore, since this study is not just focusing on high-level of environmental turbulence, the effective levels of environmental turbulence for deploying specific types of organisational capability can be further clarified with the concept of DCs.

Secondly, most previous studies had also addressed organisational ambidexterity in the general sense. As such, it is usually measured by using the interaction term between the exploitation and exploration capabilities, but when the two specific types of organisational ambidexterity (e.g., structural and contextual) is included under one study, each of them need to be measured differently/separately. For these reasons, this study used different measures for two types of organisational ambidexterity, which allows their direct comparison with the exploitation and exploration capabilities and also between themselves. Meanwhile, by investigating the structural and contextual ambidexterity separately, it does not just enhance the knowledge on organisational ambidexterity, but also helps to clarify the differences between organisational learning and organisational ambidexterity as they are quite different but interrelated topics. In addition, this study also contributes to the knowledge on NPD performance as it is not just measured with financial criteria, but also with nonfinancial criteria such as innovativeness and quality performance for better comprehension of NPD performance.

Thirdly, previous studies had shown that managers and practitioners tend to stick to the same type of organisational capability in NPD projects regardless of environmental turbulence. As suggested by literature, maintaining the same capability would lead to a success trap, which in turn would reduce NPD performance. For these reasons, the findings and outcomes of this study can be useful for decision makers by demonstrating the wrong types of capabilities that can possibly reduce the firm's NPD performance, and thus recommend the appropriate types of organisational capability that can be deployed under different types of environmental turbulence in order to achieve better NPD performance.

1.8 Justification of the Study

Besides "a smaller number of carefully selected variables is much to be preferred to a larger number of carelessly selected variables" (Gay & Diehl, 1992, p. 325), there are three reasons for only investigating the relationships of organisational learning (exploitation and exploration capabilities) and organisational ambidexterity (structural and contextual) to NPD performance, under the moderating effects of environmental turbulence in the context of Malaysian manufacturing sector with DCs perspective, which are discussed as follows:

Firstly, even though the dimensions of organisational capability are varied such as market and technological capabilities, and internal and external integrative capabilities (Verona, 1999), there have already been numerous researchers that have related the notions of exploitation and exploration with various perspectives (Li, Vanhaverbeke, & Schoemakers, 2008) in NPD studies. For instance, exploitation capability had been related to market capability (Yalcinkaya, Calantone, & Griffith, 2007), process innovation (He & Wong, 2004), and incremental innovation (Benner & Tushman, 2003), while exploration capability had been related to technological capability (Yalcinkaya, Calantone, & Griffith, 2007), product innovation (He & Wong, 2004), and radical innovation (Benner & Tushman, 2003). Therefore, even though market and technological orientations are among the current focus of studies in NPD literature, they, just like others, can be identified as either exploitation- or exploration-related capabilities for NPD. This justified the focus put on the exploitation and exploration capabilities in this study on NPD performance.

Secondly, organisational ambidexterity is related to the incongruence between alignment and adaptability (Gibson & Birkinshaw, 2004), efficiency and flexibility (Eisenhardt, Furr, & Bingham, 2010), and evolutionary/incremental and revolutionary/radical innovation change (O'Reilly & Tushman, 2008; Tushman & O'Reilly, 1996) that are synonym to the incongruence between exploitation and exploration capabilities as widely observed through organisational ambidexterity literature (Jansen, Tempelaar, Bosch, & Volberda, 2009; O'Reilly & Tushman, 2008; Jansen, Bosch, & Volberda, 2005). Since NPD performance is not just limited to efficiency (e.g., exploitation) and/or effectiveness (e.g., exploration) as it is also relying on the integration (e.g., ambidexterity) between efficiency and effectiveness of activities (Carbonara & Scozzi, 2006), this provides justification to focus on the organisational ambidexterity in this study on NPD performance.

Thirdly, the concept of DCs focuses on the firm's ability in building, integrating, and reconfiguring both internal and external competencies in response to environmental turbulence (Teece, 2007; Teece, Pisano, & Shuen, 1997). Since DCs is a multidimensional construct (Barreto, 2010; Helfat & Peteraf, 2003; Winter, 2003), the organisational learning (Pavlou & Sawy, 2011) and organisational ambidexterity (O'Reilly & Tushman, 2008) can be viewed as DCs. Precisely speaking, while the firm's ability to enhance and improve current product development with existing competencies (exploitation) is one type of DCs, the ability to completely build new product with new competencies (exploration) is another type of DCs. Similarly, the firm’s ability to simultaneously pursue the existing product development and completely build new products within a separate structure (structural ambidexterity) and organisational context (contextual ambidexterity) are also types of DCs. For these reasons, since this study is using the concept of DCs as contemporary theory, addressing organisational learning and organisational ambidexterity as different types of DCs is self-justifying for the reasons to focus only on these organisational capabilities on NPD performance.

All-in-all, with less than a decade from now to witness Malaysia turns into a fully developed nation, Malaysia faces increasing uncertainty in both local and global marketplaces due to the global economic condition that is still not fully recovered from the recent economic downturn (e.g., financial crises in Europe and USA). As a result, Malaysian manufacturing sector not only need to continuously produce products to compete in the current marketplace, but it must also be ready and capable of producing new products for future viability. Meanwhile, the balanced focus between exploitation and exploration of new products can be made possible with organisational ambidexterity by simultaneously pursuit both of them. With all of these factors addressed together, the contemporary theory of DCs is extremely relevant to manage firms’ organisational capabilities (exploitation, exploration, structural, contextual) under environmental turbulence to achieve sustainable NPD performance in the context of manufacturing sector in Malaysia.

1.9 Scope of the Study

This study was aimed at investigating the relevant deployment of organisational capabilities to achieve better NPD performance, which is according to the types and levels of environmental turbulence with DCs concept in mind. To achieve this objective, this study is encompassed by the following scopes:

i The unit of analysis is organisational/firm-level. The respondents are the production/product managers or any equivalent managers that are responsible to the completion of (or have completed) NPD projects.

ii This study focused on the completed NPD projects that are manufactured by the firms themselves within the previous five years, which is a reasonable time period to observe the effects of environmental turbulence on NPD performance.

iii This study took place in the Malaysian manufacturing sector where the topics on NPD are commonly discussed. This sector was chosen for its significant contributions to jobs employment, exports, GDP, and its pertinent role in realising Malaysia's Vision 2020.

iv The sampling frame was taken from the Federation of Malaysian Manufacturing (FMM) Directory 2011 that includes various manufacturing industries of all sizes, both locally and internationally operated to improve the response rate.

v All the related analyses such as descriptive, correlation, and multiple regressions were performed using the SPSS v.19 statistical technique.

1.10 Limitations of the Study

Following are the possible limitations that may affect this study from achieving its objectives:

i Respondent limitation: Respondent is reluctant to cooperate in the survey, respondent does not answering the questionnaire seriously, and firm policy does not allow respondent to participate in the survey.

ii Time and cost limitation: Questionnaire does not reach the respondents' addresses, the questionnaire is received by respondents but lost and needs to be resent, and follow-up of respondents involves firm's bureaucracy.

iii Data limitation: Sample size, outliers, normality, multicollinearity, and other assumptions that are not perfectly met which affects the significance level of analysis, and thus influences the interpretation of results.

1.11 Organisation of the Thesis

After considering the background, problem statement, research questions, objectives, significance, justification, scope, and limitations of the study, this thesis is organised as follows:

Chapter Two focuses on the literature review that begins with a review on the NPD literature at global marketplace, the Malaysian's economy and manufacturing sector' contexts, while the rest of the discussion covers the literature on NPD performance, the relationships of organisational capabilities and environmental turbulence with NPD performance, the contemporary theory of DCs and theoretical framework, the operational definitions of variables, and development of hypotheses. Accordingly, Chapter Three focuses on the research methodology that discusses the research design, sampling procedure, survey administration, measurement issues, validity and reliability of scales, and data analysis and interpretation. Meanwhile, Chapter Four is structured to discuss on data analysis and interpretation that includes the overview of data collection, preparation of data for analysis, technique of reducing data with factor analysis, reliability of measurement scale, analysis of univariate variables with mean analysis, testing of bivariate hypotheses with correlation analysis (for Objectives 1 and 2), and testing of multivariate hypotheses with hierarchical multiple regression analysis (for Objectives 3 and 4). Chapter Five is reporting on the findings according to study objectives, which is then proceeded with the discussion of findings according to environmental turbulence, and followed up with the study contributions, limitations, future research agendas, and concluding remarks.

CHAPTER TWO:
LITERATURE REVIEW

2.0 Research Background

This chapter reviews the literature of four main variables, and a concept of dynamic capabilities (DCs). Firstly, this chapter reviews NPD literature in the context of global marketplace, Malaysian economy, and manufacturing sector, followed with a review on NPD performance literature that covers both financial and nonfinancial criteria. Secondly, the organisational learning literature is reviewed on the exploitation and exploration capabilities, and the organisational ambidexterity literature on the structural and contextual ambidexterity. Thirdly, this review continues on the environmental turbulence literature with the moderating effects of market turbulence, technological turbulence, and competitive intensity. Fourthly, a review on the contemporary theory is discussed within DCs literature, which is followed by the development of theoretical framework based on the concept of DCs. Accordingly, the operational definitions of variables and related terms are discussed, followed by the hypotheses building to examine the relationships between organisational capabilities and NPD performance under the moderating effects of environmental turbulence. This literature review ends with chapter summary.

2.1 Reviews on New Product Development Literature

NPD innovation activities can create balance between exploitation and exploration of new products under turbulence environment that is crucial in explaining the source of sustainable competitive advantage (Ireland & Webb, 2007). Due to this reason, NPD innovation activities can be conceptualised as DCs for defining new products and processes (Tether, 2003). The use of DCs concept for defining NPD is imperative since the previous definitions were irrelevant to decide the types of new products to be built when addressing environmental turbulence (Tether, 2003; Bhattacharya, Krishnan, & Mahajan, 1998).

The use of DCs concept to study NPD becomes relevant since the previous NPD literature that had attempted to conclude the pattern of research has found that the methodology used in NPD has not been changed since 30 years ago (Ernst, 2002). As a result, previous study had argued “while how products are developed differs not only across firms but within the same firm over time, what is being decided seems to remain fairly consistent at a certain level of abstraction” (Krishnan & Ulrich, 2001, p. 3). Since the previous NPD empirical researches remain constant and well below the average of methodology used in other disciplines in the social sciences (Ernst, 2002), new research streams emphasising on the roles of organisational capability and environmental turbulence have emerged in NPD (Page & Schirr, 2008).

With the emerging of new research streams on organisational capability and environmental turbulence, it was found that while new researchers have replaced the old, existing researchers have widened their perspectives on NPD. As a result, new variables have emerged in influencing NPD performance especially under environmental turbulence. For instance, researchers had observed a changing trend of citation in the previous NPD literature where the most influential works in the discipline were no longer cited for specific topics. Instead, they were cited as the starting point or introduction to current NPD studies. These influential works were being replaced by the works of current authors. For these reasons, while the fundamental topics are still continuously explored, the emergence of new topics becomes relevant (Durisin, Calabretta, & Parmeggiani, 2010).

Among the current topics emerged in NPD literature are technological competencies (Acur, Kandemir, Weerd-Nederhof, & Song, 2010), strategic orientation (Spanjol, Qualls, & Rosa, 2011), operational capabilities (Pavlou & Sawy, 2011), and organisational learning (Kim & Atuahene-Gima, 2010). These topics are interrelated since they are considered as resources or capabilities under the resource-based view (RBV) (Helfat & Peteraf, 2003; Barney, 1991) and DCs concept (Teece, 2007; Teece, Pisano, & Shuen, 1997). Thus, with the emerging of new influential authors and new topics becoming relevant in NPD studies, it was found that the trend of NPD works of these authors is associated to RBV and DCs perspectives. For instance, a previous study had proposed a NPD model based on the assumption that rents are generated with a firm's resources (Verona, 1999).

For these reasons, when addressing NPD issues, current studies have shown increasing interest in organisational capabilities from the resource-based perspective. In the context of this study, NPD refers to the use of organisational capabilities to build incremental (exploitation) and radical (exploration) new products under environmental turbulence (Hohenegger, Bufardi, & Xirouchakis, 2007).

2.1.1 NPD and Global Marketplace

Research had shown a firm that focuses NPD on the global marketplace is positively related to the introduction rate of new products and financial performance (Ozer & Cebeci, 2010), which implies globalisation is affecting NPD practices across industries (Eppinger & Chitkara, 2006). As such, for a successful NPD in international markets, global NPD strategies become imperative for these firms (Brentani, Kleinschmidt, & Salomo, 2010). For instance, based on the Globalisation Index that measured according to five indicators, namely trade, finance, labour, technology, and culture, Malaysia is ranked 27th being most globalised economy in the world and 7th in Asia in 2010 (Ernst & Young, 2011), and 28th in the world and 7th in Asia in 2011 from 60 largest countries according to GDP (Ernst & Young, 2012). In addition, Malaysia is also ranked 23th being largest exporter in the world in 2010 (WTO, 2011), which implies the international trade is critical to Malaysian economy. As such, the NPD performance of Malaysian manufacturing firms can be critically affected by globalisation since changes in the economic structure has turned Malaysia into one of the most open economies in the world (Julian & Ahmed, 2009).

There are at least four reasons for a firm to go global with NPD, which are (1) to get lower cost of NPD operations and activities, (2) to improve the NPD process, (3) to achieve global growth by accessing critical information on foreign markets, and (4) to access technological development in the region (Eppinger & Chitkara, 2006). As such, a firm that implements global NPD will gain advantages over local counterparts by accessing the capabilities, critical information, knowledge, and technology of the local and global markets that improve the firm's organisational learning capabilities. Consequently, these four reasons to go with global NPD have challenged the NPD performance of Malaysian manufacturing firms that are relatively at disadvantage over those of the foreign firms. However, with strong economic performance, Malaysia offers better business opportunities for various products and services since the Asian Financial Crises in 1997-1998 (Julian & Ahmed, 2009) that had caused a traumatic impact to Malaysia with nearly collapses in term of currency, stock, and property markets (Ping & Yean, 2007).

Nevertheless, since manufacturing sector in Malaysia is heading towards globalisation (Devadason & Meng, 2009), they must increase their learning capabilities to compete successfully in the global marketplace. This occurred due to the organisational learning is imperative for business improvement and adaptation towards changing marketplace such as during global financial crisis in 2008 where the know-how on R&D, engineering, and technology activities can be increased by learning (Aydin & Ceylan, 2009).

2.1.2 NPD and Malaysian Economy

The falls and rises of Malaysian economy are influenced by the turbulence in business environment that affects the firm's performance, which in turn affects the growth of Malaysian economy. It appears the threats and challenges from changing environment is never ending as the processes of rapid economic, social, and environmental change is still continuously affecting Malaysia (Hezri & Hasan, 2006). For instance, while Malaysia is taking advantage from the economics growth of China and India that allows it to expand the exports of natural and agricultural resources, this is however has threaten the exports of Malaysian manufacturing products as the manufactured goods from China and India are getting more competitive with better quality and variety (Ianchovichina, Ivanic, & Martin, 2010). This has left major implications to the growth of Malaysian manufactured goods and exports. Thus, with the rise of competitions from rapid growing nations of China and India, the NPD of Malaysian manufacturing sector that has been the engine for economy growth since 30 years ago has becoming more critical (Latib, 2011).

Meanwhile, as a major contributor to GDP (BNM, October 31, 2011), manufacturing sector is crucially important to Malaysian economy (Mohammadjafari, Dawal, Ahmed, & Zayandehroodi, 2011). However, a previous study had shown that NPD contributions to firm revenues and profits are continuously decreasing (Cooper, 2005), which is also observed in the case of Malaysian manufacturing firms (Mat &

Jantan, 2009; Jamaliah & Zain, 1999). This weak NPD performance may affect the Malaysian economy and competitiveness (Mohammadjafari, Dawal, Ahmed, & Zayandehroodi, 2011). For instance, The World Competitiveness Scoreboard Index 2005 has shown that Malaysian competitiveness has declined from 16th place in 2003 to 28th place in 2004 (IMD, May 13, 2005), which has left major implications on the economic policy of Malaysia (Ianchovichina, Ivanic, & Martin, 2010).

According to the World Bank survey in 2005, one of the reasons for the decline is the shortage in innovation capability. To overcome this matter, the report had called upon the Malaysian government to strengthen the National Innovation System (Ramasamy & Yeung, 2007) that focuses on a balanced approach between technology-driven (e.g., exploration) and market-driven (e.g., exploitation) innovation (MOSTI, 2011). Together with the implementation of RMK-9 (2006-2010) to combat inflation, achieve annual growth rate of 6%, reduce federal government deficit, create economic growth centres, increase private investment, and investment in human resources (Derichs, 2007), Malaysia has achieved remarkable improvement in the recent World Competitiveness Index from the world's 16th in 2010 up to the world's 10th in 2011. Meanwhile in the region, Malaysia's competitiveness comes 2nd after Singapore and 5th in Asia (IMD, 2011).

To remain competitive, the RMK-10 that succeeded RMK-9 was planned to support innovation and encourage more design and commercialisation of high-tech products in order to achieve high-income develop nation toward Vision 2020 (RMK-10). All of these were planned since NPD is no longer a strategic option, instead it has become a necessity and critical for survival (Craig & Hart, 1992). As a result, the contribution of the manufactured goods to total Malaysian exports has increased dramatically from just 11.9% in 1970, up to 75.5% in 2006 (Julian & Ahmed, 2009), and projected to achieve an average growth rate of over 6% per year to achieve Vision 2020 (MITI, September 16, 2009). However, with the actual average growth of just 4.1% per year (Ramasamy & Yeung, 2007), there is still a lot of work to do to improve the contribution of manufacturing sector to Malaysia economy.

2.1.3 NPD and Malaysian Manufacturing Sector

Malaysian manufacturing sector is consisted of seven major industries, namely Petrochemical, Automotive, Wood-based, Textiles and Apparel, Rubber Products, Machinery and Equipment, and Electrical and Electronics (MITI, n.d.). As of April 2014, this sector has provided jobs to over one million people with an average salary of RM 2,825 per month, and recorded an increase of sales value from RM 49.4 billion last year to RM 53.2 billion of the same period this year (JPM, June 11, 2014). On the other hand, SMEs that constituted 97.3% of total business establishment in 2011 includes not just manufacturing but also services, agriculture, construction, and mining and quarrying in Malaysia. In manufacturing, SMEs contribution on GDP is still very small at 7.9% in 2012 that was decreased from 8.1% in 2011 (SMECorp, September 24, 2013). This implies SMEs still have a lot of works to do to increase its contribution on total employment, output, and value-added activities in manufacturing sector (Ariff, 2008).

Regardless of the firms size (e.g., SMEs or large corporations), Malaysian manufacturing has been treated as a growth-enhancing sector where the products from electrical and electronics, and textile and apparel industries were produced to fulfil global markets. Since Malaysia can no longer depend on commodities, the manufacturing sector has to produce high-value added new products that can be marketed globally (Ariff, 2008). However, NPD is not a straightforward activity, where the strategic NPD management, NPD project management, NPD process and structural, and NPD people management have been identified as four major NPD issues in the Malaysian technology-based firms (Yahaya & Abu-Bakar, 2007).

It was found that these four NPD managerial issues are consistent with the issues addressed in NPD literature for over 30 years (Ernst, 2002). For instance, while a market approach is used when dealing with strategic management issues, a business and product knowledge are used when dealing with project management issues; knowledge on past organisational learning is used when dealing with process and structural issues; and managerial and supervisory skills are used when dealing with people management issues (Yahaya & Abu-Bakar, 2007). Therefore, Malaysian manufacturing firms must contend the NPD issues since NPD is crucial for growths (Zirger & Maidique, 1990) that stimulate profits (Owens, 2007).

As a result, NPD that is a critical component for innovation is central to the performance of manufacturing firms (Katila & Ahuja, 2002). As NPD is synonymous to the manufacturing process where the transformation of materials into items with greater value takes place (Groover, 2007), Malaysian manufacturing firms have to be active in NPD not just because it is critical for the financial well-being (Jamaliah & Zain, 1999) but also for the survival and long-term success of the firms (Ramaseshan, Caruana, & Pang, 2002). This was evidenced in a recent study on the hard disc industry that has shown a success NPD is critical for the long-term survival of Malaysian manufacturing firms (Martin, 2013).

In the context of Malaysian manufacturing firms, NPD processes and methods were treated as the competitive tools for firm’s survival (Al-Shalabi, Omar, & Rundquist, 2010). As such, Malaysian manufacturing firms must be more reliant on the introduction of new products that are made possible with various manufacturing processes (Kalpakjian & Schmid, 2006). To do this, Malaysian manufacturing firms must focus on various NPD projects where the exploitation capability of an existing product will enables incremental innovation, while the exploration capability of new product opportunities will enables radical innovation (Andriopoulos & Lewis, 2009). In other words, to be successful Malaysian manufacturing firms not only have to focus on customer satisfaction where the product meets the customer and market needs (e.g., exploitation), but they also need to encourage product innovation and increase flexibility (e.g., exploration) (Kalpakjian & Schmid, 2006).

Unfortunately, although the NPD practices of Malaysian manufacturing firms are no different from those of global firms, they are at the infancy level (Islam, Doshi, Mahtab, & Ahmad, 2009) since this industry is still growing (Jabar, Soosay, & Santa, 2011). As a result of infancy NPD practices, the organisational learning of Malaysian manufacturing firms is not very complicated since most of NPD activities are related to exploitation capability (Bauly, 2004). For instance, previous study has found 40.8% of the Malaysian's cross-functional teams in manufacturing sector are involved in product modifications, 20.8% in product line extensions, 16.7% in "me-too-product", while only 2.7% in true innovation (Mat & Jantan, 2009). This result implies that less than 3% of NPD projects were related to exploration capability. As for this reason, manufacturing firms in Malaysia must also focus on the exploration capability to create balance with exploitation capability in order to increase NPD performance. Nevertheless, regardless of the types of NPD, previous survey has found that manufacturing firms in Malaysia were very active with NPD projects, which is crucial for sustainability (Jamaliah & Zain, 1999).

2.2 Reviews on NPD Performance Literature

As shown before, NPD performance is critical to the firms' financial well-being and future viability that explains why Malaysian manufacturing firms are active in NPD projects. Just like any firms, Malaysian manufacturing firms manage their NPD projects in a portfolio (Cooper, 2005), which is manifested by the business strategy that involves allocation of resources (Cooper & Edgett, 2001). Since NPD processes are implemented simultaneously within multiple NPD projects (Barczak, Griffin, & Kahn, 2009), it was found different types of NPD projects (e.g., really new versus incremental) require different types of resources (Song & Montoya-Weiss, 1998) that need different measures over different levels of analyses (Garcia & Calantone, 2002). Different measures are needed since NPD performance is a multidimensional concept (He & Wong, 2004). For instance, NPD performance can be seen through various perspectives such as accounting, marketing, and operations (Neely, 2002) and various categories such as profitability, market valuation, operational performance, and innovation (Aral & Weill, 2007).

In general, NPD performance can be identified from two important dimensions: (1) the business performance that relates to exploitative NPD, and (2) the knowledge performance that relates to explorative NPD (Ahn, Lee, & Lee, 2006). Similarly, capabilities can be measured with: (1) market performance that measures market share, sales, and profit, among others, and (2) the efficiency performance that measures the production cost, and time-to-market, among others (Krasnikov & Jayachandran, 2008). This implies the criteria for measuring NPD performance are diversified including both financial and nonfinancial measures (Wang, Lee, Wang, & Chu, 2009; Ittner, Larcker, & Randall, 2003). Tables 2.1a and b show various criteria for measuring NPD performance according to previous NPD study by Page (1993).

Table 2.1a

Financial Criteria for Measuring NPD Performance

Financial Criteria	Percentage of Use
Return on investment	23.3%
Various profit margin measures	20.6%
Sales and sales growth	20.6%
Various profit measures	16.4%
Payback and payback period	8.5%
Internal rate of return	8.5%
ROA, ROE, and ROCE	8.5%
Breakeven and breakeven point	5.3%
Share and market share	4.8%
Return on sales	3.2%
Net present value	2.6%
Other financial measures	16.9%

Table 2.1b

Nonfinancial Criteria for Measuring NPD Performance

Nonfinancial Criteria	Percentage of Use
Sales performance of new products	30.7%
Market share achieved	24.9%
Satisfy customer needs	21.2%
Other marketing-related benefits	18.5%
Strategic issues/fit/synergy	13.2%
Technical aspects/performance	9.0%
Uniqueness of the new products	1.6%
Other nonfinancial factors	10.6%

As shown in the table, some measures (e.g., market shares) can exist in both criteria depending on the context of study (Wang, Lee, Wang, & Chu, 2009; Page, 1993). For instance, while 20.6% of previous NPD studies focused on sales and sales growth as the financial measure, 30.7% focused on sales performance as the nonfinancial measure. This implies "the choice of performance variable can have substantive implications for the results of research and that researchers must carefully choose performance measures that are appropriate to the particular research question they are investigation" (McGuire, Sundgren, & Schneeweis, 1988, p. 869).

Meanwhile, previous studies on organisational learning and ambidexterity have also adopted both financial and nonfinancial NPD performance. However, as shown in Table 2.2, the NPD financial and nonfinancial criteria were not equally stressed upon in measuring organisational learning/ambidexterity.

Table 2.2
Types of Measures Used in Previous Studies on Organisational Learning/Ambidexterity and Performance

Authors	Financial	Nonfinancial
De Clercq, Thongpapanl and Dimov (2013)	▪	
Aloini, Martini and Neirotti (2012)	▪	
Lee, Wu and Liu (2012)	▪	
Chu, Li and Lin (2011)	▪	
Molina-Castillo, Jimenez-Jimenez and Munuera-Aleman (2011)	▪	
Pavlou and Sawy (2011)		▪
Bustinza, Molina and Arias-Aranda (2010)		▪
Kim and Atuahene-Gima (2010)	▪	
Li, Chu and Lin (2010)	▪	
Atuahene-Gima and Murray (2007)	▪	
Ahn, Lee and Lee (2006)	▪	▪

Based on this table, it appeared many studies have related organisational learning and ambidexterity to financial performance. Even the recent study by De Clercq, Thongpapanl, and Dimov (2013) also stressed on the financial performance. This over focus on financial performance occurred due to the emphasis of these studies on incremental (e.g., exploitation) NPD projects (Cooper, 2005). Nevertheless, there were some studies stressed on the nonfinancial performance such as Pavlou and Sawy (2011) that attempted to sustain competitive advantage via NPDs with organisational learning in mind, or Bustinza, Molina, and Arias-Aranda (2010) that focused on the nonfinancial performance to achieve long-term advantage. On the other hand, the numbers of studies that measured firm performance with both NPD financial and nonfinancial criteria were still very low, even much lower than the numbers of studies on NPD nonfinancial performance. For instance, there was only one study by Ahn, Lee, and Lee (2006) with both criteria of NPD performance.

For these reasons, the effective performance measures for organisational capabilities should be based on the context (Loasby, 2010) since these capabilities are "multidimensional and may not be adequately captured by the proxy measures used in objective data collection" (Krasnikov & Jayachandran, 2008, p. 5). For instance, depending on the objectives of study, some scholars used fully the financial criteria (Rijsdijk, Langerak, & Hultink, 2011; McNally, Cavusgil, & Calantone, 2010), some used fully the nonfinancial criteria (Song, Montoya-Weiss, & Schmidt, 1997), while others used both criteria for measuring NPD performance (Rothaermel & Alexandre, 2009; Kim, Wong, & Eng, 2005).

2.2.1 NPD Performance Measures for this Study

As discussed in the previous section, the selection of effective NPD measures should be according to the context of study. Since exploitation and exploration capabilities of organisational learning can be measured in different ways, this study had decided to adopt both criteria of NPD performance. This is important since firms that extensively use both measures earn higher stock returns than those that do not (Ittner, Larcker, & Randall, 2003). Furthermore, the use of both NPD financial and nonfinancial measures is critical especially under turbulence environment where the competitive advantage of Malaysian manufacturing firms cannot last very long. For these reasons, firms must continuously improve their existing products for current viability while at the same time develops new products to achieve future viability. In addition, the benefits of using both measures were being realised in previous studies. For instance, two recent studies in Malaysia were using both criteria to measure NPD performance in R&D firms (Kowang, Rasli, & Long, 2014), and organisational performance in manufacturing firms (Omar, Sulaiman, Hui, Rahman, & Hamood, 2015). In the context of this study, the specific financial and nonfinancial criteria adopted for measuring NPD performance are discussed in the following sections.

2.2.1.1 NPD Financial Performance

Financial performance is usually measured with the accounting-based performance measures (Ittner, Larcker, & Meyer, 2003; McGuire, Sundgren, & Schneeweis, 1988), such as market shares, sales, and profits (Richard, Devinney, Yip, & Johnson, 2009; Brown & Eisenhardt, 1995; Moorman, 1995). As shown in Table 2.1a, growth in sales, profits, and returns on investment (ROI) are the top three criteria for measuring NPD financial performance. Sales growth refers to the percentage of change in sales revenue from the beginning to the end of one period. It is calculated by using the estimate revenue of products, in which the total unit of products produced is multiplied with the average sales price of those products (Ishikawa, Fujimoto, & Tomoyose, 2010; Nobeoka & Cusumano, 1997). Profit that is the ultimate dependent variable in management studies refers to the financial gain from investment or business operations after subtracting all of the related expenses (Ernst, 2002). ROI that refers to the net gain from investment divided by the cost of investment (Botchkarev, Andru, & Chiong, 2011) indicates how well the skills and resources are matched, organised, and deployed in the NPD processes (Song & Montoya-Weiss, 2001). Meanwhile, even though market share is not near the top of financial criteria, it is listed second top in the nonfinancial criteria list (Page, 1993), which is an important indicator for market performance (Richard, Devinney, Yip, & Johnson, 2009; Banbury & Mitchell, 1995). As such, achieving the target for market share, which refers to the firm's total share in the industry sales (Ishikawa, Fujimoto, & Tomoyose, 2010; Banbury & Mitchell, 1995) is a common firm's practice in a strategic plan (Caminal & Vives, 1996). For these reasons, this study was interested to measure NPD financial performance with sales growth, market share growth, profit growth, and ROI.

In the context of this study, NPD financial performance was defined as the criteria to measure the firm's performance relating to NPD with the typical accounting systems (Ittner, Larcker, & Meyer, 2003; Ittner & Larcker, 1998), such as with the market share growth, sales growth, profits, and ROI.

2.2.1.2 NPD Nonfinancial Performance

From learning and growth perspectives, effective innovation processes can be fostered with human capital, information capital, and organisational capital. These assets that are intangible in nature should not be simply measured using the amount of money spent on them (Kaplan & Norton, 2004) as their values are indirect (Kaplan, 2008). This happens due to the lacks of direct information for intangible assets that has been recognised as deficiency in the existing accounting paradigms (Angelopoulos, Giamouridis, & Vlismas, 2012). Although they cannot be measured accurately with the financial performance, firms both large and SMEs are generating cash flows from the investments in intangible assets since they are more difficult to duplicate by others (Blaug & Lekhi, 2009). For instance, Balance Scorecard that promotes the importance of nonfinancial performance through intangible assets has shown that human, organisation, and information capitals from learning and growth perspective are linked to the financial performance via organisational processes that create value to customers (Kaplan, 2008).

This implies the nonfinancial criteria for measuring intangible assets are actually the indicator to firm's financial performance (Kaplan, 2008; Ittner & Larcker, 1998) such as where firm's performance is related to constant development and introduction of new product (Ernst, 2002). For these reasons, it appeared the nonfinancial performance is also critical to measure NPD performance. For instance, even though the internal exploitation of known technology and external exploration of new technology that are positively related to innovative performance are not related to financial performance (Rothaermel & Alexandre, 2009), it was found that innovative NPD of Malaysian manufacturing firms contributed to their financial performance (Rosli & Sidek, 2013).

For the purpose of this study, the NPD nonfinancial performance was defined as the criteria to measure the firm's specific assets relating to NPD that cannot be precisely measured using accounting measures but are the predictors to the firm's future financial performance (Ittner & Larcker, 1998). The NPD nonfinancial criteria adopted for this study are discussed as follows:

i NPD Innovativeness Performance

Product innovativeness is "the degree of newness of the firm's product portfolio" (McNally, Cavusgil, & Calantone, 2010, p. 567), while the number of new products introduced by the firm represents innovation in the products (Katila & Ahuja, 2002). Hence, new products can be classified according to the innovativeness levels (Song & Montoya-Weiss, 1998) that is critical in determining the type of new product functions (Kim & Kim, 2009). The degree of product innovativeness is related to the (1) firm's knowledge and experience on the equivalent projects, and (2) customers' effort in learning and adopting new products (Langerak & Hultink, 2006). Similarly, innovativeness in the new product portfolio is influenced by the (1) specification (e.g., market, technology and/or customer groups of projects) of the focus areas, (2) resources commitment (human, finance, and time) of the focus areas, (3) organisational formality, and (4) stimulation of synergies in the innovation (McNally, Cavusgil, & Calantone, 2010).

There are various typologies for categorising the degree of innovativeness such as with the tetra categorisation (e.g., incremental-modular-architectural-radical), triadic categorisation (e.g., low-moderate-high), and dichotomous categorisation (e.g., discontinuous-continuous). In a similar vein, there are two categories of newness of product innovation that are according to (1) "new-to" factors such as new-to-the-world, new-to-the-industry, new-to-the-scientific community, new-to-the-market, new-to-the-firm, and new-to-the-customer, and (2) "new-what" factors such as new technology, new product line, new product benefits/features, new product design, new process, new services, new competition, and new customers and needs (Garcia & Calantone, 2002). As such, the types of NPD projects can be new-to-the-world, new-to-the-firm, next generation improvements, and incremental improvements where the higher the level of product newness, the longer the time it takes to complete the project. For instance, while new-to-the-world project takes 53.2 months to be completed, new product lines takes 36.0 months, next generation product improvement takes 22.0 months, and the incremental improvement takes 8.6 months to be completed (Griffin, 2002).

Even though highly new products takes a longer cycle time than the less new products, the cycle time for all types of products is in a declining trend. For instance, the cycle time for the new-to-the-world NPD project has declined from 181 weeks (in 1995) to 104 weeks (in 2004), the more innovative product declined from 78 weeks (in 1995) to 62 weeks (in 2004), and the incremental products also declined from 33 weeks (in 1995) to 29 weeks (in

2004) (Barczak, Griffin, & Kahn, 2009), which suggests an overall improvement to the NPD projects of all types of product innovativeness.

Despite various perspectives of innovativeness in the literature, there is however some consistency regarding the degree of discontinuity factors in innovativeness that is divided into marketing and technological discontinuity (Garcia & Calantone, 2002). Marketing discontinuity happens when the firm operates in a new marketing domain, such as new product category and distribution channels. Meanwhile, technological discontinuity happens when the firm operates in a new technological domain, such as new innovative technologies or a new process in NPD (McNally, Cavusgil, & Calantone, 2010). However, since innovativeness relates to technological competence (Acur, Kandemir, Weerd-Nederhof, & Song, 2010), innovativeness is strongly emphasised on the technology push rather than market pull (Droge, Calantone, & Harmancioglu, 2008).

Since the influence of innovation in the new product to firm's performance begins after its introduction to the market (Katila & Ahuja, 2002), in the context of this study, the innovativeness performance is refers to "the extent to which the new product is new to the target market and to the developing firm" (Langerak & Hultink, 2006, p. 206).

ii NPD Quality Performance

Product quality (besides top management support) is the most significant factor to the new product success (Gonzales & Palacios, 2002). Consistently, a previous study in China found product quality to be the second most important related factor to NPD success (Calantone, Schmidt, & Song, 1996).

In addition, product quality is a means to acquire the comparative advantage (Jacobson & Aaker, 1987) and might contribute to the firm's competitive advantage since product quality positively relates to the business unit's returns and market share. As such, firms that produce high quality products can perform well, relative to the competitors in any economic conditions (Kroll, Wright, & Heiens, 1999). In other words, quality significantly characterises a firm's success where high quality products positively increases a firm's performance. For these reasons, "firms are advised to assess the quality degree of the new product as the main product success determinant" (Gonzales & Palacios, 2002, p. 268).

There are three types of quality: (1) quality of design/redesign, (2) quality of conformance, and (3) quality of performance. Quality of design is customer oriented where the quality characteristics of the product under development is to meet the needs of customers at a given cost. It begins with consumer research, services and sales analyses to determine the product concept that meets the customer needs. Quality of conformance relates to the degree of uniformity and dependability of the products produced by the firms at the given cost while keeping in line with the quality characteristics of the design, which can be achieved and improved within the nominal value and specification limit of the design. Quality of performance focuses on the performance of the quality that is previously identified under quality of design, which is also met and improved under quality of conformance in the marketplace (Gitlow, Oppenheim, Oppenheim, & Levine, 2005).

Meanwhile, in relation to quality performance, there are five types of quality problems, namely conformance problems, unstructured performance problems, efficiency problems, product design problems, and process design problems. Conformance problems occur when well-structured systems and standardised inputs, processes, and outputs are not performing well as expected from the product users' standpoint. Unstructured performance problems incur when the non-standardised tasks are being poorly performed. Efficiency problems occur when quality improvement (e.g., cost and productivity) does not perform satisfactorily from the systems owners' or operators' standpoint. Product design problems occur when a new product does not meet or satisfy user needs. Meanwhile, process design problems occur when the devised processes or activities to achieve a goal are not correctly designed (Smith, 2000).

Even though quality is created with innovation to discover the future needs of customers, the ideas for innovation do not originate from the customers research, as it is a backward-looking activity to improve the existing needs of current customers. Instead, innovation comes from the firms themselves, since customers do not know what they want until the product reaches the market (Gitlow, Oppenheim, Oppenheim, & Levine, 2005), which implies product quality is a nonfinancial measure of NPD performance.

Product quality is relevant to be used to measure NPD performance as research had shown that quality of newly launched products is actually high compared to the general thinking that the newest product has low quality in the first year of production (Levin, 2000). High product quality improves firm's performance in terms of growth, profitability, and market value (Cho & Pucik, 2005) and also increases productivity by reducing the defective rate (Gitlow, Oppenheim, Oppenheim, & Levine, 2005). In the case of Malaysian manufacturing firms, it had been shown that the joint effect of three attributes of quality orientation, which are the top management commitment, process quality management, and quality design, can explain about 33.2% of the variance in NPD performance (Mokhtar & Yusof, 2010). This implies that one-third of NPD performance is related to quality attributes. As such, it is relevant to measure NPD performance with product quality in the context of the Malaysian manufacturing sector.

In the context of this study, quality performance refers to the perception on the superiority of product reliability and customer satisfaction related to the competing products (Atuahene-Gima & Li, 2004).

2.3 Reviews on Organisational Learning Literature

Organisational learning refers to an active process that requires continuous feedback in acquiring and processing information and to improve knowledge for better decision making in administering firm's NPD projects (Saban, Lanasa, Lackman, & Peace, 2000). Since the concept of organisational learning is multidisciplinary (Shrivastava, 1983) and ubiquitous (Dodgson, 1993), convergence is yet to exist as the concept and terminology of organisational learning are used differently by many researchers in various domains (Crossan & Berdrow, 2003; Crossan, Lane, & White, 1999). Thus, there is basically little consensus regarding the operative definition of organisational learning (Saban, Lanasa, Lackman, & Peace, 2000). For instance, organisational learning can be seen from four different perspectives, either as (1) an adaptation process, (2) sharing of assumptions, (3) development of a knowledge base, or (4) institutionalised experience (Shrivastava, 1983). In the context of this study, organisational learning can be understood as a firm's adaptation process to environmental change. This is because a theory on strategic renewal recognises that the exploitation of existing competencies and exploration of new competencies are both required in order to maintain adaptiveness (Floyd & Lane, 2000).

In the meantime, the focus on firm's capabilities has taken place within strategic management literature (Pitelis & Teece, 2010), which argued the value of organisational capability that resides within the firm's routines and processes will become the source of competitive advantage when it is valuable, difficult-to-imitate, and not easily available to the market (Teece, 2007). In fact, study on organisational capability takes places in NPD because the field is highly uncertain and complex that typically requires organisational capability to deal with (Kusunoki, Nonaka, & Nagata, 1998). For instance, organisational learning that exists in the process of change, dynamism, integration, cooperation, innovation, and in the use of information in NPD (Menon, Chowdhury, & Lukas, 2002) can be treated as critical to NPD process (Saban, Lanasa, Lackman, & Peace, 2000). As for this study, organisational learning is treated as one form of organisational capability (Saban, Lanasa, Lackman, & Peace, 2000; Weinstein & Azoulay, 1999) since it helps to acquire core capability (Barbaroux & Gode-Sanchez, 2007).

Likewise, organisational learning also plays central roles in DCs (Dodgson, 1993) where it shapes DCs (Zollo & Winter, 2002) to be the ultimate organisational capability (Wang & Ahmed, 2007). Since the terms organisational learning (Bhatnagar, 2006), exploitation and exploration capabilities (Yalcinkaya, Calantone, & Griffith, 2007), exploitation and exploration innovation (Greve, 2007), exploitative and exploratory innovation (Jansen, Bosch, & Volberda, 2006), exploitative and explorative innovation activities (He & Wong, 2004), and product exploitation and exploration (Molina-Castillo, Jimenez-Jimenez, & Munuera-

Aleman, 2011) are widely applied across literature, organisational (exploitation and exploration) learning can be regarded as one form of organisational capability from DCs perspective. In the context of this study, exploitation and exploration capabilities that are the two types of organisational learning were also regarded as organisational capability and would be adopted throughout this study.

2.3.1 Study on Organisational Learning and NPD in Malaysia

There have been many NPD studies taking place in Malaysian manufacturing sector. Majority of these studies were focusing on the manufacturing sector itself rather than a specific industry. This shows most researchers recognised the importance of NPD activities in various manufacturing industries of Malaysia. Table 2.3 shows the summary of previous studies on NPD with the related issues/topics in manufacturing sector of Malaysia.

Table 2.3
Empirical Research of NPD in Malaysian's Manufacturing Sector

Authors	Issues/Topics	Moderators	Sectors
Jabar, Soosay and Santa (2011)	Organisational learning	-	Various manufacturing industries
Ebrahim, Ahmed and Taha (2010)	NPD critical factors for virtual team	-	Various manufacturing industries (SMEs)
Al-Shalabi, Omar and Rundquist (2010)	NPD outsourcing and organisation	-	Various manufacturing industries
Adis and Razli (2009)	Strategic orientation; Marketing strategy; Market research activities	Environmental factors	Various manufacturing industries
Mat and Jantan (2009)	Trust and coordination in cross-functional NPD teams	-	Various manufacturing industries
Islam, Doshi, Mahtab and Ahmad (2009)	Organisational learning at team level	Top management support	High-tech semiconductor
Al-Shalabi and Rundquist (2009)	NPD Processes and methods	-	Various manufacturing industries
Zaaimuddin, Gan and Eze (2009)	Knowledge management process	-	R&D firms
Yahaya and Abu-Bakar (2007)	NPD management issues	-	Technology-based business

Based on this table, although there was no specific pattern of NPD topics in Malaysian manufacturing sector, majority of these topics were related to NPD management issues, such as NPD virtual teams management (Ebrahim, Ahmed, & Taha, 2010), NPD cross-functional teams management (Mat & Jantan, 2009), and NPD knowledge management (Zaaimuddin, Gan, & Eze, 2009). However, when dealing with the NPD process and structural issues, managers will use organisational learning as the strategic decision making approaches (Yahaya & Abu-Bakar, 2007). In fact, two of current NPD studies in Malaysia were related to organisational learning. For instance, Jabar, Soosay, and Santa (2011) have found organisational learning was affecting technology transfer and NPD of Malaysian manufacturing sector although not in a simultaneous way. Meanwhile, Islam, Doshi, Mahtab, and Ahmad (2009) have found knowledge acquisition and information interpretation (two components of organisational learning) were significantly related to NPD success. Similarly, when looking outside of NPD scope, previous studies on Malaysian manufacturing sector also focused on organisational learning (Ngui, Songan, & Hong, 2008; Ramayah, Sulaiman, Jantan, & Ching, 2004).

In the same way, majority of the management issues in NPD can be related to resource-based perspective, which treats the intangible assets such as organisational learning (Jabar, Soosay, & Santa, 2011), NPD processes (Al-Shalabi & Rundquist, 2009), and trust and coordination (Mat & Jantan, 2009) as the sources of competitive advantage. This resource-based perspective is consistent to the concept of DCs as mentioned before. All of these suggested the relevance of studying NPD with organisational learning in the context of Malaysian manufacturing sector.

Aside from the above reasons, the focus of this study on the relationship between organisational learning and NPD performance of Malaysian manufacturing firms is timely relevant since previous study had argued that firms focus more attention on organisational learning because it increases competitive advantage, innovation, and effectiveness (Islam, Doshi, Mahtab, & Ahmad, 2009). For instance, although NPD in Malaysia is still at the infancy level that may cause delays in NPD implementation as they lack of resources and poor understanding on new product requirements (Owens, 2007), it was found that organisational learning is significantly related to NPD success of Malaysian semiconductor industries (Islam, Doshi, Mahtab, & Ahmad, 2009). In a similar vein, a study found that organisational learning is positively related to technology transfer of Malaysian manufacturing firms (Jabar, Soosay, & Santa, 2011). However, the number of NPD studies on organisational learning in manufacturing sector of Malaysia is relatively low that need further investigation. This justifies the focus of this study on organisational learning in NPD.

2.3.2 Types of Organisational Learning

Innovation has been the focus of organisational learning since exploitation and exploration capabilities were used for product innovations (Li, Lin, & Chu, 2008). Since the earlier works on organisational learning (Levitt & March, 1988), exploitation and exploration learning (March, 1991), and the myopia of learning (Levinthal & March, 1993), the exploitation and exploration capabilities have been commonly associated to organisational learning (Chu, Li, & Lin, 2011; Kim & Atuahene-Gima, 2010; Li, Chu, & Lin, 2010; Li, Vanhaverbeke, & Schoemakers, 2008; Liao, Fei, & Liu, 2008; Atuahene-Gima & Murray, 2007; Greve, 2007; Holmqvist, 2004; Kyriakopoulos & Moorman, 2004; Rothaermel & Deeds, 2004; Danneels, 2002). In the context of NPD, both types of capabilities are important because different types of new products are generated by investing in different types of capabilities (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011).

Correspondingly, a previous study had shown that the levels of exploitation and exploration capabilities were affected differently by structural, relational, and cognitive dimensions of social capital (Atuahene-Gima & Murray, 2007). Another study had also shown while exploitation capability is associated to product quality, exploration capability is associated to product innovativeness (Cho & Pucik, 2005). As such, it can be concluded that the type of relationships between organisational learning and NPD performance can be varied according to the type of capabilities.

In the context of this study, exploitation capability is important to Malaysian manufacturing sector for achieving better NPD performance. For instance, previous study in Malaysian manufacturing sector has shown the exploitation capability that allowed the firms to fulfil customers' needs is the source of competitive advantage, which enabled them to perform well in the business (Adis & Razli, 2009). In a similar vein, the focus of Malaysian manufacturing firms on resources allocation for exploiting the existing product competences is statistically significant for decision making that can possibly leads to NPD performance (Tajudin, Musa, & Musa, 2012). However, as the Malaysian manufacturing firms were focusing too much on exploitation capability, this in return will negatively affect their NPD performance (Cooper, 2005; He & Wong, 2004). This implies exploitation capability needs to be managed effectively.

Similar to exploitation capability, the exploration capability is also proven to be important to Malaysian manufacturing firms for achieving better NPD performance. For instance, previous study on Malaysian manufacturing firms has found exploration capability was important for building innovative capability that contributes to the improvement of firms' performance (Abdullah & Salleh, 2011). Furthermore, it was found that the Malaysian manufacturing firms that were effective in exploration capability will be able to build unique new products for better NPD innovation (Tan & Nasurdin, 2010). However, since only small numbers of firms were successful at gaining market acceptance with a pure exploration capability, most firms have adopted dual strategy (e.g., combination of exploitation and exploration) for their NPD projects (Rahaman & Muhamad, 2004). As for this reason, the strategy for exploration capability needs to be investigated further.

Besides the above reasons, a study on exploitation and exploration capabilities with ambidexterity perspective in Malaysia was also performed previously (He & Wong, 2004), but there was no additional study to further enhance this earlier work. This means, further investigation on the deployment of different types of organisational learning (between exploitation and exploration of new products) need to be done in order to increase NPD performance. As a result, this study treats both exploitation and exploration capabilities as equally important that deserve further investigation in the context of Malaysian manufacturing sector.

2.3.3 The Concepts of Exploitation and Exploration Capabilities

Previous study on organisational learning in manufacturing sector of Malaysia has found exploitation and exploration capabilities as being important to firm performance. Nevertheless, since exploitation and exploration capabilities are incongruence, their effects on firm performance can turn negative if pursuit too high (He & Wong, 2004). This implies both types of organisational learning are grounded on two different concepts. Since the distinction between exploitation and exploration capabilities has been covered in wide ranging management literature, Table 2.4 compares the concepts of exploitation and exploration capabilities from the earlier works of March (1991) to Rothaermel and Alexandre (2009).

Table 2.4
The Concepts of Exploitation and Exploration Capabilities

Authors	Exploitation Capability	Exploration Capability
Rothaermel and Alexandre (2009)	Existing resources and capabilities	New resources and capabilities
Danneels (2008, 2002)	Apply new and/or existing competences/knowledge	Create new competences/ knowledge
He and Wong (2004)	Mechanistic structure; Tightly coupled structure; More control and less variance	Organic structure; Loosely coupled structure; Less control and more variance
Levinthal and March (1993)	Development and use of thing that already known; Support current viability	New knowledge and thing that come to be known; Support future viability
March (1991)	Short-term and certain result; Generate current income	Long-term and uncertain result; Build new capabilities

As shown in the table, exploitation capability is conceptually refers to a knowledge search within the firm boundary that is closer to the existing knowledge base (Li, Vanhaverbeke, & Schoemakers, 2008). It is used for exploiting old certainties (March, 1991) and refining the existing competencies (Danneels, 2008) such as existing technologies (Levinthal & March, 1981) by using what had been learned (Crossan & Berdrow, 2003; Crossan, Lane, & White, 1999). It relates to stable performance with certain results (March, 1991) such as in the process innovation (He & Wong, 2004) where the improvement is to satisfy existing customers, and to increase revenue and profits of the firm (Benner & Tushman, 2003). Exploitation capability can take place within and between firms (Holmqvist, 2004) such as where technology exploitation can be sourced either internal or external to the firms based on their current knowledge of known technology (Rothaermel & Alexandre, 2009).

On the contrary, exploration capability is conceptually refers to a search for the unfamiliar distant knowledge (Li, Vanhaverbeke, & Schoemakers, 2008) with search strategies (Levinthal & March, 1981). It is used for exploring new possibilities (March, 1991) and assimilation of new learning (Crossan & Berdrow, 2003; Crossan, Lane, & White, 1999) such as to build and experiment with new technologies. It relates to the variation in performance with more distant results (March, 1991).

Exploration capability can take place within and between firms (Holmqvist, 2004) such as when the firms have no previous knowledge on the new technology they can be sourced either internal or external to the firms (Rothaermel & Alexandre, 2009).

Noted that in the earlier discussion of organisational learning, this study has treated both exploitation and exploration capabilities as organisational capability (see Section 2.3). When referred to the concepts in Table 2.4, it appeared that they were also related to organisational capability (e.g., Rothaermel & Alexandre, 2009; Danneels, 2008). Accordingly, other concepts in the table were not contradicted the context of this study. As a result, all concepts discussed here were collectively adopted for this study to clarify and further explain the meanings of exploitation and exploration capabilities.

2.3.4 The Interpretations of Exploitation and Exploration Capabilities

Since a convergence in a study on organisational learning is yet to happens, various studies have interpreted exploitation and exploration capabilities in a different ways. For instance, exploitation capability has been interpreted as incremental innovation, alignment, search depth, opportunity seizing, customers competencies, marketing resources, first-order competencies, low-level learning, efficiency, and evolutionary. Accordingly, exploration capability has been interpreted as radical innovation, adaptability, search scope, opportunity sensing, technology competencies, technological resources, second-order competencies, high-level learning, flexibility, and revolutionary. These various interpretations of exploitation and exploration capabilities ranged from Fiol and Lyles (1985) to Eisenhardt, Furr, and Bingham (2010) are exhibited in Table 2.5.

Table 2.5
The Interpretations of Exploitation and Exploration Capabilities

Authors	Exploitation Capability	Exploration Capability
Eisenhardt, Furr and Bingham (2010)	Efficiency	Flexibility
Teece (2009)	Opportunity seizing	Opportunity sensing
Danneels (2008, 2002)	First-order competences	Second-order competences
Yalcinkaya, Calantone and Griffith (2007)	Marketing resources	Technological resources
Birkinshaw and Gibson (2004)	Alignment	Adaptability
Benner and Tushman (2003)	Incremental innovation	Radical innovation
Katila and Ahuja (2002)	Search depth	Search scope
Tushman and O'Reilly (1996)	Evolutionary change	Revolutionary change
Fiol and Lyles (1985)	Single-loop/ Low-level learning	Dual-loop/ High-level learning

As shown in the table, exploitation capability was originally referred to "refinement, choice, production, efficiency, selection, implementation, [and] execution" (March, 1991, p. 71). Since then, many scholars studied and interpreted the notion of exploitation from various perspectives (Li, Vanhaverbeke, & Schoemakers, 2008). For instance, it has been interpreted as incremental innovation that involves improvement of the existing products to achieve better efficiency in operations and to deliver more value to customers (O'Reilly & Tushman, 2004), which is designed to exploit existing knowledge to meet existing customer needs (Benner & Tushman, 2003). Exploitation capability has also interpreted as the use of existing first-order competencies (Danneels, 2008) or low-level learning. This single-loop learning that occurs with repetition from past experiences in the well understood context has formal institutional rules, happens mainly for short-term and temporary results, and occurs at all levels of organisation (Fiol & Lyles, 1985).

In addition, exploitation capability was also interpreted as alignment that refers to the coherence among various activities to achieve the same goal (Gibson & Birkinshaw, 2004), search depth that looks at the extent to which a firm uses the existing knowledge (Katila & Ahuja, 2002), and marketing resources that is the foundation for exploitation capability (Yalcinkaya, Calantone, & Griffith, 2007). Besides that, efficiency (Eisenhardt, Furr, & Bingham, 2010), and evolutionary change (Tushman

& O'Reilly, 1996) had also been interpreted as exploitation capability. Meanwhile, from the concept of DCs, opportunity seizing is interpreted as equivalent to exploitation capability (Teece, 2009) where one type of DCs is DCs for exploitation (Fischer, Gebauer, Gregory, Ren, & Fleisch, 2010).

On the contrary, exploration capability was originally related to "search, variation, risk taking, experimentation, play, flexibility, discovery, [and] innovation" (March, 1991, p. 71). Since then, many scholars studied and interpreted the notion of exploration from various perspectives (Li, Vanhaverbeke, & Schoemakers, 2008). For instance, it was interpreted as radical innovation or revolutionary change in technology with new knowledge and organisational complexity (Dewar & Dutton, 1986) to meet emerging customers markets (Benner & Tushman, 2003). In a similar vein, while exploitation is the first-order competencies, exploration capability is interpreted as second-order competencies (Danneels, 2008) used for creating new first-order competencies (Danneels, 2008). It also interpreted as a high-level or a dual-loop learning that happens via insights and heuristics where the context is ambiguous and occurs mostly at the upper organisational levels (Fiol & Lyles, 1985).

Besides these, exploration capability also interpreted as adaptability that refers to the ability to respond quickly to environmental change by reconfiguring activities to meet the market needs (Gibson & Birkinshaw, 2004), search scope that looks at the extent to which a firm explores new knowledge (Katila & Ahuja, 2002), and technological resources that is the foundation for exploration capability (Yalcinkaya, Calantone, & Griffith, 2007). Others like flexibility (Eisenhardt, Furr, & Bingham, 2010), and revolutionary change (Tushman & O'Reilly, 1996) had also been related to exploration capability. Meanwhile, from the concept of DCs, opportunity sensing is interpreted as equivalent to exploration capability (Teece, 2009) where one type of DCs is DCs for exploration (Fischer, Gebauer, Gregory, Ren, & Fleisch, 2010).

In the context of this study, all interpretations in Table 2.5 for exploitation and exploration capabilities are recognised as synonymous, and should be treated as the same. This is because by combining all of the related interpretations, the meaning of exploitation and exploration capabilities can be better understood. Nevertheless, for standardisation purpose the terms exploitation and exploration capabilities are maintained and used consistently throughout this study. However, the interpretations will be referred to when necessary.

For the purpose of this study, exploitation capability was referred to as the ability to build, refine, implement, and execute familiar NPD projects with already known knowledge/competencies for current viability of the firms (Rothaermel & Alexandre, 2009; O'Reilly & Tushman, 2008; Levinthal & March, 1993; March, 1991). This definition is adopted since NPD projects with incremental improvement were considered as producing new products that are relatively different from the existing one (Kim & Kim, 2009). As for exploration capability, it is defined as the ability to search, experiment, innovate, and discover new opportunities through NPD projects with unfamiliar or new knowledge/competencies for future viability of the firm (Rothaermel & Alexandre, 2009; Levinthal & March, 1993; March, 1991). This definition is adopted since innovative products that were built with new concepts and technologies are significantly different from the previous one as firm has relatively little knowledge on the innovative product development (Kim & Kim, 2009).

2.3.5 The Perspectives of Exploitation and Exploration Capabilities

It is no doubt that both exploitation and exploration capabilities are positively influence a firm's performance (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011). However, firm's ability to create new products is determined by the interaction and interdependent between exploitation and exploration capabilities that vary in the degree of use (Katila & Ahuja, 2002). As such, it was argued that the deployment of exploitation and exploration of new products can be performed either separately or simultaneously (Raisch, Birkinshaw, Probst, & Tushman, 2009; Chen & Katila, 2008; O'Reilly & Tushman, 2008). Table 2.6 shows the summary of two perspectives on exploitation and exploration capabilities in NPD studies.

Table 2.6
Two Perspectives of Exploitation and Exploration Capabilities in NPD Literature

Authors	**Sequential (Trade-off)**	**Simultaneous (Parallel)**
Chu, Li and Lin (2011)		▪
Molina-Castillo, Jimenez-Jimenez and Munuera-Aleman (2011)	▪	
Li, Chu and Lin (2010)		▪
Kim and Atuahene-Gima (2010)		▪
Atuahene-Gima and Murray (2007)	▪	
Ahn, Lee and Lee (2006)		▪
Rothaermel and Deeds (2004)	▪	
Kyriakopoulos and Moorman (2004)	▪	

As shown in the table, the first perspective is to use each of capabilities separately (trade-off) under different conditions. For instance, when the environment is stable, focus is given to the exploitation of new product to strengthen NPD performance, but when the environment is turbulent, focus is given to the exploration of a new product to achieve better NPD performance (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011). Similarly, a previous study has shown that simultaneous use of exploitation and exploration strategies reduces the new product financial performance as they are in a trade-off situation (Kyriakopoulos & Moorman, 2004).

In addition, it was shown when both capabilities are combined, diminishing returns occurred to NPD performance (Atuahene-Gima & Murray, 2007). As for these reasons, exploitation and exploration capabilities should be deployed sequentially.

The second perspective is to use both capabilities in complementary or parallel since the trade-off between exploitation and exploration does not exist (Gibson & Birkinshaw, 2004). Since strategy is a process where a firm continues to exploit current technologies and markets for existing business while at the same time also takes risk by exploring new technologies and markets for emerging business (Harreld, O'Reilly, & Tushman, 2007), previous study showed that the exploitation and exploration of new products should be used in parallel. For instance, a study in NPD had shown exploitation and exploration capabilities that are widely suggested to be a trade-off in the organisational learning literature are actually compatible with each other (Ahn, Lee, & Lee, 2006). This is because when the environment is stable, using the combination of high-level of exploitation capability with low-level of exploration capability can positively increase NPD performance (Chu, Li, & Lin, 2011). The parallel use of exploitation and exploration of new products is also justified where the cost efficiency (e.g., exploitation) and differentiation (e.g., exploration) of new product advantages led to greater NPD success (Kim & Atuahene-Gima, 2010). In fact, the exploitation and exploration of new products have to be used in balance to reduce time-to-market and improve product performance (Cohen, Eliashberg, & Ho, 1996). Similarly, since a healthy balance is crucial to the firm's short- and long-term viability (Ahn, Lee, & Lee, 2006), previous study had shown that high exploitation capability needs to be combined with low exploration capability and vice versa (Li, Chu, & Lin, 2010). As for these reasons, exploitation and exploration capabilities should be deployed simultaneously.

In the context of this study, although exploitation and exploration capabilities can be treated either sequentially or simultaneously, this study has decided to adopt both perspectives as "exploitation and exploration are not mutually exclusive" (Zack, 1999, p. 137). Moreover, even though "in pure exploitation, a firm uses both existing technological and customer competencies … [while] in pure exploration, the new product is a tool to build new competencies relating to both customers and technologies" (Danneels, 2002, p. 1105), they are complementary (Chu, Li, & Lin, 2011) and important to be viewed together (Yalcinkaya, Calantone, & Griffith, 2007). Under these circumstances, it appeared that the perspectives on exploitation and exploration capabilities can change from sequentially to simultaneously and vice versa according to the context of study.

Since the number of NPD studies on exploitation and exploration capabilities in manufacturing sector of Malaysia is relatively low, both perspectives were relevant and adopted in this study. As a result, this study is able to investigate the deployment of individual exploitation and/or exploration capabilities with the sequential perspective, and organisational ambidexterity (that will be discussed next) with the simultaneous perspective.

2.4 Reviews on Organisational Ambidexterity Literature

Organisational ambidexterity has been defined as a firm's ability to simultaneously create balance between adaptability and alignment (Birkinshaw & Gibson, 2004), efficiency and flexibility (Luzon & Pasola, 2011), and exploitation and exploration (Jansen, Bosch, & Volberda, 2005). This implies organisational ambidexterity can be used to create balance between any two things that are in contradiction. However, since organisational ambidexterity is manifested by the simultaneous pursuing of exploitation and exploration of new products (Rothaermel & Alexandre, 2009), study on organisational ambidexterity should be stay focused on exploitation and exploration terms to maintain its original construct (O'Reilly & Tushman, 2013).

Basically, the term ambidexterity refers to the ability to use both hands with equal skill. When applied to the organisational context in NPD, it refers to the firm's ability to deploy both exploitation and exploration of new products simultaneously (Luzon & Pasola, 2011). The idea for organisational ambidexterity emerged since firms manage concurrent NPD projects to get benefits from technology transfer but need not compromised the integrity and quality of individual project. In doing so, managing multiple projects demand the firms to build and implement specific organisational capabilities with the skills that are not easily acquired (Nobeoka & Cusumano, 1997). According to literature, managing multiple projects without compromising individual project can be done with organisational ambidexterity that allows firms to renew their competencies by introducing breakthrough products without destroying the existing business (O'Reilly & Tushman, 2004).

In addition, organisational ambidexterity is crucial since exploitation and exploration of new products that are the resources to develop competitive advantage under dynamic environment (Auh & Menguc, 2005) need coordination and integration to create value (Teece, 2007). Without coordination and integration, exploitation and exploration of new products that are the knowledge-related non-tradable firm assets (Teece, 2007) can possibly turn from core capabilities into core rigidities (Leonard-Barton, 1992), competency traps (Levitt & March, 1988), or failure/success traps (Levinthal & March, 1993). Therefore, in order to deal with this incongruence and to create balance between exploitation and exploration of new products, firms need to become ambidextrous (Visser, *et. al.*, 2010; Taylor & Helfat, 2009).

For those reasons, scholars' interest in the concept of organisational ambidexterity has been increasing in recent years as shown by the number of studies in major management journals (Raisch, Birkinshaw, Probst, & Tushman, 2009). Accordingly, previous studies had consistently viewed the organisational ambidexterity from the concepts of dynamic organisational capability (Venkatraman, Lee, & Iyer, 2007), DCs (O'Reilly & Tushman, 2008), and organisational-level DCs (Jansen, Tempelaar, Bosch, & Volberda, 2009). This suggests that organisational ambidexterity is a firm's critical capability (Gibson & Birkinshaw, 2004). In that case, organisational ambidexterity was treated as a firm's organisational capability. As for this study, organisational ambidexterity was also treated the same way.

In the meantime, firm performance can be effectively improved if it is capable of reconciling and harnessing the trade-off activities between exploitation and exploration of new products (Rothaermel & Alexandre, 2009). In fact, striking a balance between exploitation and exploration is crucial for rent creation (Rugman & Verbeke, 2002; Wernerfelt, 1984) since focusing too much on exploitation or exploration alone can lead to disaster (He & Wong, 2004; Levinthal & March, 1993). Meanwhile, previous study had revealed that when exploitation and exploration of new products are jointly used at different levels, their effect on NPD performance is positive (Chu, Li, & Lin, 2011). All of these were suggesting that organisational ambidexterity was able to increase NPD performance.

Clearly, the topic of organisational ambidexterity was relevant for this study since NPD contributions to performance were gradually going to the south despite increasing number of NPD projects due to the firm focusing too much on exploitation of new products (Cooper, 2005). Similarly, a study in manufacturing sector of Malaysia has discovered the same trend since vast amounts of NPD projects were related to exploitation of new products (Mat & Jantan, 2009). As a result, He and Wong (2004) has suggested the Malaysian manufacturing firms to use organisational ambidexterity in creating balance between exploitation and exploration of new products so that the NPD performance can be increased.

Nevertheless, it was discovered that organisational ambidexterity itself may have some limitations of use if pushed to the upper limit that can also negatively affects NPD performance (He & Wong, 2004). Moreover, managing different capabilities simultaneously is not an easy process since firms usually stick to what they do best (Visser, *et. al.*, 2010). Under these circumstances, this study on organisational ambidexterity is timely relevant since it may have both advantages and disadvantages compared to exploitation and exploration capabilities on NPD performance that deserve further investigation.

2.4.1 Literature Streams of Organisational Ambidexterity

There are four streams of literature on organisational ambidexterity, namely (1) organisational learning that interested on balancing between exploitation and exploration, (2) organisational adaptation on the balancing between continuity and change, (3) strategic management on the balancing between variation-reducing and variation-increasing, and (4) technological innovation on the balancing between incremental and radical (Raisch & Birkinshaw, 2008). Although there were many literature streams of organisational ambidexterity, they are similar in term of creating balance between two contradicted concepts. In the context of this study, the literature stream from organisational learning is adopted since it related to the earlier discussion of exploitation and exploration capabilities (see Section 2.3). On the other hand, the literature stream from technological innovation would also be adopted for this study since exploitation and exploration of new products were treated as equivalent to incremental and radical NPDs, respectively (see Section 1.1, p. 5).

Alongside with the literature streams, there are four incongruences or disagreements that need further attention in organisational ambidexterity, which are between (1) differentiation vs. integration of ambidexterity (pursuing exploitation and exploration of new products in different vs. same organisational unit), (2) organisational vs. individual level of ambidexterity (different organisational structures for parallel exploitation and exploration of new products vs. managers that flexibly allocate time for exploitation and exploration of new products), (3) static vs. dynamic perspective of ambidexterity (or sequential vs. simultaneous pursuit of exploitation and exploration of new products), and (4) internal vs. external perspective of ambidexterity (exploitation and exploration of new products addressed either internal or external to the firm) (Raisch, Birkinshaw, Probst, & Tushman, 2009). Even though all four perspectives were not contradicted to this study, the static (sequential) vs. dynamic (simultaneous) perspective for pursuing exploitation and exploration of new products is more related to this study, which is explained as follows:

Although organisational ambidexterity can be performed either sequentially or simultaneously (Venkatraman, Lee, & Iyer, 2007), it is commonly referred to the simultaneous pursuing of exploitation and exploration of new products (Jansen, Bosch, & Volberda, 2005). In contrast, sequential perspective is more associated to the concept of punctuated equilibrium (Gupta, Smith, & Shalley, 2006) that is not the focus of this study. In addition, previous study had stated that the effect of organisational ambidexterity on firm performance would be greater if firm can simultaneously pursuing both exploitation and exploration of known and new technologies through internal and external sources (Rothaermel & Alexandre, 2009).

Meanwhile, since this study also stressed on dynamic environment, the simultaneous perspective suit this context very well compared to the sequential perspective that is more suitable for stable environment (Raisch, Birkinshaw, Probst, & Tushman, 2009; Chen & Katila, 2008). Furthermore, more research is needed on the simultaneous perspective since a study on organisational ambidexterity had only begun to explore how firms can simultaneously (instead of sequentially) pursuing both exploitation and exploration of new products (Jansen, Bosch, & Volberda, 2005).

As for these reasons, this study refers the organisational ambidexterity as to the ability to simultaneously exploiting the existing products with known knowledge, and exploring the new product opportunities with unfamiliar or new knowledge (Andriopoulos & Lewis, 2009; Raisch, Birkinshaw, Probst, & Tushman, 2009).

2.4.2 Types of Organisational Ambidexterity

Apart from static vs. dynamic perspective of ambidexterity (see previous discussion), the most common issue in organisational ambidexterity is on the use of different types of ambidexterity, which is between structural ambidexterity where a firm uses different structures for different NPD projects, and contextual ambidexterity where individuals within a firm collectively and effectively divide time between different NPD projects (Gibson & Birkinshaw, 2004). As such, there are two meanings of ambidexterity, which are according to structure and behaviour. While ambidexterity that exists in the structure is called structural ambidexterity, ambidexterity that lies in the behavioural orientation (e.g., individual management ability, capability of top management team, capability embedded in general behaviour of organisational members) is called contextual ambidexterity (Luzon & Pasola, 2011). These terms and concepts of structural ambidexterity and contextual ambidexterity have been widely accepted within literature (Gibson & Birkinshaw, 2004). Table 2.7 shows the comparison between them (Birkinshaw & Gibson, 2004).

Table 2.7
Structural Ambidexterity vs. Contextual Ambidexterity

Characteristics	**Structural Ambidexterity**	**Contextual Ambidexterity**
How is ambidexterity achieved?	Alignment-focused (exploitation) and adaptability-focused (exploration) activities are done in separate units or teams	Individual employees divide their time between alignment-focused (exploitation) and adaptability-focused (exploration) activities
Where are decisions made about the split between alignment and adaptability?	At the top of organisation	On the front line – by salespeople, plant supervisors, office workers
Role of top management	To define the structure, to make trade-off between alignment and adaptability	To develop the organisational context in which individuals act
Nature of roles	Relatively clearly defined	Relatively flexible
Skills of employees	More specialists	More generalists

As shown in the table, structurally ambidextrous firm separates the exploitation unit from the exploration unit, each with different management, processes, structures, and cultures, but they are well integrated under a senior management team (O'Reilly & Tushman, 2004) to allow the structures to be "tightly coupled [within] subunits that are themselves loosely coupled with each other" (Benner & Tushman, 2003, p. 247). As such, in order to become structurally ambidextrous, one needs to have the senior teams (1) that have the ability to sense and understand different needs of businesses, (2) that are committed to implement ambidexterity even though other members are not ambidextrous, and (3) that communicate a clear vision to allow both exploitation and exploration of new products to co-exist (O'Reilly & Tushman, 2004).

In contrast, contextual ambidexterity is viewed as a meta-level capacity with multidimensional construct, in which the simultaneous pursuing of exploitation and exploration of new products within a single business unit is built on the processes or systems that encourage individuals to divide their time between activities. This means, while these individuals in their units provide value to the current customers, at the same time they are also seeking for opportunities that exist in the changing environment and must respond accordingly. Therefore, contextual ambidexterity allows individuals in the firm to dynamically and flexibly decide on how to divide time between the rewarded and valued activities of exploitation and exploration (Gibson & Birkinshaw, 2004). The collective efforts of individuals at pursuing exploitation and exploration of new products can be exhibited at the organisational level of contextual ambidexterity (Schudy, 2010). This is because the organisational ambidexterity is built in firms to promote a high-performance organisational context and strive for high-level performance management and social support where stronger interaction between stretch, discipline, support, and trust in the business unit context leads to high-level of contextual ambidexterity (Birkinshaw & Gibson, 2004).

Although the ways structural ambidexterity deals with exploitation and exploration of new products were different from contextual ambidexterity, both of them are important to be viewed together. For instance, while structural ambidexterity gives short-term benefits, contextual ambidexterity gives long-term benefits to the firm (Birkinshaw & Gibson, 2004). Furthermore, various types of organisational ambidexterity should be investigated on NPD performance to fully understand their consequences (Simsek, Heavey, Veiga, & Souder, 2009). For the purpose of this study, structural ambidexterity and contextual ambidexterity were treated as equally important and adopted for further investigation.

Specifically, this study needs to investigate structural ambidexterity because most firms are lacking of the ability to be structurally ambidextrous where they prefer to use similar structure for both exploitation and exploration of new products (Visser, *et. al.*, 2010). Moreover, this study is crucial since previous research that compared various structures for NPD has found that firms with structural ambidexterity are the most successful in launching breakthrough innovation products with increased or at least held steady performance (O'Reilly & Tushman, 2004). Therefore, to suit the context of this study, structural ambidexterity that is achieved via structure (Luzon & Pasola, 2011; Andriopoulos & Lewis, 2009) is defined as a firm's ability to create dual or separate structures for simultaneous pursuing of exploitation and exploration of new products with different management, processes, and cultures but coordinated and integrated under high-level management (O'Reilly & Tushman, 2004).

Meanwhile, contextual ambidexterity was also adopted for this study since it has both direct and indirect links to NPD performance (Schudy, 2010). Furthermore, since coordinating between new and old product linkages is very challenging, it is clear that firms have to be contextually ambidextrous (Taylor & Helfat, 2009). Moreover, when compared to structural ambidexterity, it was found that contextual ambidexterity is less researched (Schudy, 2010), which means it should be emphasised in this study. For the purpose of this study, contextual ambidexterity that is achieved via behaviour (Luzon & Pasola, 2011; Andriopoulos & Lewis, 2009) refers to the collective individuals' behavioural ability in dividing time and efforts to shift between contradicting activities of exploitation and exploration of new products with the support from high-level performance management and social (Birkinshaw & Gibson, 2004; Gibson & Birkinshaw, 2004).

2.4.3 Complementary between Structural and Contextual Ambidexterity

As discussed earlier, while structural ambidexterity manages the incongruences between exploitation and exploration of new products within separate business units, contextual ambidexterity manages the incongruences with the collective behavioural ability of individuals (Gibson & Birkinshaw, 2004). This implies both types of organisational ambidexterity achieve balance between exploitation and exploration of new products in a different ways that deserve equal attention.

So far, the literature had focused on structural ambidexterity when dealing with the conflicting nature between exploitation and exploration of new products since it is the standard approach to deal with conflict where separate structures for exploitation and exploration were created (Birkinshaw & Gibson, 2004). However, separation of activities in different structures can cause isolation (He & Wong, 2004). For these reasons, firms may also need to be contextually ambidextrous since it complements structural ambidexterity in pursuing different NPDs simultaneously (Gibson & Birkinshaw, 2004). For instance, while structural ambidexterity is needed to create differentiation between exploitation and exploration of new products with dual structures, contextual ambidexterity is needed to create integration between dual structures with behavioural and social means (Andriopoulos & Lewis, 2009).

Therefore, in relation to the earlier discussion on structural and contextual ambidexterity (see Section 2.4.2), it was found that another reason for investigating both of them is their complementary function. Moreover, it will be difficult to investigate the effects of organisational ambidexterity if one of them is excluded since previous study has concluded that there was no single way to become ambidextrous, and there was also no single leadership model for ambidexterity (Gibson & Birkinshaw, 2004). As such, both structural ambidexterity and contextual ambidexterity were treated as complementary in this study.

2.5 Reviews on Environmental Turbulence Literature

Almost 20 years ago, Chakravarthy (1997) has observed various industries had gone through major transformations in technology and political climates that have boosted the changing rate and continually increased the levels of environmental turbulence. About the same time, Wind and Mahajan (1997) have found that the business environment of the 90's were characterised with changing business practices (e.g., downsizing and outsourcing), rising population (e.g., demographics and values), new public policies (e.g., privatization), increasing number of mergers, acquisitions and strategic alliances, globalisation, and rapid and radical technology development. Turning into 21st century, environmental turbulence has gaining even more concern since firms can no longer sustain competitive advantage simply through the ownership of a specific set of valuable, rare, inimitable, and non-substitutable resources. This occurred due to the needs that keep on changing, which requires different types and combinations of resources to fulfil them. As a result, firms' capabilities have turned irrelevant at the time of change and make it difficult for any single competitive advantage to sustain longer (Biedenbach & Soderholm, 2008). This implies business environments not just getting high in turbulence, but also becoming unavoidable. In order to survive firms have to face it.

As for this reasons, although firms face barriers in attempting to preserve their competitive advantage when the environment is continuously changing and the relationship between resources and capabilities are dynamic in nature (Grobler, 2007), previous study had recommended that firms need to take risky investments and to be more innovative when facing high environmental turbulence as these activities can increase NPD performance. Since the windows of opportunity are very small, the timing for new product introduction is critical under environmental turbulence. For instance, the implication of being late at introducing a new product to market is greater than the implication of project overspending, unless it is able to be introduced at the most appropriate time. Thus, since the firm's ability to quickly respond to environmental change can be the source of sustainable competitive advantage, managers must deal with the dynamisms and volatility in the environment to reduce the risk and uncertainty (Calantone, Garcia, & Droge, 2003).

As can be expected, Malaysia economy has been facing three unavoidable major environmental turbulences in less than 30 years. It all begun with a Commodity Shock in 1985/86 as a result of massive collapse of world commodity trade, followed by the Asian Financial Crisis in 1997/98 as a result of floated Thai baht, while the latest turbulence occurred in 2008/09 by the Global Financial Crisis as a result of bursting speculative bubble in the US housing market. As a result of recent turbulence, Malaysia manufacturing output has contracted by -14.6% in 2009 (Athukorala, 2010). This implies environmental turbulence did affect the performance of Malaysian manufacturing sector in the past, and will happen again in the future, which makes this study on environmental turbulence as timely relevant.

2.5.1 Characteristics of Environmental Turbulence

Generally, an environment can be considered as turbulent when it is dynamic, heterogeneous, and hostile (Calantone, Garcia, & Droge, 2003), and when the change is frequent and dramatic, prediction is less accurate, and response is less timely (Droge, Calantone, & Harmancioglu, 2008). However, the levels of environmental turbulence is different among industries and also different over time, where at one time it was characterised by high volatility and high competitive intensity, while at other times it was characterised by low volatility and low competitive intensity. This would suggest a firm that serves in one industry may face various environmental conditions over time, which means low- or high-volatile change does not necessarily belong to any specific industry although different industries were known for the pattern of environmental turbulence.

For instance, 20 years ago a study had identified three features of the increased turbulence in information and communication industry, namely falling entry and increasing mobility barriers with the convergence of industries and overlap of boundaries, increasing return to scale in the knowledge-based industries that heads toward disequilibrium instead of diminishing return, and the dynamics of innovation with frequent NPD (Chakravarthy, 1997). However, looking at today standards these three features of turbulence have also been characterised other industries in manufacturing sector such as electrical and electronics. Besides that, the automotive industry for instance is associated with more moderate change, but with the global oil crisis and increased environmental concerns, alternative technologies such as bio-fuel, fuel-cell, electric, and hybrid technologies have elevated the uncertainty of future dominant technologies in this industry. Table 2.8 depicts the characteristics of environmental turbulence (Eisenhardt & Martin, 2000).

Table 2.8
General Characteristics of Environmental Turbulence for the Study

Characteristics	**Low/Moderate-Level of Environmental Turbulence**	**High-Level of Environmental Turbulence**
Predictability	More predictable	Less predictable
Pattern type	More patterned	Less patterned
Market stability	More stable	Less stable
Market boundary	Clear market boundary	Unclear market boundary
Frequency of occurrence	More frequent	Less frequent
Capability activity	Exploitation	Exploration
Structure for activity	Rigid/detailed structure	Less rigid/simple structure
Source of change	More toward external	Internal and external

As shown in the table, moderate environmental turbulence is characterised by the change that occurs very frequently yet predictable, which happens under stable conditions with linear structures and clear market boundaries. Under this environment, capability building is based on rigid and detailed structures and more toward exploitation capability. On the contrary, high-volatile environmental turbulence is characterised by the change that is less predictable, less stable condition with nonlinear structure and unclear market boundaries. Under this environment, capability building is based on less rigid and simple structures and more toward exploration capability (Eisenhardt & Martin, 2000). However, in any case, moderate change occurs more frequently than volatile change (Tripsas, 1997).

Also mentioned in the table are the sources of environmental turbulence, namely the internal source that can be caused by the change in policies under new management/leadership, and external source that can be caused by the change in customer preferences (Ambrosini, Bowman, & Collier, 2009), technological, competitive, and resource uncertainty (Song & Montoya-Weiss, 2001). When related to the levels of turbulence, it was found that change in moderate environment was contributed mainly by the external factors, while change in volatile environment was contributed by both internal and external factors (Eisenhardt & Martin, 2000).

Based on these levels and characteristics of environmental turbulence, it was found that Malaysian manufacturing sector has gone through both high- and low-turbulence from internal and external factors since 30 years ago with three major turbulences and various smalls one. This makes environmental turbulence so critical to be considered in NPD study of Malaysian manufacturing sector. As a consequence, this study was focusing on both levels of environmental turbulence since the right deployment strategies for organisational capabilities should be differentiated under different levels of environmental turbulence.

2.5.2 Types of Environmental Turbulence

As "the source of turbulence – that is, where it is derived – impacts either the degree of moderation or the identity of the relationships moderated or both" (Droge, Calantone, & Harmancioglu, 2008, p. 281) and as the environmental turbulence and hyper-competition are not necessarily the same thing (Chakravarthy, 1997) such as where the environment may be turbulent but competition may be less intensive, by considering all factors that contribute to environmental change, it is crucial to understand their effects on NPD performance. For instance, since the effects of strategic decision comprehensiveness to the types of NPD outcomes varied according to the source of environmental turbulence, researchers were suggested to consider other sources of environmental turbulence besides technological and demand (market) uncertainties (Atuahene-Gima & Li, 2004). Therefore, since changes in capability development are contributed by the heightening of the intensity of international competition (competitiveness intensity), rapidly changing market demand (market turbulence), and rapid changing of technology (technological turbulence) (Wheelwright & Clark, 1992), it was shown that the market turbulence, technological turbulence, and competitive intensity are the sources of environmental turbulence (Droge, Calantone, & Harmancioglu, 2008; Jaworski & Kohli, 1993). These three types of environmental turbulence are discussed as follows:

Market turbulence is one type of market uncertainty (Chen, Reilly, & Lynn, 2005). It refers to the rate of change in customers' preferences and composition (Jaworski & Kohli, 1993), and continuous change in customer demand, price structure, and competitor composition (Calantone, Garcia, & Droge, 2003). It also refers to the perception on customer preferences, demand, and emergence of new market segments with speed of change and unpredictability (Atuahene-Gima & Li, 2004). In

Malaysia, changing in consumer preferences can be caused by differences in cultures and ethnicities, levels of uncertainty acceptance, individualism, and long-term orientation (Sian, Chuan, Kai, Chen, & Chen, 2010). For the purpose of this study, market turbulence is regarded as a constant change in customer preferences, and price/cost structures, where firms must continuously modify their products to satisfactorily address the source of change (Calantone, Garcia, & Droge, 2003).

On the contrary, technological turbulence that is one type of technological uncertainty (Chen, Reilly, & Lynn, 2005) can be caused by innovation in technology that has accelerated the change in scientific communities and marketplace (Calantone, Garcia, & Droge, 2003). It is a crucial factor that not only affects the firm competitiveness but also underpins globalisation, national economic growth, and its lifecycle (Banbury & Mitchell, 1995). It can affect the types of development activities that is emphasised by the firm (Song & Montoya-Weiss, 2001). It can be regarded as the perception on firm's technology in terms of speed of change and unpredictability that is characterised with rapid obsolescence of technology and shorter product development cycle (Atuahene-Gima & Li, 2004). In Malaysia, technological change can be caused by technical efficiency, emerging of new production process, and transfer and adoption of new technology (Jajri & Ismail, 2007). For these reason, this study refers technological turbulence as to the rate of change in technology used in NPD (Chen, Reilly, & Lynn, 2005).

In contrast to the above turbulences, competitive intensity can cause firms to hardly survive in the industries as they unable to entertain customer needs particularly under high-level competitive environment (Gonzales & Palacios, 2002). This happens due to strong competition has limited the opportunities available to firms (Ang, 2008). Thus, by strategically responding to competition, firms can achieve long-term profitability. Since competitiveness depends on organisational context (Barnett, 1997), there are at least five competitive forces that can influence the firms' profitability at industry-level, which are the (1) threat of entry, (2) threat of substitutes, (3) power of suppliers, (4) power of buyers, and (5) the rivalry among existing competitors. These five forces that are crucial aspects of competitive environment provide the baseline to the strengths and weaknesses of firms (Porter, 2008). Meanwhile, at firm-level competitive intensity refers to the magnitude of firm's effects on the rivals' chances of life, in which a firm with a high-level competitiveness is the one that has zero-sum relationships with the others (Barnett, 1997). In Malaysia, competition can possibly be increased under economic liberalisation such as AFTA, FTA, TPPA, and subsidy reduction (Nugroho, n.d.). As such, this study refers competitive intensity as to "the degree of competitive strength in a product market" relative to the number of competitors and competing areas (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011, p. 4; Miller, 1987).

Although there were three different types of environmental turbulence, this study has decided to look further into all of them. This is importance since looking at environmental turbulence as a multidimensional instead of unidimensional construct would allow the observation of a more complete result related to the effects of different sources of environmental turbulence to NPD outcomes (Atuahene-Gima & Li, 2004). Correspondingly, the need to address all three types of environmental turbulence was recommended in previous study that suggested besides market and technological turbulences, future research should also include competitive intensity to clarify the relationship between product meaningfulness and NPD performance (Rijsdijk, Langerak, & Hultink, 2011). Moreover, since the source of uncertainty can be technological, marketing, competitive, and/or the resources themselves, future research that look at the independent and joint effects of various sources of uncertainty on NPD process and their interaction should be explored (Song & Montoya-Weiss, 2001). This implies all three types of environmental turbulence were important to be viewed together.

As for these reasons, all three types of environmental turbulence were adopted in this study. Therefore, to suit the context of this study environmental turbulence is referred to the frequency and unpredictability of market turbulence, technological turbulence and/or competitive intensity in manufacturing sector that affects firm's NPD performance (Menguc & Auh, 2006; Jaworski & Kohli, 1993).

2.5.3 Moderating Effects of Environmental Turbulence on NPD Performance

Environmental turbulence is filled with risk and uncertainty in NPD strategy that is elevated by the frequency and unpredictability of the market and technological changes (Calantone, Garcia, & Droge, 2003). As such, it was recognised since 20 years ago that citing results from studies that assumed a stable state condition would be inaccurate to reflect the current state of NPD field (Page, 1993). Obviously, there is already growing interest in investigating the effects of exploitation and exploration of new products on NPD performance, particularly under the scope of environmental turbulence (Kim & Atuahene-Gima, 2010; Li, Chu, & Lin, 2010; Akgun, Byrne, Lynn, & Keskin, 2007; He & Wong, 2004).

For instance, previous study had highlighted market turbulence did not just negatively affect firm's financial performance (McNally, Cavusgil, & Calantone, 2010) but also NPD performance (Langerak & Hultink, 2006). Nevertheless, empirical research that related the moderating effects of external environment on exploitation and exploration of new products has just begun (Jansen, Bosch, &

Volberda, 2006). As such, although it has been proven both exploitation and exploration of new products were positively related to NPD performance (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011), their individual effects on NPD performance can be different depending on the types of environmental turbulence (He & Wong, 2004). As such, a study that focuses on the moderating effects of environmental turbulence on NPD performance would be relevant.

The need to investigate the moderating effects of environmental turbulence is important since previous studies had put forward that there is no effect of the environmental turbulence on NPD performance when tested directly, but the effect is obvious when it is tested as a moderator. This lends support in strengthening the roles of environmental turbulence as a moderator to NPD performance (Li, Chu, & Lin, 2010; Calantone, Garcia, & Droge, 2003). Thus, when relating to NPD performance, previous studies had shown that environmental turbulence has a moderating influence over the relationship between organisational capabilities and NPD performance. For instance, the positive effect of exploitation capability on NPD performance is stronger when moderated by a greater level of competitive environment, output-based reward, and project development formalisation, while the positive effect of exploration capability on NPD performance is stronger when moderated by the greater level of dynamic environment, process-based reward, and risk-taking encouragement (Li, Chu, & Lin, 2010).

In addition, previous study had also suggested that the positive effect of exploitation capability on product quality increases under greater market turbulence, while for exploration capability the positive effect on innovativeness decreases under greater competitive intensity (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011). Similarly, organisational ambidexterity that is important for dealing with the trade-off between exploitation and exploration of new products is recommended to be effective under environmental turbulence, which is evidenced in previous study that showed firms being successful at pursuing organisational ambidexterity under dynamic environments (Lin & Peng, 2012). Meanwhile, the combination between high-level alignment (exploitation) and low-level adaptability (exploration) is the best combination to achieve high performance under stable environments (Gibson & Birkinshaw, 2004). These studies implied that the environmental turbulence does have a moderating effects on NPD performance, and depending on the types and levels of turbulence, these effects can be positive or negative.

In the context of this study, it can be concluded that environmental turbulence influences NPD performance through its moderation effects on organisational capabilities. Thus, as the environmental aspects have becoming the focal point of discussion in various studies (Jansen, Bosch, & Volberda, 2005), future research should explore the moderating effects of different types of environmental turbulence in the relationships between organisational capabilities and NPD performance. Thus, the moderating effect of environmental turbulence was also adopted as a focal point of discussion in this study between organisational capabilities and NPD performance.

In the meantime, since the environment is changing quickly with advancement and automation in technologies that have caused a shorter product lifecycle (Song & Montoya-Weiss, 2001), firms were forced to rethink a more dynamic way to develop new products (Takeuchi & Nonaka, 1986) where dynamic connotes change (Winter, 2003). As a key for quick NPD to market is the ability to respond to emerging demand and quickly rectify mistakes as soon as possible (Menon, Chowdhury, & Lukas, 2002), the concept of DCs becomes pertinent. The relevance of this contemporary theory on the issues addressed in this study is discussed next.

2.6 The Contemporary Theory of Dynamic Capability

In general, there are basically three possible theories that fit the context of this study. Firstly, the concept of punctuated equilibrium that allows firms to incrementally change (evolutionary) throughout a long period of stability, and punctuated with a radical change (revolutionary) throughout a short period of instability (Lam, 2004; Tushman, Smith, Wood, Waterman, & O'Reilly, 2002). However, as radical change can happens at any time without following a long period of stability, punctuated equilibrium was not so accurate in describing the reality of change in environment (Bitar, 2003). Secondly, the contingency theory allows firms to make strategic choice depending on the conditions they face since there is no optimal solution for all (Ginsberg & Venkatraman, 1985), but this theory has been criticised as having lack of clarity (Schoonhoven, 1981) and static in nature (Sabherwal, Hirschheim, & Goles, 2001). Thirdly, the concept of DCs would allow firms to use different capabilities to match the source of change (Teece, 2007; Teece, Pisano, & Shuen, 1997) under both low- and high-level of environmental turbulence (Ambrosini, Bowman, & Collier, 2009; Eisenhardt & Martin, 2000). Since previous study had demonstrated the concept of DCs in relation to NPD performance under high-level of environmental turbulence (e.g., Pavlou & Sawy, 2011), it appears that this concept is the most relevant to address the issues in this study.

2.6.1 Evolution of DCs from RBV

The concept of DCs was emerged from resource-based view (RBV) that views the source of competitive advantage as not residing in the existing distinctive competencies, but in the ability to create them (Chakravarthy, 1997). This RBV concept was started back from the Penrose's work in 1959 that focuses on a balanced sequence of resource development to achieve goals (Rugman & Verbeke, 2002). It was then popularised by Wernerfelt in 1984 that claimed the imperfectly available resources are the firm's position barrier to maintain high returns over long periods of time. Prescriptively, RBV is designed to achieve and sustain above average returns vis-à-vis rivals with a bundle and combination of resources that are firm specific, heterogeneous, and rarely distributed among firms. This sustainable above average returns is achieved in equilibrium and created via isolating mechanisms and superiority of resources in the face of rivals (Rugman & Verbeke, 2002).

Since DCs treats firm's resources as heterogeneous to achieve sustainable competitive advantage (Helfat & Peteraf, 2003; Barney, 1991), it exists as an extension of RBV (Ambrosini & Bowman, 2009; Teece, 2009; Teece, Pisano, & Shuen, 1997). For this reason, the assumptions used in RBV also apply to DCs (Ambrosini & Bowman, 2009) as they share many similar features (Webb & Schlemmer, 2008) such as where a competitive advantage is created with the resources or capabilities that were not just valuable, rare, inimitable, but also non-substitutable (Rugman & Verbeke, 2002; Barney, 1991).

On the other hand, although DCs is extended from RBV and share many similar features, they are different in three aspects. Firstly, the advantage of RBV is achieved in equilibrium, while DCs is achieved in disequilibrium (Webb & Schlemmer, 2008). Secondly, RBV focused on the best way of utilising firm's resources, while DCs focused on the best way of integrating, renewing, reconfiguring, and recreating resources (Kusunoki, Nonaka, & Nagata, 1998). Thirdly, RBV is static in nature and insensitive to environmental change, while DCs is dynamic in nature that responds to environmental change (Webb & Schlemmer, 2008; Teece, Pisano, & Shuen, 1997).

For the above reasons, although both of them are resource centric that shares many similar assumptions, this study is interested in the concept of DCs instead of RBV since it fits the context of this study very well. Specifically, the relationships between organisational learning, organisational ambidexterity, and NPD performance with the moderating effects of environmental turbulence should be best viewed with DCs that is useful to firms operating under rapidly changing environment (Webb & Schlemmer, 2008). In fact, recent study has found that DCs is useful for this study as it affected decision making and performance of firms in Malaysia (Omar, Sulaiman, Hui, Rahman, & Hamood, 2015). Similarly, other study also found DCs concept through organisational learning has led to the performance of Malaysian manufacturing firms (Ramayah, Sulaiman, Jantan, & Ching, 2004). Correspondingly, previous study has recommended Malaysian SMEs to focus on DCs in innovation to compete globally (Rosli, 2012). All of these have implied the importance of DCs for achieving better performance and competitive advantage in manufacturing sector of Malaysia. For these reasons, DCs concept was adopted as a relevant theory for this study. For the purpose of this study, DCs is treated as a contemporary theory instead of underpinning theory for the reason that DCs is an extension of RBV (Teece, Pisano, & Shuen, 1997) that is still new and emerging in literature (Bitar, 2003).

2.6.2 Development Paths of DCs

Generally, the concept of DCs that was emerged as an important strategic management topic in the 90's (Rugman & Verbeke, 2002) has shifted the focus on firm's strategy from industry- to firm-level of analysis in explaining the source of competitive advantage. With DCs concept, the focus was emphasised on the firm's resource base that is constantly changing according to environmental turbulence (Guttel & Konlechner, 2010).

As DCs focused on the firm's resource base, it was found that technological assets, complementary assets, financial assets, reputational assets, structural assets, institutional assets, and market assets (Teece, Pisano, & Shuen, 1997) that are tangible and intangible in nature (Hitt, Ireland, & Hoskisson, 2005) can be the source of DCs if they were controlled or assessed by firms (Helfat & Peteraf, 2003). However, as "intangible assets are the ultimate source of sustainable value creation" (Kaplan & Norton, 2004, p. 7), DCs concept aims to achieve better performance by manipulating intangible rather than tangible assets (Teece, 2007).

In relation to intangible assets, development paths for DCs can be based on (1) organisational routines (Cepeda & Vera, 2007; Helfat, *et. al.*, 2007) such as firm specific processes (Wang & Ahmed, 2007), and/or (2) individual cognitions and skills that stresses on the roles of managers with abilities or capacities to become competitive (Cepeda & Vera, 2007; Teece, 2007). As a result of these development paths, DCs has been accepted as firm specific abilities, capacities, skills, processes, and/or routines that are difficult to duplicate by competitors (Pitelis & Teece, 2010).

Nonetheless, since DCs is widely accepted as "a firm ability to build, integrate and reconfigure internal and external competences to address rapidly changing environment" (Teece, Pisano, & Shuen, 1997, p. 516) that is also refers to the firm's ability to purposefully renew resources (Helfat, *et. al.*, 2007), this study is adopting DCs from the second development path that emphasised on the abilities, capacities or skills rather than routines or processes (first development path) as a source of competitive advantage. Adopting the concept of DCs as abilities, capacities or skills is relevant and crucial for this study since all four types of organisational capability (exploitation capability, exploration capability, structural ambidexterity, and contextual ambidexterity) were defined as firm abilities (see Sections 1.6 or 2.7).

For the purpose of this study and building of theoretical framework, DCs is defined according to the most popular DCs definition by Teece, Pisano and Shuen (1997) as a firm's ability to deploy organisational capabilities in response of environmental turbulence in achieving better NPD performance.

2.6.3 DCs in the Context of this Study

Since DCs is "linked to many different content areas, or schools of thought" (DiStefano, Peteraf, & Verona, 2010, p. 1197), it appeared DCs concept is multidimensional in nature (Helfat & Peteraf, 2003; Winter, 2003) that has many forms (Ambrosini, Bowman, & Collier, 2009). As such, DCs concept has been demonstrated for various applications in numerous literatures. However, since this study had defined DCs according to the relationships between organisational learning, organisational ambidexterity, environmental turbulence, and NPD performance, the suitability of DCs concept for this study is shown as follows:

Exploitation and exploration capabilities can be treated as DCs since DCs is "rooted in both exploitative and exploratory activities" (Benner & Tushman, 2003, p. 238) such as where DCs micro-foundations of opportunity sensing and opportunity seizing resemble the exploration and exploitation capabilities, respectively (Katkalo, Pitelis, & Teece, 2010). Since previous study has shown the use of DCs for exploitation and exploration (Fischer, Gebauer, Gregory, Ren, & Fleisch, 2010), these two types of organisational learning are relevant to be studied with DCs concept.

Similarly, organisational ambidexterity that refers to the firm's ability to simultaneously pursue both exploitation and exploration of new products with internal and external sourcing can also be treated as DCs (Rothaermel & Alexandre, 2009). For instance, the ability of middle management in creating and maintaining managerial linkages for communication and coordination between and within units during technological transition does not only represent contextual ambidexterity, but also one form of DCs (Taylor & Helfat, 2009). For this reason, organisational (structural and contextual) ambidexterity is also relevant to be studied with DCs.

Accordingly, in many studies on DCs, environmental turbulence has been characterised with rapidly changing technology (Teece, Pisano, & Shuen, 1997), technological change and global competition (Teece, 2007), converging technologies (Bhutto, 2005), uncertainty of technological knowledge, lack of complementary technologies and developed markets (Marsh & Stock, 2006), emergence of knowledge economy, global competition and technological advance (Lawson & Samson, 2001), unpredictability and strong competition (Chen & Lee, 2009), complex value nets (Kylaheiko & Sandstrom, 2007), radical and new innovation (O'Connor, 2008), new products and processes creation (Helfat, 1997), and rapid development of new products (Deeds, DeCarolis, & Coombs, 2000). This implies DCs and environmental turbulence are linked together (Wang & Ahmed, 2007). As such, this study on environmental turbulence with DCs concept is also relevant.

Meanwhile, NPD performance that has been used in a previous study on DCs (Marsh & Stock, 2006; Ho & Tsai, 2006) can be related to DCs measures of evolutionary fitness and technical fitness (Helfat, *et. al.*, 2007). As evolutionary fitness is for "doing the right things", while technical fitness is for "doing the things right" (Ambrosini & Bowman, 2009), these measures for DCs resemble product effectiveness and process efficiency that measure NPD performance (Verona, 1999). Similarly, since effectiveness is measured with financial criteria, while efficiency is measured with nonfinancial criteria (Verworn, Herstatt, & Nagahira, 2008), this implies DCs concept fits well with NPD financial and nonfinancial performance applied for this study.

2.6.4 Development of Theoretical Framework

Since multidimensional issues in organisational learning, organisational ambidexterity, environmental turbulence, and NPD performance are best to be viewed with DCs concept (Barreto, 2010), this study has conceptualised DCs as a firm's ability to deploy organisational capabilities in response of environmental turbulence in achieving better NPD performance. Accordingly, since DCs treats organisational capabilities as firm-specific, path-dependent, and the source of long-term competitive advantage (Kusunoki, Nonaka, & Nagata, 1998), the theoretical framework that suits the relationships between organisational learning, organisational ambidexterity, and NPD performance under moderating effects of environmental turbulence with DCs concept is depicted in Figure 2.1.

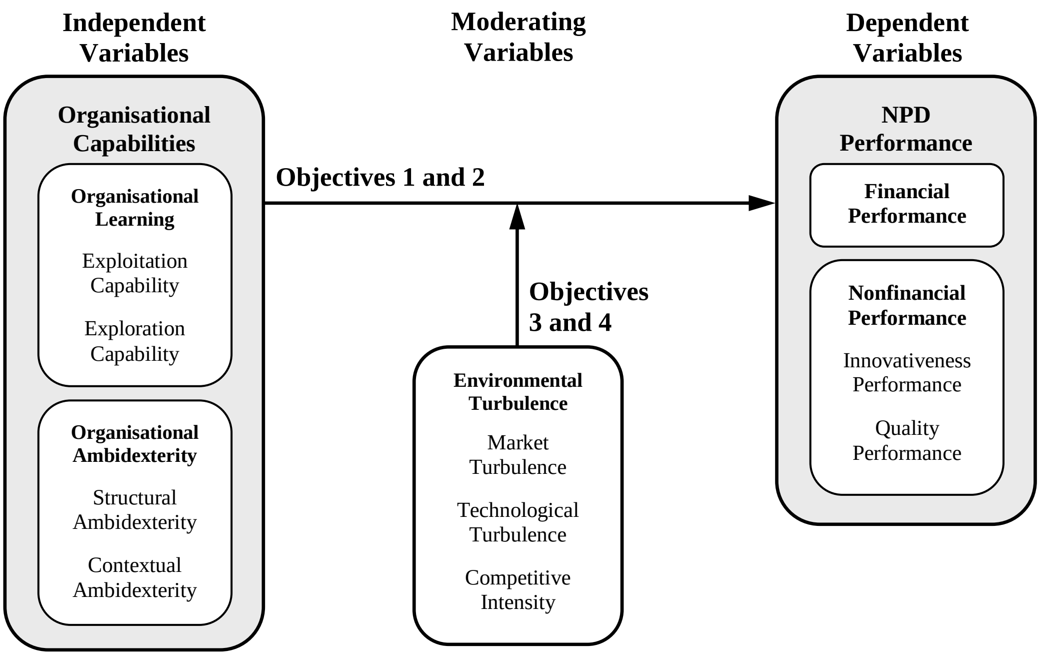


Figure 2.1
The Schematic Diagram of Theoretical Framework

As shown in the figure, Objectives 1 and 2 were addressed through the relationships between organisational learning and NPD performance, and organisational ambidexterity and NPD performance, respectively, while Objectives 3 and 4 were addressed with the moderation of environmental turbulence in the relationships between organisational learning and NPD performance, and organisational ambidexterity and NPD performance, respectively. Therefore, as shown by the flow of relationships in the figure, this theoretical framework was consistent with the conceptualisation of DCs that is built to answer the research questions in this study.

2.7 Operational Definitions

After extensively reviewing the literature on NPD performance, organisational learning, organisational ambidexterity, environmental turbulence, and the concept of DCs, the related terms and variables are conceptualised and/or operationalised according to the purpose and context of this study as follows:

- i NPD performance is conceptualised as the financial and nonfinancial criteria to measure the firm's performance relating to NPD projects (Wang, Lee, Wang, & Chu, 2009; Page, 1993).
- ii NPD financial performance is operationalised as the criteria to measure the firm's performance relating to NPD projects with typical accounting systems, such as market share growth, sales growth, growth in profits, and ROI (Kihn, 2005; Ittner & Larcker, 1998).
- iii NPD nonfinancial performance is conceptualised as the criteria to measure the firm's specific assets relating to NPD projects that cannot be precisely measured with accounting measures, but are predictors to the firm's future financial performance, such as with product innovativeness and quality performance (Kihn, 2005; Ittner & Larcker, 1998).
- iv Innovativeness performance is operationalised as "the extent to which the new product is new to the target market and to the developing firm" (Langerak & Hultink, 2006, p. 206).
- v Quality performance is operationalised as the perception on the superiority of product reliability and customer satisfaction relating to the competing products (Atuahene-Gima & Li, 2004).

vi Organisational learning is conceptualised as an active process that requires continuous feedback in acquiring and processing information, and to improve knowledge for better decision making in administering the firm's NPD projects either with exploitation or exploration capability (Saban, Lanasa, Lackman, & Peace, 2000).

vii Exploitation capability is operationalised as the ability to build, refine, implement, and execute familiar NPD projects with already known knowledge/competencies for current viability of firms (Rothaermel & Alexandre, 2009; O'Reilly & Tushman, 2008; Levinthal & March, 1993; March, 1991).

viii Exploration capability is operationalised as the ability to search, experiment, innovate, and discover new product opportunities with unfamiliar or new knowledge/competencies for future viability of firms (Rothaermel & Alexandre, 2009; Levinthal & March, 1993; March, 1991).

ix Organisational ambidexterity is conceptualised as the ability to simultaneously exploit existing products with known knowledge/competencies, and exploring new product opportunities with unfamiliar or new knowledge/competencies (Andriopoulos & Lewis, 2009; Raisch, Birkinshaw, Probst, & Tushman, 2009).

x Structural ambidexterity is operationalised as the ability to create and use dual or separate structures for simultaneously pursuing exploitation and exploration of new products, each with different management, processes, and cultures, but coordinated and integrated under high-level management (O'Reilly & Tushman, 2004).

xi Contextual ambidexterity is operationalised as the collective behavioural ability that enables individuals' time division and efforts shifting between the contradicted activities of exploitation and exploration of new products, which is promoted under a high-performance organisational context (Birkinshaw & Gibson, 2004; Gibson & Birkinshaw, 2004).

xii Environmental turbulence is conceptualised as the frequency and unpredictability of market turbulence, technological turbulence and/or competitive intensity in manufacturing sector that affect the firm's NPD performance (Calantone, Garcia, & Droge, 2003; Jaworski & Kohli, 1993; Kohli & Jaworski, 1990).

xiii Market turbulence is operationalised as a constant change in the customers' preferences, and price/cost structures where firms must continuously modify their products to satisfactorily address the source of change (Calantone, Garcia, & Droge, 2003; Jaworski & Kohli, 1993; Kohli & Jaworski, 1990).

xiv Technological turbulence is operationalised as the rate of change in the technology used in NPD projects that affects NPD performance (Chen, Reilly, & Lynn, 2005).

xv Competitive intensity is operationalised as “the degree of competitive strength in a product market” relative to the number of competitors and competing areas (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011, p. 4; Miller, 1987).

xvi Dynamic capability is conceptualised as the firm’s ability to deploy organisational capabilities in response of environmental turbulence in achieving better NPD performance (Teece, 2007; Teece, Pisano, & Shuen, 1997).

2.8 Development of Hypotheses

There are not many empirical studies that were done on the topic of organisational ambidexterity (Raisch, Birkinshaw, Probst, & Tushman, 2009), and there is also contradiction in the results of previous studies on organisational learning (Asgari & Eslami, 2012). For these reasons and in line with the purpose of this study, the hypotheses building particularly on the moderation effects of environmental turbulence are based on “a theoretically generated prediction, or an educated guess” (Fife-Schaw, 2006, p. 396) that is consistent with the concept of DCs and the theoretical framework of the study. As such, the hypotheses in this study were built partly on previous empirical research and partly on the theoretical model where the researchers believed that “changes in the value of one variable are related to changes in the value of the other variable” (Argyrous, 2011, p. 17), which are discussed in the following sections.

2.8.1 Development of Organisational Learning and NPD Performance Hypothesis

The hypotheses in this section are built based on Objective 1 of the study that is to determine the basic relationships (not a causal relationship) between each type of organisational learning and NPD performance.

In the case of high-tech semiconductor firms in Malaysia, it appears that the team's organisational learning is positively related to NPD performance (Islam, Doshi, Mahtab, & Ahmad, 2009). This is because, even though the outcomes of learning can be negative, such as in cases where mistakes happen in the process of trial-and-error, the consequences of learning are usually positive (Dodgson, 1993). Meanwhile, it was posited that organisational learning has a positive effect on product innovativeness (Wei & Xiaobin, 2009). In the same consistency, it was shown that organisational learning has a positive effect on organisational innovation (Liao, Fei, & Liu, 2008). Since organisational learning is related to product quality and product innovativeness, hence it would have a positive relationship with NPD nonfinancial performance (Cho & Pucik, 2005).

Specifically, the exploitation and exploration capabilities that are the two forms of organisational learning are imperative to NPD (Zhou & Wu, 2010). There are lots of evidences of the positive relationship between exploitation and exploration capabilities, with NPD performance. For instance, previous study showed that while exploitation capability is related to the enhancement of existing product, exploration capability is related to the production of a completely new product (March, 1991). Similarly, since exploitation capability is related to process innovation, exploration capability is related to product innovation (He & Wong, 2004). Furthermore, while marketing activities are related to exploitation, technical/R&D/technological activities are related to exploration (Yalcinkaya, Calantone, & Griffith, 2007).

In addition, previous research on NPD processes had also shown that proficiency in both marketing (exploitation) and technical (exploration) activities could increase the levels of NPD success (Calantone, Schmidt, & Song, 1996). In the same consistency, a study had revealed that NPD performance is strongly related to marketing (exploitation) and R&D (exploration) capabilities (Krasnikov & Jayachandran, 2008). In a similar vein, the leveraging of organisational capabilities such as technological (exploration) and marketing (exploitation) capabilities is positively related to NPD performance in terms of process efficiency and product effectiveness (Verona, 1999). Moreover, while exploitation capability is positively related to the number of incremental product innovation, exploration capability is positively related to the number of radical product innovation (Tinoco, 2009).

Accordingly, since the existing knowledge assists the development of new knowledge, there is a positive relationship between search depth (exploitation) and search scope (exploration) to product innovation (Katila & Ahuja, 2002). Meanwhile, even though there is no significant difference in product quality of various NPD entry strategies (Millson & Wilemon, 2008), it was posited that both exploitation and exploration capabilities are positively related to product quality. In summary, with all of the evidences from previous studies, organisational learning (both exploitation and exploration) was expected to be positively related to NPD performance.

In a more detail, when looking at the relationship between exploitation capability and NPD performance, research had resulted that effective incremental product development (e.g., exploitation) critically influences the firm's business performance and indirectly influences the firm's survival (Banbury & Mitchell, 1995). Meanwhile, a study in the Malaysian manufacturing firms had revealed that exploitation capability is positively related to sales growth rate (He & Wong, 2004). Moreover, previous results had indicated that since product quality is related to the product's process (Gonzales & Palacios, 2002), exploitation capability in turn is positively related to product quality (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011). In addition, a previous study also showed that the speed and profitability (related to exploitation) of a new product is influenced by product innovativeness (Langerak & Hultink, 2006).

Since previous studies had shown many positive relationships between exploitation capability and NPD performance, by default, this study had hypothesised the bivariate relationship between exploitation capability and NPD performance as follows:

> Hypothesis 1(a): Exploitation capability is positively related to financial performance.
>
> Hypothesis 1(b): Exploitation capability is positively related to innovativeness performance.
>
> Hypothesis 1(c): Exploitation capability is positively related to quality performance.

When looking at the relationship between exploration capability and NPD performance, previous study in the Malaysian manufacturing firms had shown exploration capability to be positively related to sales growth rate (He & Wong, 2004). Meanwhile, since the search scope (exploration) and product performance is linearly related, it has been shown that the wider the search scope, the higher the number of new product introduction would occur (Katila & Ahuja, 2002). Accordingly, rapid product introduction critically influences the firm's business performance and indirectly influences the firm's survival (Banbury & Mitchell, 1995). Furthermore, exploration capability is also positively related to NPD innovativeness (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011) which is consistent with another study that had demonstrated proactive strategic orientation and organic structure (that is synonymous to exploration) having positive effects on innovativeness (Droge, Calantone, & Harmancioglu, 2008). Apparently, since exploration capability is very innovative in nature (Molina-Castillo, Jimenez-

Jimenez, & Munuera-Aleman, 2011) and quality is created with innovation (Gitlow, Oppenheim, Oppenheim, & Levine, 2005), it was suggested that exploration capability should also be related to the creation of the new product quality.

Since previous studies had shown many positive relationships between exploration capability and NPD performance and the relationship between search scope (exploration) and product innovation deserves more investigation in future research (Katila & Ahuja, 2002), by default, this study had hypothesised the bivariate relationship between exploration capability and NPD performance as follows:

> Hypothesis 2(a): Exploration capability is positively related to financial performance.
>
> Hypothesis 2(b): Exploration capability is positively related to innovativeness performance.
>
> Hypothesis 2(c): Exploration capability is positively related to quality performance.

2.8.2 Development of Organisational Ambidexterity and NPD Performance Hypothesis

The hypotheses in this section were built based on Objective 2 of the study that is to determine the basic relationships (not a causal relationship) between each type of organisational ambidexterity and NPD performance.

There are two specific stages of NPD, which are "a truth-seeking early stage … [focusing] on evaluating novel products' prospects and eliminating bad bets", and "a success-seeking late stage … [focusing] on maximising the value of products that have been cleared for development" (Bonabeau, Bodick, & Armstrong, 2008, p. 96). Similarly, there are two types of activities in NPD processes that are the front-end activities, such as concept search, screening, testing, and business analysis, and back-end activities, such as product development, product use/field/market testing, and commercialisation (Page, 1993). In those stages/activities of NPD, it appears that a truth-seeking early stage and front-end activities resemble the nature of exploration capability, while a success-seeking late stage and back-end activities resemble the nature of exploitation capability. This would suggest that both exploitation and exploration of new products are equally important in NPD.

However, exploitation and exploration of new products are both trading-off in nature (March, 1991). As such, many researchers focused into the trade-off relationships between exploitation and exploration of new products (Kyriakopoulos & Moorman, 2004). As a result, "although a large body of research has addressed the question of how to successfully manage the individual [trade-off] innovation projects, the management of a firm's new product portfolio [that includes both exploitation and exploration NPD] has received comparably less research attention" (Salomo, Talke, & Strecker, 2008, p. 560). This is not a surprise as original works on organisational learning clearly stated that they fight for the same scarce resources (March, 1991).

In fact, even though NPD success is positively related to existing competencies (Zirger & Maidique, 1990), which is important for refining existing skills and knowledge in NPD (Zhou & Wu, 2010), improvement of these skills is making exploration of new alternatives to become less attractive (Levitt & March, 1988). At the same time, even though exploration is related to product innovation (He & Wong, 2004), which is important for pursuing new skills and knowledge in NPD (Zhou & Wu, 2010), pursuing new skills would reduce the improvement speed of existing skills (Levitt & March, 1988). For instance, even though search depth (exploitation) is positively related to product innovation, at one point, deepening the search process would decrease the number of new products being introduce (Katila & Ahuja, 2002).

Meanwhile, increase in process management practices does not only improve incremental innovation (exploitation) to satisfy the existing customer needs, but it also improves the response speed to incremental change, and therefore maximising short-term profits of the firm. In contrast, increase in the process management practices would decrease radical innovation (exploration) that is needed to meet the emerging customer needs, and it would also slow down the firm's response to technological change, thereby leading to a decrease in long-term profits of the firm (Benner & Tushman, 2003). As a result, since a single product cannot meet various market needs, firms might need to introduce many new products to satisfy the multiple market segments (Kim, Wong, & Eng, 2005). Since exploitation leads to exploration, and exploration leads to exploitation, the interplay between them are crucial for NPD (Holmqvist, 2004), which justified the need to manage both of them (Rothaermel & Deeds, 2004).

Furthermore, previous study had found that while marketing resources is the foundation for exploitation capability, which is to manipulate the existing capabilities to meet the existing market needs, technological resource is a foundation for exploration capability that is used for creating new capabilities. Since continuous exploitation of existing capabilities is the foundation for exploration capability, it would suggest that exploitation and exploration capabilities are complementary (Yalcinkaya, Calantone, & Griffith, 2007). Similarly, the interrelationship between internal and external processes that is important for resource renewal (Raisch, Birkinshaw, Probst, & Tushman, 2009) are complementing rather than replacing each other (Teece, 1998). In addition, research had shown that while exploration alliances are crucial to the product under development stage, exploitation alliances are crucial to the product on the existing market. Hence, while exploration alliances are critical in early stages of NPD, exploitation alliances are critical in the later stages of NPD. In a similar vein, it was shown that product development from exploration alliances can predict product market from exploitation alliances (Rothaermel & Deeds, 2004). For these reasons, exploitation and exploration of new products that are complementing each other would have joint effects on innovation and performance (Lichtenthaler, 2009). As such, the organisational ambidexterity that refers to the "firm's ability to simultaneously balance different activities [exploitation and exploration of new products] in a trade-off situation" (Rothaermel & Alexandre, 2009, p. 759) is very much needed.

In relation to the organisational ambidexterity that is needed to create the balance between exploitation and exploration of new products in NPD projects, the goals of NPD portfolio management, which are (1) to maximise the overall value of all projects, (2) to create balance between projects, (3) to align projects to the firm's strategy, and (4) to select the best number of projects (Cooper & Edgett, 2001), can be achieved if the firm is ambidextrous, which is higher at both levels of exploitation and exploration innovation strategies (He & Wong, 2004). Therefore, as organisational ambidexterity enables the firm to simultaneously pursue exploitation and exploration of new products to achieve long-term success (Birkinshaw & Gibson, 2004), it was shown that the organisational ambidexterity is related to firm performance (Gibson & Birkinshaw, 2004). Since the improvement in NPD portfolio management positively increases NPD programme performance (Acur, Kandemir, Weerd-Nederhof, & Song, 2010), this study had hypothesised that each and every types of organisational (structural and contextual) ambidexterity is expected to be positively related to NPD (financial and nonfinancial) performance.

In a more detail, when relating structural ambidexterity to NPD performance that is achieved via structure (Andriopoulos & Lewis, 2009) and regarded as the firm's ability to build and manage dual/separate structures for exploitation and exploration NPDs, the relationship between structural ambidexterity and NPD performance can be demonstrated as follows:

Even though a highly coordinated team can be achieved with virtual coordination, the co-location of the physical team remains relevant with the right functional mix. The right mix is important since the design function is critical for innovative (exploration) products, and the marketing function is critical for incremental (exploitation) products (Kim & Kim, 2009). In fact on the one hand, empirical research had proven that when applying functional structure to incremental NPD process, the effect on derivative innovation performance is positive. On the other hand, when applying cross-functional structure to radical NPD process, the effect on breakthrough innovation performance is also positive. In contrast, when applying functional structure to radical NPD process or applying cross-functional structure to incremental NPD process, the effect on innovation performance is negative (Visser, *et. al.,* 2010). Furthermore, previous study had also suggested that when both exploitation and exploration of new products are pursued to the extreme limit, they would be harmful to the firm (He & Wong, 2004). However, since structural ambidexterity is capable of enabling the firm to pursue simultaneously the exploitation and exploration of new products with dual or separate structures, it had been argued to solve the contradiction between exploitation and exploration of new products and to maintain a strong relationship between them with NPD performance. Thus, the relationship between structural ambidexterity and NPD performance was expected to be positive.

Since structural ambidexterity is treated as one form of DCs that is theorised as positively related to NPD performance, by default, this study had hypothesised the basic bivariate relationship between the structural ambidexterity and NPD performance as follows:

> Hypothesis 3(a): Structural ambidexterity is positively related to financial performance.
>
> Hypothesis 3(b): Structural ambidexterity is positively related to innovativeness performance.
>
> Hypothesis 3(c): Structural ambidexterity is positively related to quality performance.

Meanwhile, when relating contextual ambidexterity to NPD performance, the contextual ambidexterity that is achieved via behaviour (Andriopoulos & Lewis, 2009) in terms of the collective individual ability to divide and shift time and effort between the contradicting activities of exploitation and exploration NPDs, the relationship between contextual ambidexterity and NPD performance can be demonstrated as follows:

Since contextual ambidexterity is about the ability to divide and shift time and effort between the contradicting activities, it can be seen through effective communication between different people and functions of the firm. For instance, previous study had indicated that different types of communication are needed for different types of NPD leaders. The differences can be seen when the operating and innovating leaders communicate (1) with team members, (2) external groups or other team members, and (3) between the more and less successful leaders. When communicating with team members, NPD leaders in operating (incremental innovation) systems put more stress on technical issues, product features, product modification, and extension, while NPD leaders in innovative (radical innovation) systems put more stress on marketing and manufacturing issues, and customer needs. When communicating with different groups or other team members, NPD leaders in operating systems communicate more with customers, sales and vendors, while NPD leaders in innovative systems communicate more with engineering people. While NPD leaders in operating systems discuss more on costs, NPD leaders in innovative systems discuss more about technical specifications (Barczak & Wilemon, 1991).

As such, previous research had suggested that effective communication in NPD process can be determined by the types of team leaders' communication that is different between the operating systems and innovating systems. Therefore, when dealing with different NPD processes, either incremental (exploitation) or radical (exploration), team leaders must acquire and utilise different skills of communication with team members, and between teams in order to achieve effective communication in the NPD process (Barczak & Wilemon, 1991). Since contextual ambidexterity is referred to the behavioural ability that enables individuals to perform time division and effort shifting between the contradicting activities of exploitation and exploration in NPD projects (Birkinshaw & Gibson, 2004), the effective communications can be achieved with contextual ambidexterity.

In addition, with the ability to manage and divide time and effort between NPD projects, firms can at one time reconfigure resources for incremental innovation (exploitation) that allows them to gradually adapt the existing routines and structures to the new environments, while at other times firms can be geared for radical innovation (exploration) that requires them to completely renew structures (Teece, 2007) and routines as innovation has changed the existing ones (Sirmon, Hitt, & Ireland, 2007). Meanwhile, since efficiency of NPD projects is positively related to collaborative working environment, which can be achieved with project management experience, balance in management commitment, and integration of cross-functions (Swink, Talluri, & Pandejpong, 2006) that resemble contextual ambidexterity, it was argued NPD performance can be positively related to contextual ambidexterity. For instance, previous study had revealed contextual ambidexterity does have a strong relationship with firm's performance (Gibson & Birkinshaw, 2004).

Since contextual ambidexterity is treated as one form of DCs that is theorised as positively related to NPD performance, by default, this study had hypothesised the basic bivariate relationship between the contextual ambidexterity and NPD performance as follows:

> Hypothesis 4(a): Contextual ambidexterity is positively related to financial performance.
>
> Hypothesis 4(b): Contextual ambidexterity is positively related to innovativeness performance.
>
> Hypothesis 4(c): Contextual ambidexterity is positively related to quality performance.

2.8.3 Development of Hypothesis on Moderating Effects of Environmental Turbulence between Organisational Learning and NPD Performance

The hypotheses in this section were built based on Objective 3 of this study, which was to examine the moderating effects (causal relationship) of each type of environmental turbulence in the relationships between organisational learning and NPD performance.

Since the seminal paper on organisational learning (March, 1991), "there has been a growing interest in research on [exploitation and exploration regarding] if, when, and how organisations adapt to change" (O'Reilly & Tushman, 2008, p. 192). As such, organisational learning has a long time been identified as the firm's key resource and capability for achieving sustainable competitive advantage under turbulent environments (Chu, Li, & Lin, 2011). Since organisational learning is associated to environmental conditions (Kloot, 1997), both types of learning (exploitation and exploration capabilities) are positively related to NPD performance under stable environments, but not necessarily under highly turbulent environments. For instance, when relating to competitive intensity, NPD success is only positively related to the weakly competitive market but negative under highly competitive market (Zirger & Maidique, 1990). Meanwhile, by reducing the levels of market and technical uncertainty, the positive effects on NPD performance can be achieved (Verworn, Herstatt, & Nagahira, 2008). This is because “since learning processes involve lags in adjustment to changes, the contribution of learning to knowledge depends on the amount of turbulence in the environment” (March, 1991, p. 79).

In contrast, when triggered by environmental change, firms have learned to learn differently from their established standards in order to keep in touch with the realities that would allow them to make improvements (Takeuchi & Nonaka, 1986). As such, the effects of organisational learning on NPD performance can be positive under highly turbulent environments. For instance, previous study had shown that firms with high market orientation engaged in high-levels of market exploitation and exploration strategies tended to have strong NPD financial performance (Kyriakopoulos & Moorman, 2004). For these reasons, even though NPD activities (e.g., exploitation and exploration capabilities) would affect NPD performance under high-levels of market and technical uncertainty (Sounder, Sherman, & Davies-Cooper, 1998), the results can be quite different as both positive and negative relationships had been previously reported.

When relating to the relationship between exploitation capability and NPD performance under turbulent environments, various studies showed different results on the direction of the related relationships. For instance, previous study had shown when demand is certain the effect of customer orientation (e.g., exploitation) on the firm's performance is greater (Zhou & Li, 2010). As such, firms will use exploitation strategy with rigid structure under stable environments (Eisenhardt & Martin, 2000). However, if this trend continues for a long period, even though it had been proven to work very well under stable periods, it would potentially create danger for the firm. This is because as the external environment is changing, the established standard (exploitation) from the past success stories would become less practical and thus irrelevant (Takeuchi & Nonaka, 1986). As a result, research had shown that the moderating effect of environmental turbulence between exploitation capability and firm's financial performance can be negative (Jansen, Bosch, & Volberda, 2006). In addition, previous research had also presented that higher technological turbulence has no effect on the relationship between speed-to-market (related to exploitation) and new product success (Chen, Reilly, & Lynn, 2005). Meanwhile, even though competitive erosion of the firm market share can be avoided by being first to introduce incremental innovation (exploitation) to market (Banbury & Mitchell, 1995), high competitive intensity will increase the new product cost efficiency of exploitation capability (Kim & Atuahene-Gima, 2010).

In contrast, another branch of studies had suggested a positive relationship exists between exploitation capability and NPD performance under environmental turbulence. For instance, exploitation of new market under dynamic environments can create longer competitive advantage if the firms' capabilities can deal with the opportunities that have been correctly analysed (Sirmon, Hitt, & Ireland, 2007). In addition, since exploitation capability is related to market turbulence, market orientation that links exploration to exploitation capabilities would only improve the firm’s financial performance of NPD projects (Kyriakopoulos & Moorman, 2004). Moreover, the effect of exploitation capability on NPD quality will be increasingly positive when the level of market turbulence is high (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011). As such, previous study had suggested that when market turbulence is high, the positive effect of the speed-to-market (related to exploitation) on new product success will be stronger (Chen, Reilly, & Lynn, 2005).

Meanwhile, previous study had shown that the direction of relationships can be changed depending on the types and strengths of variables included in the equation. This is because “a regression coefficient that is positive (negative) in sign in a two-variable [bivariate] regression equation may change to a negative (positive) sign for the same independent variable in a multiple [multivariate] regression equation containing other independent variables that are highly correlated with the one in question” (Hamburg, 1983, p. 412). For instance, while NPD performance is positive at low-level exploitation and exploration capabilities, it becomes negative at high-level exploitation and exploration capabilities (Li, Chu, & Lin, 2010). In another NPD study, research had found that the moderating effects of environmental uncertainty between strategic decision comprehensiveness and firm performance were conflicting (Atuahene-Gima & Li, 2004).

Thus, since previous studies showed various results in the direction of relationship between exploitation capability and NPD performance under the influence of environmental turbulence, by default, this study had hypothesised the following relationship according to the theoretically generated prediction and educated guess:

Hypothesis 5(a): The relationship between exploitation capability and NPD performance is significantly moderated by market turbulence; in a more detail:

Hypothesis 5(a)(1): The relationship between exploitation capability and financial performance is significantly moderated by market turbulence.

Hypothesis 5(a)(2): The relationship between exploitation capability and innovativeness performance is significantly moderated by market turbulence.

Hypothesis 5(a)(3): The relationship between exploitation capability and quality performance is significantly moderated by market turbulence.

Hypothesis 5(b): The relationship between exploitation capability and NPD performance is significantly moderated by technological turbulence; in a more detail:

Hypothesis 5(b)(1): The relationship between exploitation capability and financial performance is significantly moderated by technological turbulence.

Hypothesis 5(b)(2): The relationship between exploitation capability and innovativeness performance is significantly moderated by technological turbulence.

Hypothesis 5(b)(3): The relationship between exploitation capability and quality performance is significantly moderated by technological turbulence.

Hypothesis 5(c): The relationship between exploitation capability and NPD performance is significantly moderated by competitive intensity; in a more detail:

Hypothesis 5(c)(1): The relationship between exploitation capability and financial performance is significantly moderated by competitive intensity.

Hypothesis 5(c)(2): The relationship between exploitation capability and innovativeness performance is significantly moderated by competitive intensity.

Hypothesis 5(c)(3): The relationship between exploitation capability and quality performance is significantly moderated by competitive intensity.

Similar to the exploitation capability, previous studies were also in contradiction regarding the direction of relationship between exploration capability and NPD performance under environmental turbulence. For instance, technology orientation (e.g., exploration) is more effective for the firm's performance when demand is uncertain (Zhou & Li, 2010). Therefore, firms will use exploration strategy with organic structure when the environment is turbulent (Eisenhardt & Martin, 2000). Following the same theme, it is evidenced that firms will use more decentralised and organic structure when facing uncertainty and dynamic environments (Calantone, Garcia, & Droge, 2003), since informal control will lead to positive new product quality (Lukas & Menon, 2004). In addition, because exploration capability increases the new product differentiation under high environmental turbulence (Kim &Atuahene-Gima, 2010), investing on innovativeness (technology push) will pay off under high environmental turbulence (Droge, Calantone, & Harmancioglu, 2008).

In contrast, even though exploration capability is positively moderated by the environmental turbulence to firm's financial performance (Jansen, Bosch, & Volberda, 2006), the positive relationship between exploration capability and NPD performance will be decreasing when the level of competitive intensity is high (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011).

Since the results from previous studies were varied in the direction of the relationship between exploration capability and NPD performance when moderated by environmental turbulence, by default, this study had hypothesised the following relationship based on the theoretically generated prediction and best educated guess:

Hypothesis 6(a): The relationship between exploration capability and NPD performance is significantly moderated by market turbulence; in a more detail:

> Hypothesis 6(a)(1): The relationship between exploration capability and financial performance is significantly moderated by market turbulence.
>
> Hypothesis 6(a)(2): The relationship between exploration capability and innovativeness performance is significantly moderated by market turbulence.
>
> Hypothesis 6(a)(3): The relationship between exploration capability and quality performance is significantly moderated by market turbulence.

Hypothesis 6(b): The relationship between exploration capability and NPD performance is significantly moderated by technological turbulence; in a more detail:

Hypothesis 6(b)(1): The relationship between exploration capability and financial performance is significantly moderated by technological turbulence.

Hypothesis 6(b)(2): The relationship between exploration capability and innovativeness performance is significantly moderated by technological turbulence.

Hypothesis 6(b)(3): The relationship between exploration capability and quality performance is significantly moderated by technological turbulence.

Hypothesis 6(c): The relationship between exploration capability and NPD performance is significantly moderated by competitive intensity; in a more detail:

Hypothesis 6(c)(1): The relationship between exploration capability and financial performance is significantly moderated by competitive intensity.

Hypothesis 6(c)(2): The relationship between exploration capability and innovativeness performance is significantly moderated by competitive intensity.

Hypothesis 6(c)(3): The relationship between exploration capability and quality performance is significantly moderated by competitive intensity.

2.8.4 Development of Hypothesis on Moderating Effects of Environmental Turbulence between Organisational Ambidexterity and NPD Performance

The hypotheses building in this section were focused on Objective 4, which is to examine the moderating effects of environmental turbulence in the relationship between organisational ambidexterity and NPD performance.

Even though the level of environmental turbulence is positively related to the level of ambidexterity, there had been no further investigation on the effect of environmental turbulence in the ambidexterity and performance relationship (Raisch, Birkinshaw, Probst, & Tushman, 2009; Jansen, Bosch, & Volberda, 2005). As such, studies that had related the condition (e.g., market turbulence, technological turbulence), where organisational ambidexterity influences the firms' performance, is still relatively rare (Raisch, Birkinshaw, Probst, & Tushman, 2009). In addition, even though organisational ambidexterity may be positively related to environment turbulence, since the new products mix changes over time, the question of how the environmental turbulence affects them remains to be answered (Rothaermel & Alexandre, 2009). This is because the effective balance between exploitation and exploration of new products may not be the same under different environmental turbulence (Raisch, Birkinshaw, Probst, & Tushman, 2009; He & Wong, 2004).

Previous research had indicated the balance between exploitation and exploration activities being important under intense competitions where any miss-balance negatively affects the firms' performance (Auh & Menguc, 2005). It has also been shown that high level of environmental turbulence and competitive intensity would increase the level of ambidexterity (Jansen, Bosch, & Volberda, 2005). As such, it is recommended that organisational ambidexterity is moderated by the environmental factors related to the performance outcomes (Raisch & Birkinshaw, 2008). For instance, recent research had shown that ambidexterity is not just a necessity but it also enhances the firm's performance under environmental turbulence (Lee, Wu, & Liu, 2012). In fact, previous findings has suggested that when levels of environmental turbulence (e.g., market and technology) and competitiveness (e.g., competitive intensity) are high, the organisational units become more ambidextrous by building and pursing both exploitation and exploration of new products simultaneously (Jansen, Bosch, & Volberda, 2005). Therefore, under high environmental turbulence and competitive intensity, both exploitation and exploration of new products must be emphasised (Kim & Atuahene-Gima, 2010), which can be achieved with organisational ambidexterity.

Organisational ambidexterity is a form of DCs that is necessary for product innovation (Tinoco, 2009) where the implications can be seen at the individual, organisational, and environmental levels (Bitar, 2003). Since the firm's success at building and implementing technological innovation is influenced by the firm's environment, internal characteristics, and the flows between the environment and internal characteristics (Utterback, 1971), it had been suggested that the continued success of a firm's NPD is related to the external environment turbulence, internal capabilities (organisational learning and ambidexterity), and their interaction.

For instance, previous study had evidenced the integration between R&D (e.g., exploration) and marketing (e.g., exploitation) is highly necessary when the market and technical uncertainties are high. However, when these levels of uncertainty are low where the environment is predictable, and decisions and actions are routine, the integration is not necessary (Song, Montoya-Weiss, & Schmidt, 1997). In other words, for achieving success, the integration between R&D and marketing has to be achieved under a highly uncertain environment (Sounder, Sherman, & Davies-Cooper, 1998), which can be done with organisational ambidexterity (Kauppila, 2010). Therefore, to survive in the face of environmental turbulence and competitive intensity, firms should be considering using organisational ambidexterity between exploitation and exploration of new products (Tinoco, 2009). For these reasons and since organisational ambidexterity is one form of DCs that is capable of responding to environmental change, this study had hypothesised that organisational ambidexterity (structural and contextual) is significantly related to NPD (financial and nonfinancial) performance under the moderation effects of environmental (market, technological, and competitiveness) turbulence.

In a more detail, since the firm's ability to change and manage different structures for NPD under different environment is related to structural ambidexterity, hence to deal with the trade-off nature between exploitation and exploration of new products, the firm needs to become structurally ambidextrous where it uses separate (dual) structures for different types of learning activities (Visser, *et. al.*, 2010) to maintain a strong relationship with NPD performance under environmental turbulence. Ironically, even though by increasing the overlapping of tasks with some functional interactions (e.g., between separate structures of exploitation and exploration of new products) is eventually beneficial for the firm when the level of uncertainty is low, the result can be harmful under high levels of uncertainty (Bhuiyan, Gerwin, & Thomson, 2004). This would suggest the relationship between structural ambidexterity and NPD performance can be weakened under high-level of environmental turbulence.

Since the direction of relationship between structural ambidexterity and NPD performance under environmental turbulence still lacks of empirical evidences, by default, this relationship was hypothesised based on the theoretically generated prediction and educated guess, as follows:

Hypothesis 7(a): The relationship between structural ambidexterity and NPD performance is significantly moderated by market turbulence; in a more detail:

> Hypothesis 7(a)(1): The relationship between structural ambidexterity and financial performance is significantly moderated by market turbulence.
>
> Hypothesis 7(a)(2): The relationship between structural ambidexterity and innovativeness performance is significantly moderated by market turbulence.
>
> Hypothesis 7(a)(3): The relationship between structural ambidexterity and quality performance is significantly moderated by market turbulence.

Hypothesis 7(b): The relationship between structural ambidexterity and NPD performance is significantly moderated by technological turbulence; in a more detail:

> Hypothesis 7(b)(1): The relationship between structural ambidexterity and financial performance is significantly moderated by technological turbulence.
>
> Hypothesis 7(b)(2): The relationship between structural ambidexterity and innovativeness performance is significantly moderated by technological turbulence.
>
> Hypothesis 7(b)(3): The relationship between structural ambidexterity and quality performance is significantly moderated by technological turbulence.

Hypothesis 7(c): The relationship between structural ambidexterity and NPD performance is significantly moderated by competitive intensity; in a more detail:

> Hypothesis 7(c)(1): The relationship between structural ambidexterity and financial performance is significantly moderated by competitive intensity.
>
> Hypothesis 7(c)(2): The relationship between structural ambidexterity and innovativeness performance is significantly moderated by competitive intensity.
>
> Hypothesis 7(c)(3): The relationship between structural ambidexterity and quality performance is significantly moderated by competitive intensity.

In the meantime, studies on the contextual ambidexterity are still very rare; as much as the study on the structural ambidexterity. However, when compared to the structural ambidexterity, contextual ambidexterity was suggested to be effective in the long-term. This is because even though structural separation between exploitation and exploration of new products may be crucial, it is only good for use temporarily during the period of reintegration between capabilities. As such, previous study had suggested that contextual ambidexterity should also be used as it enables enhancement between exploitation and exploration of new products. In fact, a firm is suggested to use contextual ambidexterity, which is not “an alternative to structural ambidexterity but rather a complement” (Birkinshaw & Gibson, 2004, p. 55). For these reasons, just like with structural ambidexterity, contextual ambidexterity is designed to deal with the incongruence between exploitation and exploration of new products especially under environmental turbulence where the positive relationship with NPD performance can be maintained. However, empirical evidences on the outcomes of contextual ambidexterity and its effects on performance are still lacking (Simsek, Heavey, Veiga, & Souder, 2009). For these reasons, by default, the relationship was hypothesised based on the theoretically generated prediction and educated guess, as follows:

Hypothesis 8(a): The relationship between contextual ambidexterity and NPD performance is significantly moderated by market turbulence; in a more detail:

> Hypothesis 8(a)(1): The relationship between contextual ambidexterity and financial performance is significantly moderated by market turbulence.
>
> Hypothesis 8(a)(2): The relationship between contextual ambidexterity and innovativeness performance is significantly moderated by market turbulence.
>
> Hypothesis 8(a)(3): The relationship between contextual ambidexterity and quality performance is significantly moderated by market turbulence.

Hypothesis 8(b): The relationship between contextual ambidexterity and NPD performance is significantly moderated by technological turbulence; in a more detail:

> Hypothesis 8(b)(1): The relationship between contextual ambidexterity and financial performance is significantly moderated by technological turbulence.
>
> Hypothesis 8(b)(2): The relationship between contextual ambidexterity and innovativeness performance is significantly moderated by technological turbulence.
>
> Hypothesis 8(b)(3): The relationship between contextual ambidexterity and quality performance is significantly moderated by technological turbulence.

Hypothesis 8(c): The relationship between contextual ambidexterity and NPD performance is significantly moderated by competitive intensity; in a more detail:

> Hypothesis 8(c)(1): The relationship between contextual ambidexterity and financial performance is significantly moderated by competitive intensity.

Hypothesis 8(c)(2): The relationship between contextual ambidexterity and innovativeness performance is significantly moderated by competitive intensity.

Hypothesis 8(c)(3): The relationship between contextual ambidexterity and quality performance is significantly moderated by competitive intensity.

2.9 Chapter Summary

NPD performance has been critical for the short- and long-term growths of Malaysian manufacturing sector. This happens due to the improvement in NPD performance enabled Malaysian manufacturing firms to compete globally and sustain competitive advantage. This can be achieved with the right management of NPD portfolio where Malaysia can improve its levels of innovativeness and competitiveness relative to other nations through organisational capabilities. Previously, studies in both develop nations and Malaysia has found doing too much on exploitation NPD would decrease performance. Unfortunately, most NPD projects in Malaysia were towards exploitation NPD instead of a balanced approach between exploitation and exploration NPDs. For this reason, it was found that the organisational learning of Malaysian manufacturing firms is not necessarily guarantee NPD success. As such, to increase NPD performance, both exploitation and exploration NPDs need to be deployed correctly when necessary, but studies on this issue are still limited.

On the other hand, a balance between exploitation and exploration NPDs can be achieved via organisational ambidexterity. Studies on organisational ambidexterity have posited this capability enables both exploitation and exploration NPDs to be simultaneously pursued towards achieving better NPD performance. Most importantly, studies have argued that this capability should be doing well under turbulence environment. This is critical since firms must exploit the existing products for maintaining current financial performance, while at the same time explore the new product possibilities for sustainability of business. However, previous study in Malaysia has found pushing both exploitation and exploration NPDs too far can also negatively affected NPD performance. Hence, firms must also know the limits of this organisational ambidexterity, but numbers of studies on this issue is still very low.

Meanwhile, the existing methodological approaches in NPD have been criticised as being obsolete, since these approaches did not emphasised the effects of environmental turbulence on NPD strategies. Without the right approach, it would be difficult to decide on the deployment types of organisational capability under environmental turbulence in achieving better NPD performance. Fortunately, this issue can be best viewed through a resource-based concept of DCs. With DCs approach, Malaysian manufacturing firms will be able to deploy the right types of organisational capability under the specific types of environmental turbulence in achieving better NPD financial performance for current viability, and NPD nonfinancial performance for future viability.

CHAPTER THREE:
RESEARCH METHODOLOGY

3.0 Introduction

This study had attempted to empirically answer the research questions on the deployment issues of organisational capabilities under moderating effects of environmental turbulence to achieve greater new product development (NPD) performance. By doing so, the appropriate deployment of organisational capabilities for NPD can be recommended from the concept of dynamic capabilities (DCs). The need to answer these questions emerged since each of organisational capabilities can be positively related to NPD performance, but in combination and under moderating effects of environmental turbulence, the results can be contradicted. As for this reason, the related hypotheses have to be tested according to research methodology, which are organised into research design that includes study technique and context, level of analysis, and type of industries. This is followed by sampling procedure that involves defining of population, sample frame and size, selection of respondents, and random selection of samples. Accordingly, survey administration that includes mailing method and method to increase response rate, measurement topics of variables, items, and scales, validity and reliability of scales, and data analysis and interpretation are also discussed. The summary is presented at the end of this chapter.

3.1 Research Design

From organisational perspective, NPD is described as the artefact (completed product) that is resulted from organisational processes (Krishnan & Ulrich, 2001). This study took place at the organisational (firm) level with the interest on gathering data from completed NPD projects within the previous five years that is sufficient to represent current situation faced by manufacturing firms in Malaysia. Completed NPD projects were chosen since the data gathered can be used for planning future NPD projects (Cao, Zhao, & Nagahira, 2011) that is important for the deployment of organisational capabilities under environmental turbulence. Meanwhile, data is gathered only once over a certain period of time (e.g., 6 months), which is normal for a cross-sectional study (Sekaran, 2003). This quantitative study is organised in the context of Malaysian manufacturing sector.

3.1.1 Technique of Study

This study applied a quantitative technique that is usually utilised to describe or explain phenomena (e.g., descriptive, correlation, and inferential statistics), and to build and test theory (e.g., DCs). It is suitable for probability sampling (e.g., random sampling), cross-sectional study (e.g., data that is taken only once), and when researcher involvement is limited (e.g., mail survey) (Cooper & Schindler, 2008). With quantitative technique, data that was collected via mail questionnaire has minimal interference (limited researcher involvement) since "correlational studies are invariably conducted in noncontrived settings" (Sekaran, 2003, p. 129). The gathered data was coded, categorised, and manipulated with SPSS v.19 statistical technique, and interpreted with descriptive, correlation, and inferential statistics according to the well-established hypotheses testing procedure.

3.1.2 Level of Analysis

Even though some studies investigated ambidexterity at individual level of analysis (Mom, Bosch, & Volberda, 2009; Mom, Bosch, & Volberda, 2007), organisational is a common level of analysis for organisational ambidexterity (Schudy, 2010), which is much easier to achieve than at the individual level (Gupta, Smith, & Shalley, 2006). For instance, since contextual ambidexterity is "the collective orientation of the employees" (Gibson & Birkinshaw, 2004, p. 50) that is embedded in "the general behaviour of organisational members" (Luzon & Pasola, 2011, p. 932), it is usually measured at organisational level rather than individual level of analysis. Furthermore, organisational level of analysis is also commonly observed in the case of exploitation and exploration capabilities (Li, Vanhaverbeke, & Schoemakers, 2008). Meanwhile, environmental turbulence that refers to the firm's external factor is also analysed at organisational level (Tan, Li, & Li, 2006). In addition, the contemporary concept of DCs is using a firm-level analysis in explaining sustainable competitive advantage (Guttel & Konlechner, 2010). For these reasons, this study was analysing the firm's organisational capabilities, environmental turbulence, and NPD performance at organisation (firm) level of analysis.

3.1.3 Context of Study

This study focused on Malaysian manufacturing sector due to the presence of NPD activities in this sector (Bauly, 2004) that involves "the process of converting raw materials into products" (Kalpakjian & Schmid, 2006, p. 1). In addition, manufacturing sector is the largest contributor toward Malaysia's external trade in 2009, and employment rate in 2010. It is also forecasted to contribute around 27.9% of gross domestic product (GDP) in 2011, which is more than a quarter of total GDP of Malaysia (FMM, 2011).

3.1.4 Types of Industry

This study was interested in all types of industries within manufacturing sector of Malaysia including both high- and low-tech industries. This is because even though studies on exploitation and exploration capabilities are commonly take place in the high-tech industries (Chu, Li, & Lin, 2011; Yang & Li, 2011; Li, Chu, & Lin, 2010) such as pharmaceutical (Hoang & Rothaermel, 2010) and biotechnology industries (Rothaermel & Deeds, 2004), they are also taking place in the mid- to low-tech industries such as shipbuilding (Greve, 2007) and footwear industries (Dewar & Dutton, 1986), which suggests the study on exploitation and exploration capabilities is not necessarily for the high-tech firms/industries only. In addition, previous studies on innovation, and exploitation and exploration capabilities in NPD projects that involved various manufacturing industries and firms of all sizes have been the practice in Japan (Cao, Zhao, & Nagahira, 2011), China (Kim & Atuahene-Gima, 2010), and Singapore (Bauly, 2004). Similarly, NPD studies in various manufacturing industries are also commonly practised in Malaysia (see Table 2.3). As for this reason, since the contribution of Malaysian manufacturing sector to GDP is coming from all industries (FMM, 2011), this study is focusing on all industries to properly represent the manufacturing sector. For this study, Appendix 3A shows the lists and descriptions of manufacturing industries including both high- and low-tech.

3.2 Sampling Procedure

As mentioned before, the interest of this study was on the manufacturing sector itself rather than the specific industries within this sector. As such, a random sampling technique was used in selecting the sample since it is “the best single way to obtain a representative sample” (Gay & Diehl, 1992, p. 129). By doing so, any firms across various industries in Malaysian manufacturing sector have a “known and equal chance of being selected as a [test] subject” (Sekaran, 2003, p. 270). In other words, random sampling is the most relevant technique to use since any firms (local or MNC), of any sizes (SMEs or large), in any industries (high- or low-tech) have equal chances to be selected and represent the manufacturing sector in Malaysia. As such, since the samples are drawn from same population, random sampling can represent the said population (Banning, Camstra, & Knottnerus, 2012). Besides that, random sampling was chosen for data collection as it is suitable for inferential statistics such as regression analysis, which is the analysis to be performed in this study. For the purpose of the study, these sampling procedures were followed: (1) identify the population, (2) determine the desired sample size, and (3) perform random selection of the sample (Banning, Camstra, & Knottnerus, 2012; Gay & Diehl, 1992).

3.2.1 Population

As the context of this study is Malaysian manufacturing sector, the population frame was taken from the Federation of Malaysian Manufacturers (FMM) Directory 2011 (42nd ed.) that provides a comprehensive list of Malaysian manufacturing firms[1]. This directory was chosen as it is the most reliable for gathering data on various manufacturing firms, which is widely referred to by researchers who interested to study the Malaysian manufacturing sector in general (Jabar, Soosay, & Santa, 2011; Mokhtar & Yusof, 2010; Jamaliah & Zain, 1999). Based on this directory, there were a total of 2594 firms listed in the directory to represent the elements of a population.

3.2.2 Sample Frame

The information acquired from the samples of limited numbers of respondents has to be capable of representing the characteristics of population under study (Latham, 2007; Salant & Dillmant, 1994). Thus, samples should be taken from the sample frame that is closely related to the population and provides only the correct and completed number of elements from where the actual samples were drawn (Cooper

[1] According to the FMM website (FMM.org.my), the "membership of FMM is open to all manufacturers and companies (trading, services, institutions, sole proprietor/partnership, etc.) registered in Malaysia, large, small and medium-sized industries, whether foreign or locally owned or operated on a joint-venture basis".

& Schindler, 2008). As for this study, the sampling frame was the manufacturing firms in Malaysia that produce/manufacture the physical products themselves (Kalpakjian & Schmid, 2006), which include both customer/consumer goods and capital/industry goods (Cao, Zhao, & Nagahira, 2011; Groover, 2007).

Based on the FMM Directory 2011, there were 2383 (out of 2594) manufacturing firms that manufacture the physical products themselves, while the other 211 firms were services-based firms such as accountancy, financing, consultancy, forwarding, and distribution, all of which were excluded from this study. Similarly, out of 2383 manufacturing firms, there were 200 subsidiaries belonged to the other members of FMM (e.g., same postal addresses/contact persons), and 12 non-members of FMM (as stated in the directory) that were also excluded in order to avoid bias (Ahmed, 2011). As a result, there were 2171 valid manufacturing firms in the sample frame.

3.2.3 Selection of Respondents

Previous study had shown the functional areas that were usually involved in NPD projects are research and development (R&D), marketing, engineering, and manufacturing (Page, 1993), in which the managers of these functional areas have the knowledge and responsibility for executing NPD projects (Page & Schirr, 2008; Krishnan & Ulrich, 2001). In a similar vein, previous study on Malaysian manufacturing firms had shown NPD projects are the responsibility of R&D function (36%), all functions (36%), and engineering, strategic planning, and marketing functions (28%) (Al-Shalabi & Rundquist, 2009). However, since how to effectively invest, prioritise, and allocate resources between product developments are the imperative issues of NPD portfolio management (Cooper & Edgett, 2001), the role of management function (Zirger & Maidique, 1990), top management (Gonzales &

Palacios, 2002), and senior management support (e.g., project champion, commitment, and resource allocation) are the most critical success factors for NPD project (Ernst, 2002). They are needed to supports the R&D, manufacturing, and marketing functions of NPD (Zirger & Maidique, 1990), especially when a multidisciplinary team is the largest NPD structure (Page, 1993).

This implies depending on the purpose of study, it was decided the suitable respondents for NPD projects can be any managers, such as managing director, R&D manager, NPD manager, product and design manager (Ebrahim, Ahmed, & Taha, 2010), chief executive officer, marketing manager, and/or manufacturing manager (Gonzales & Palacios, 2002). Meanwhile, since NPD is distinguished from R&D (Bauly, 2004), other managers/functions may also have first-hand in the NPD projects (Krasnikov & Jayachandran, 2008), such as in the case of small firms (e.g., SMEs), where they do not have any proper R&D manager/function (Roper, 1999). In other words, the respondents can be any "managers who had conducted innovative NPD projects" (Cao, Zhao, & Nagahira, 2011, p. 109).

For these reasons, even though there are many managers from various functional or departmental areas can be approached as potential respondents, this study has concentrated on product/production managers (other managers also relevant based on the previous arguments) for several reasons. Firstly, previous study had shown that product/production managers play a crucial role in NPD projects, which has an overall positive impact on product performance (Rauniar, Doll, Rawski, & Hong, 2008). Secondly, previous study had approached product/project managers as the respondents when studying new product success under the influences of market and technological uncertainties (Chen, Reilly & Lynn, 2005). Thirdly, this study has focused on the completed (produced) NPD projects within the previous five years, which is where the role of product/production managers is more obvious than any other respondents (e.g., R&D manager is only relevant during early stages of NPD). Moreover, since completed NPD projects are the responsibility of product/production managers, the questionnaire is more likely to be returned (Edwards, *et. al.*, 2002).

3.2.4 Size of Sample

To determine a suitable sample size to represent Malaysian manufacturing sector, formula in Bartlett, Kotrlik, and Higgins (2001) was used:

$\underline{n}_o = (\underline{t})^2 * (p)(q) \div (\underline{d})^2$ and $\underline{n}_1 = \underline{n}_o \div (1+\underline{n}_o/Population)$

where,

$\underline{n}_o$ = required return sample size according to Cochran's formula
$\underline{t}$ = value for selected alpha level of .025 in each tail (1.95)
$(p)(q)$ = estimate of variance (.25)
$\underline{d}$ = acceptable margin of error for proportion being estimated (.05)
n_1 = required return sample size because sample > 5% population

From the calculation, it is suggested the required sample size for a given sampling frame of 2171 is n_1 = 324 (rounded from 323.58). However, due to a trend of low response rate (Baruch, 1999), and the fact that higher sample size will increase the number of response when compared to lower sample size at the same response rate, this study has decided to send more than double of the required sample size, which has been the practice of previous studies in similar settings (Ahmed, 2011; Lazim, 2011). As such, this study intentionally decided to send 700 questionnaires after considering the possibility of low response rate and mailing cost.

3.2.5 Random Selection of Samples

As discussed earlier, this study is applying a random sampling technique that is commonly used in quantitative research to achieve representativeness of sample to population (Teddlie & Yu, 2007). For ease of generating random samples, a program called Research Randomiser (Kelley, Clark, Brown, & Sitzia, 2003) was applied to randomly generate 700 samples from 2171 firms by following these simple steps:

i Go to Research Randomiser website at www.randomiser.org.

ii Click ‘Randomise’ button in menu bar to display the Randomiser form.

iii In the Randomiser form:

a. Key in ‘1’ for the set of numbers to be generated,
b. Key in ‘700’ for the numbers in set,
c. Key in ‘1 to 2171’ for the range of numbers to be randomised in set,
d. Click ‘Yes’ for generating unique numbers in set,
e. Click ‘Yes: Least to Greatest’ for sorting the numbers in set,
f. Click ‘Randomise Now!’ button to generate the random numbers.

To use these numbers, all firms in the sampling frame were numbered from 1 to 2171 according to their original sequences in the FMM directory 2011. The samples were then selected based on the numbers that match the firms’ sequences in directory.

3.3 Survey Administration

This study used a mailing method for data collection since it allows sampling error to be minimised at a relatively low cost, it gives a sense of privacy to respondents, and it is less sensitive to biases as no interviewers are involve in the process. Even though this method has its own sets of weaknesses such as the information about respondents is never completed (e.g., out-dated mailing address), respondents are less likely to respond, and no control of what happens after the questionnaire is mailed, relatively speaking, mail survey is the easiest and cheapest method that requires less resources, such as no interviewers and special skills are needed to conduct the survey (Salant & Dillmant, 1994).

Mail survey method was also chosen since it covers a wide geographical area that is normally applied for field study (Sekaran, 2003). Since time is crucially important, this study decided to use two premium postal services provided by Pos Malaysia Berhad, namely (1) a registered post service for sending questionnaires to respondents, and (2) a "Pos Ekspres" service for receiving questionnaire from respondents. The selection of premium postal services is not just to expedite the response time, but also to convey a message on the importance of this survey.

3.3.1 Method of Mailing

A better response rate for mail survey can be achieved if respondents are notified in advance on the forthcoming survey (Sekaran, 2003). As such, a mailing procedure as recommended by Salant and Dillmant (1994) was used. However, with some financial constraints and limitation of time, only the first three of four-step procedure were followed with some adjustments[2]:

i A personalised advance-notice letter was sent to each respondent to inform them of the survey and upcoming questionnaire. However, in many cases the respondents were reached by phone and/or email.

ii A week after the first contact, a personalised cover letter with a questionnaire and a stamped return envelope was mailed to each of the respondents. In some cases, the questionnaire was immediately sent to the respondents after contacting and confirming them.

iii A week after sending the questionnaire, a follow-up (by phone and/or email) to respondents was done to confirm the acceptance of the questionnaire and remind them to complete it. In some cases, the follow-up was done several times up until the due date of survey.

3.3.2 Method to Increase Response Rate

Based on the response rate of previous research on Malaysian manufacturing sector (Jabar, Soosay, & Santa, 2011; Mokhtar & Yusof, 2010; Jamaliah & Zain, 1999), this study is expected to receive between 15% and 35% of questionnaires sent. To

[2] Step 4 is simply repeating step 2 where a personalised cover letter with a questionnaire and a stamped return envelope is mailed again to each respondent, which is very costly for the study.

achieve the target, a six-step procedure to encourage participation of respondents (Dhanani, O'Shaughnessy, & Louw, 1997) was followed (which is consistent with the mailing method as addressed in Section 3.3.1):

i Each respondent was informed (telephoned or emailed) about the survey and upcoming questionnaire.

ii The questionnaire was sent using registered postal service to the named respondents rather than the department name to reduce possibility of bureaucracy in mail handling. In this case the questionnaire was marked with "attention to product/production manager".

iii The stamped return envelope of "Pos Ekspres" with address was included for ease of returning the questionnaire.

iv Each question was written short and concise for better interpretation.

v The respondents were assured with the secrecy of data.

vi The respondents were offered a copy of results upon request.

Regarding Step 4 above, after considering major issues on measurement of items (Cooper & Schindler, 2008), all items for the interval scale were adapted instead of directly adopted from the original sources to suit the respondents' context as "it was decided that a mail survey using a well-designed questionnaire would be able to elicit the information required" (Dhanani, O'Shaughnessy, & Louw, 1997, p. 161). As such, the adaptation was done since respondents may not be familiar enough with the specific terms (or jargon) from the original scales such as ambidexterity (which is so academic in nature). Besides that, the respondents' proficiency in English may spread across the spectrum, thus would make the answering of questionnaire difficult. Hence, by adapting the scales to suit local context and by simplifying the questionnaires, it was hope that the response rate could be improved.

Regarding Step 5 above, the secrecy of data provided by respondents was made clear in this study cover letter (see Appendix 3B) and data collection letter from the OYA

Graduate School of Business, Universiti Utara Malaysia (UUM) (see Appendix 3C). This was crucial in increasing the response rate as respondents were more willing to respond to a survey that came from a university (Edwards, *et. al.*, 2002). Besides that, a support letter from the Ministry of International Trade and Industry (MITI) (see Appendix 3D) was also attached to encourage greater response.

3.4 Measurement of Items and Scales

NPD performance, organisational learning and ambidexterity, and environmental turbulence were the main variables in this study. In order to observe and measure them, each of them were operationalised (Sekaran, 2003) and the related items were explained. As for the questionnaire, the structured close-ended questions with dichotomous, multiple choice, and rating response options (Cooper & Schindler, 2008) were used. Meanwhile, the open-ended questions would be very demanding for the respondents (Salant & Dillmant, 1994), and thus was not considered when knowing the response rate would be declining (Stoop, Billiet, Koch, & Fitzgerald, 2010). Besides the main variables, data on firm/respondent demographics were also needed to understand the characteristics of related industries within Malaysian manufacturing sector, which is part of the close-ended questions with dichotomous and multiple choice options. All of these data will be taken from the previous five years of completed NPD projects to represent the current situation in Malaysia, which is also not too long to be recalled by respondents.

3.4.1 Measurement for New Product Development Performance

NPD performance was measured with both financial and nonfinancial criteria (Wang, Lee, Wang, & Chu, 2009; Page, 1993). These variables that were addressed in Section A of the questionnaire are discussed in the following sections.

3.4.1.1 Measurement for NPD Financial Performance

Based on the operational definition (Chapter Two), NPD financial performance is operationalised as the financial criteria for measuring NPD with the typical accounting measures. These criteria were chosen to measure NPD performance as it is used to predict organisational learning (Bhatnagar, 2006). For instance, sales revenue, market share, and profitability are among the items used to measure firm's performance in previous study of organisational learning of Malaysian SMEs (Ngui, Songan, & Hong, 2008). For this study, sales growth (86%) and profit margin (82%) that are rated as the top and second best outcomes for NPD projects (Kim & Atuahene-Gima, 2010), ROI that is rated by 80% of respondents as a suitable measure for NPD performance (Atuahene-Gima & Murray, 2007), and market sales and share that are frequently used to measure NPD performance (Wang, Lee, Wang, & Chu, 2009; Page, 1993) were chosen. These items are summarised in Table 3.1.

Table 3.1
Items on NPD Financial Performance

Items	Source
1. The firm's sales growth relative to competitors 2. The firm's market shares growth relative to competitors 3. The firm's growth in profits relative to competitors 4. The firm's return on investment relative to competitors	Wang, Lee, Wang, and Chu (2009); Atuahene-Gima and Li (2004); Priem, Rasheed, and Kotulic (1995)

As shown in the table, four items that were originally measured with a five-point Likert scale was adapted from previous study (Priem, Rasheed, & Kotulic, 1995). The items were selected as they met the needs of this study, and for their applications in previous studies (Wang, Lee, Wang, & Chu, 2009; Atuahene-Gima & Li, 2004).

3.4.1.2 Measurement for NPD Nonfinancial Performance

The nonfinancial performance was operationalised as the measurement criteria for NPD performance that cannot be precisely measured with the typical accounting measures. The nonfinancial criteria was chosen to measure NPD performance as in response to a recommendation from previous study, which is not to over emphasise on the short-term financial performance in measuring NPD. This happens because an unbalanced focuses of incremental NPD on the short-term financial profits would reduce the overall NPD contribution toward firm performance (Cooper, 2005). Furthermore, "a framework that favours dynamic over static competition would put less weight on market share and concentration, and more weight on assessing potential competition and enterprise-level capabilities" (Teece, 2009, p. 234). In addition, some high-tech firms such as in the case of biotechnology may not currently generate any profits from projects (Rothaermel & Deeds, 2004). For these reasons, NPD performance measured with nonfinancial criteria would be suitable.

For this study, innovativeness and quality performance were chosen as the measures for NPD nonfinancial criteria since "many [have] argue[d] that improvements in areas such as [product] quality, customer or employee satisfaction, and innovation represent investments in firm-specific assets that are not fully captured in current accounting measures" (Ittner & Larcker, 1998, p. 1). These selections were made because product innovativeness and quality influence each other to contribute toward the firm's performance (Cho & Pucik, 2005), where an increase in product innovativeness also improves product quality (Wei & Xiaobin, 2009). Furthermore, besides the emphasis on reducing defective rate (e.g., quality), firms should also emphasise on intermediate output measures such as innovativeness in measuring NPD activities (McNally, Cavusgil, & Calantone, 2010) when ramping-up the production process for a fast and reliable new product introduction (Kim & Kim, 2009). For these reasons, the product does not only need to be innovative, but also produced at a high quality to achieve long-term and sustainable NPD performance.

The measurement items for innovativeness performance is summarised in Table 3.2, while quality performance in Table 3.3.

Table 3.2
Items on NPD Innovativeness Performance

Items	Source
1. The creation of new product concept 2. Major technological innovation in the product 3. Major product innovation as a whole	Pavlou and Sawy (2011); Wang, Lee, Wang, and Chu (2009); Kusunoki, Nonaka, and Nagata (1998)
4. Numbers of products being introduced by firm that is not new to the firm but new to the market 5. Numbers of products being introduced by firm that is new to the firm but not new to the market 6. Numbers of products being introduced by firm that is new to both firm and market	Wang, Lee, Wang, and Chu (2009); Yalcinkaya, Calantone, and Griffith (2007)

As shown in Table 3.2, six items were selected to measure innovativeness performance where the first three were adapted from Kusunoki, Nonaka, and Nagata (1998) that was originally measured with a seven-point Likert scale, and the other three were adapted from Yalcinkaya, Calantone, and Griffith (2007). These items were adapted because they fit well with the operational definition of innovativeness performance, and also for their proven applications in the related studies (Pavlou & Sawy, 2011; Wang, Le, Wang, & Chu, 2009).

Table 3.3
Items on NPD Quality Performance

Items	Source
1. The improvement in the cost of the product 2. The improvement in the functionality of the product 3. The improvement in the elements of technology of the product	Pavlou and Sawy (2011); Kusunoki, Nonaka, and Nagata (1998)
4. The quality of product that is better than the firm own other products 5. The quality of product that is better than the competing (competitors) products 6. The consumers perception that the product is more reliable than the competing products	Atuahene-Gima, Li, and DeLuca (2006)

Meanwhile, Table 3.3 is showing six items for measuring quality performance. The first three items were adapted from Kusunoki, Nonaka, and Nagata (1998), while the other three were adapted from Atuahene-Gima, Li, and DeLuca (2006), which was originally measured with a seven-point Likert scale. These items were adapted because they fit well with the operational definition of quality performance, and just like innovativeness performance, these items were also relevant and popular as shown in previous studies (Pavlou & Sawy, 2011).

3.4.2 Measurement for Organisational Capabilities

Even though the concept of organisational learning is multidisciplinary (Shrivastava, 1983), it is evidenced throughout literature that the exploitation and exploration capabilities, which was popularised by March (1991), are the most discussed dimensions for organisational learning. Meanwhile, structural ambidexterity and contextual ambidexterity, which are the two dimensions of organisational ambidexterity, are currently dominating the discussion in related topics of the exploitation and exploitation of new products (Gibson & Birkinshaw, 2004). Since NPD success can be achieved with organisational factors by appropriately building NPD resources and expertise (Calantone, Schmidt, & Song, 1996), organisational learning and organisational ambidexterity are the organisational capabilities related to NPD performance. Details of the measures are discussed in the following sections.

3.4.2.1 Measurement for Organisational Learning

Organisational learning refers to the active process for acquiring and processing information and knowledge for better decision making in NPD, in which exploitation capability was operationalised as the firm's ability to exploit existing products with current knowledge, while exploration capability was operationalised as the firm's ability to explore new product opportunities with new knowledge. The questions relating to these items were addressed in Section B of the questionnaire, while the summary of items for measuring exploitation and exploration capabilities is shown in Tables 3.4 and 3.5, respectively.

Table 3.4
Items on Exploitation Capability

Items	Source
1. The upgrade of current knowledge and skills of the familiar products and technologies 2. The upgrade of skills in product development processes that the firm already has significant experience on it 3. The strengthening of knowledge and skills that improve the efficiency of existing activities for innovation 4. The investment in skills enhancement of processes to improve the innovation productivity of current mature technologies 5. The enhancement of competencies in searching for solutions to customers problems that are near to the existing solutions	Molina-Castillo, Jimenez-Jimenez, and Munuera-Aleman (2011); Atuahene-Gima (2005)

Table 3.5
Items on Exploration Capability

Items	Source
1. The acquisition of manufacturing technologies and skills that are entirely new to the firm 2. The acquisition of entirely new managerial and organisational skills that are important for innovation 3. Learning of product development processes that are entirely new to the industry 4. Learning of the new skills in areas such as funding new technology, staffing R&D function, training and development of R&D, and engineering personnel for the first time 5. The strengthening of innovation processes in the areas where firm had no prior experience	Molina-Castillo, Jimenez-Jimenez, and Munuera-Aleman (2011); Atuahene-Gima (2005)

As shown in both tables, five items are adapted for each of the capabilities from Atuahene-Gima (2005) that were originally measured with seven-point Likert scale. These items were selected as they fit well with the operational definitions, and due to their proven application in the previous related study (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011).

3.4.2.2 Measurement for Organisational Ambidexterity

Organisational ambidexterity is the firm's ability to simultaneously pursue the exploitation and exploration of new products where structural ambidexterity and contextual ambidexterity are the two dimensions of this concept (Gibson & Birkinshaw, 2004). For measuring structural ambidexterity, six items that were originally designed to measure structural differentiation in ambidextrous organisations with a seven-point Likert scale were adapted from Jansen, Tempelaar, Bosch, and Volberda (2009), which are summarised in Table 3.6.

Table 3.6
Items on Structural Ambidexterity

Items	Source
1. The structural differentiation 2. The units that are specialized in specific functions 3. The units that are focused on either short or long term objectives 4. The line and staff departments that are structurally separated within the organisation 5. The innovation and production activities that are structurally separated within the organisation 6. The customers' needs that are served from separate departments	Tempelaar (2010); Jansen, Tempelaar, Bosch, and Volberda (2009)

These items were selected as they fit well with the operational definition of structural ambidexterity that refers to the firm's ability to create and manage dual/separate structures for the simultaneous pursuit of exploitation and exploration of new products. The use of these items was proven in previous study (Tempelaar, 2010).

Meanwhile, for contextual ambidexterity, five items related to the behavioural characteristics of the ambidextrous individuals/managers were used to measure this concept, where the first four items were adapted from Birkinshaw and Gibson (2004), while the fifth item was adapted from Mom, Bosch, and Volberda (2009). These items for measuring contextual ambidexterity are summarised in Table 3.7.

Table 3.7
Items on Contextual Ambidexterity

Items	Source
1. Take initiative and alert to opportunities beyond the confines of your own jobs 2. Seek out opportunities and cooperative to combines your efforts with others 3. Act as a broker who always looking to build internal linkages 4. Act as a multi-tasker who comfortable wearing more than one 'hat'	Fiset and Dostaler (2013); Gibson and Birkinshaw (2004)
5. The individual who refine and renew their knowledge, skills, and expertise	Mom, Bosch, and Volberda (2009)

As shown in the table, these behavioural characteristics were chosen because they fit well with the definition of contextual ambidexterity that is the collective behaviour of individual ability to divide and manage time between the contradicting activities of exploitation and exploration of new products, and also for their recent application in the related study (Fiset & Dostaler, 2013). The questions on structural and contextual ambidexterity were addressed in Section C of the questionnaire.

3.4.3 Measurement for Environmental Turbulence

Environmental turbulence refers to the frequency and unpredictability of market, technology and competition that influence NPD performance. Various studies had suggested the use of environmental turbulence to moderate relationships (Raisch & Birkinshaw, 2008) between organisational capabilities and NPD performance. Environmental turbulence met the criteria to be a moderator, that is treated as the third variable in a correlational study by “affects[ing] the zero-order correlation between two other variables” (Baron & Kenny, 1986, p. 1174). Furthermore, it was evidenced in previous study that there is no direct effect of environmental turbulence (as antecedent) to NPD performance, which strengthens the moderating role of environmental turbulence to NPD performance (Calantone, Garcia, & Droge, 2003). In addition, since DCs can explain how firm’s resources and capabilities are adopted under environmental change (Guttel & Konlechner, 2010), firms must focus on the uncertainties in resources and markets and try to match them (Boccardelli & Magnusson, 2006). Thus, this would justify the moderating role of environmental turbulence in the investigated relationships.

To understand these moderating effects, three dimensions of environmental turbulence, which are market turbulence, technological turbulence, and competitive intensity (Menguc & Auh, 2006; Jaworski & Kohli, 1993) were referred. As for the operational definitions, (1) market turbulence refers to the continuous change in customer preferences, and/or cost and price structures in which the firm needs to constantly build products to meet the change, (2) technological turbulence refers to the rate of technology change used in NPD projects and affects NPD performance, and (3) competitive intensity refers to the degree of competition among firms and areas in the product market. The items for measuring market turbulence, technological turbulence, and competitive intensity in accordance with these definitions were summarised in Tables 3.8, 3.9, and 3.10, respectively.

Table 3.8
Items on Market Turbulence

Items	Source
1. The customers' product preferences that change quite a bit over time*	Menguc and Auh (2006); Zhou, Yim, and Tse (2005); Workman, Homburg, and Jensen (2003); Jaworski and Kohli (1993)
2. The customers that tend to look for new product all the time	
3. The new customers that tend to have product-related needs that are different from those of our existing customers	
4. The demand for the products is coming from customers who never bought them before	
5. There are many similar customers that the firm has to deal with compared to the past	

* Reverse-coded item

Table 3.9
Items on Technological Turbulence

Items	Source
1. Rapidly changing technology in the industry	Menguc and Auh (2006); Zhou, Yim, and Tse (2005); Workman, Homburg, and Jensen (2003); Jaworski and Kohli (1993)
2. Technological developments in the industry that is minor*	
3. The technological change that provide big opportunities to the industry	
4. A large number of new product ideas that have been made possible through technological breakthroughs in the industry	

* Reverse-coded item

Table 3.10
Items on Competitive Intensity

Items	Source
1. The competition in the industry that is cutthroat	Menguc and Auh (2006); Zhou, Yim, and Tse (2005); Workman, Homburg, and Jensen (2003); Jaworski and Kohli (1993)
2. The competitors that is relatively weak*	
3. The price competition that is a hallmark of the industry	
4. Anything that one competitor can offer others can match readily	
5. One hears of a new competitive move almost every day	
6. There are many 'promotion wars' in the industry	

* Reverse-coded item

As shown in these tables, the items for measuring all three types of environmental turbulence were adapted from Menguc and Auh (2006), Zhou, Yim, and Tse (2005), Workman, Homburg, and Jensen (2003), and Jaworski and Kohli (1993) that were originally measured with a five-point Likert scale. In a more detail, five items were asked for gathering data related to market turbulence, four items for technological turbulence, and six items for competitive intensity. These items were adapted not just because they met the operational definitions, but also for their popular applications in previous related studies. These questions were addressed in Section D of the questionnaire.

3.4.4 Measurement for Firm's Demographics

Six relevant demographics of the firms were asked to reflect the characteristics of the Malaysian manufacturing sector, such as the respondent's positions, length of services, type of NPDs, age of firms, number of employees, and type of industries. The measurement of these items for the firm's demographics were addressed in Section E of the questionnaire and discussed in the following sections.

3.4.4.1 Position of Respondents

Based on the reasons discussed in Section 3.2.3, product/production managers that were responsible towards the production of new products in Malaysian manufacturing firms were selected as the respondents (Rauniar, Doll, Rawski, & Hong, 2008). However, as discussed earlier, product/production managers do not necessarily come from the product/production functions, hence another category is created. Table 3.11 summarises the categorical items for respondent's position.

Table 3.11
Items on Respondent's Position

Items	Source
1. I am product/production manager 2. I am equivalent to product/production manager	e.g., Rauniar, Doll, Rawski, and Hong (2008)

As shown in the table, other managers with equivalent responsibility to product/production managers were also considered as respondents. For instance, product managers can be any managers with various backgrounds, such as senior engineering, technical managers, and even department managers (Chen, Reilly, & Lynn, 2005). For these reasons, another category of respondents that is simply termed as "equivalent to product/production managers" was created.

3.4.4.2 Respondent's Length of Service

Data on respondent's length of service is needed to identify the suitability of the respondent to complete the survey as this study is asking the respondents to provide information on NPD projects that are completed within the previous five years. As such, five items that were originally used to ask the age of firms (Loderer & Waelchli, 2009) were adopted as they fit well to the question. The summary for the items on respondent's length of service is shown in Table 3.12.

Table 3.12
Items on Respondent's Length of Service

Items	Source
1. 1 to 5 years	
2. 6 to 10 years	
3. 11 to 20 years	e.g., Loderer and Waelchli (2009)
4. 21 to 30 years	
5. Over 30 years	

3.4.4.3 Types of NPD

The items for types of NPD projects were adopted from Mat and Jantan (2009) to identify the firm involvement in innovation relating to exploitation and/or exploration of new products. The summary of these items is shown in Table 3.13.

Table 3.13
Items on Types of NPD

Items	Source
1. NPD project of existing product modification	
2. NPD project of product line extensions	Mat and Jantan (2009)
3. NPD project of 'me-too-product'	
4. NPD project of true innovation	

As shown in the table, four items were adopted as they refer to the levels of sophistication of innovation in NPD projects (Bauly, 2004) that suit this study well.

3.4.4.4 Age of Firms

Firm age was measured by the number of years in business since founded. Firm age was asked because older firms may have more NPD projects and greater cumulative experience to enhance innovation in NPD (Sorensen & Stuart, 2000). Firm age was also asked to identify the levels of experience in NPD projects. The categories for firm age is summarised in Table 3.14.

Table 3.14
Items on Age of Firms

Items	**Source**
1. 1 to 5 years	
2. 6 to 10 years	
3. 11 to 20 years	Loderer and Waelchli (2009)
4. 21 to 30 years	
5. Over 30 years	

As shown in the table, five categories of firm age that ranged from “1 to 5 years” to “over 30 years” were adopted from previous related study, also in manufacturing sector (Loderer & Waelchli, 2009). These categories were suitable to evenly represent all ages of firms in Malaysian manufacturing sector.

3.4.4.5 Number of Employees

The size of a firm is represented by the number of full-time employees (Chu, Li, & Lin, 2011). Three categories of employee size were adopted from FMM Directory 2011 where the first and second categories represent SMEs, while the third category represents large enterprises. Table 3.15 summarises the items asking for number of employees.

Table 3.15
Items on Number of Employees

Items	Source
1. 1 – 50	
2. 51 – 150	FMM Directory 2011
3. More than 150	

As shown in the table, the sizes of firms were represented by number of employees that ranged from "1-50" to "more than 150". All sizes of firms were included so as to get better representativeness of the sample and to improve the response rate. Besides that, various sizes of firms were asked due to the possibility of different types of NPD projects between SMEs and large corporation.

3.4.4.6 Types of Industry

With a similar reason to firm's size, all types of industries were included in this study to get a better representativeness of the sample and to improve the response rate. Other reasons for the selection of all industries have been discussed in a more detail in Section 3.1.4. Table 3.16 depicts 12 types of manufacturing industries according to the Malaysian Investment Development Authority (MIDA, 2011).

Table 3.16
Items on Types of Industry

Items	Source
1. Basic metal products	
2. Electrical and electronics	
3. Electronics manufacturing services	
4. Engineering supporting	
5. Food processing	
6. Machinery and equipment	
7. Medical devices	MIDA (2011)
8. Petrochemical and polymer	
9. Pharmaceuticals	
10. Rubber products	
11. Textiles and apparel	
12. Wood-based	
13. Other	

As shown in the table, all twelve industries can be either grouped under high- or low-tech related industries. For instance, while electrical and electronics is related to the high-tech group of industry, textiles and apparel is related to the low-tech group of industry. These high- and low-tech industries can be influencing the types of NPD projects undertaken by Malaysian manufacturing firms.

3.4.5 Measurement Scale

Since all items for the questionnaire were taken from various sources, their measurement scales were varied and unstandardised. For instance, the original Likert scale for measuring NPD financial performance (Priem, Rasheed, & Kotulic, 1995), market turbulence, technological turbulence, and competitive intensity (Jaworski & Kohli, 1993) was at a five-point. Meanwhile, there was originally no scale for measuring contextual ambidexterity as it was adapted from the characteristics of ambidextrous managers (Birkinshaw & Gibson, 2004). Furthermore, the final three questions on innovativeness performance were only qualitatively measured on the respondents (Yalcinkaya, Calantone, & Griffith, 2007), whereas the rest of the items were measured with a seven-point Likert scale. For standardisation purposes, all items in Sections A to D of the questionnaire were measured with a seven-point Likert scale. This was made possible because "it seems reasonable to conclude that data gathered from a 5-point format can readily be transferred to 7-point equivalency using simple rescaling method" (Dawes, 2008, p. 75).

In addition, the seven-point Likert scale was used in previous study on the organisational learning and NPD of the Malaysian manufacturing firms (Jabar, Soosay, & Santa, 2011), and also on the study of innovation in NPD of Japanese manufacturing firms (Cao, Zhao, & Nagahira, 2011). Since the "Likert scale is designed to examine how strongly subjects agree or disagree with statements" (Sekaran, 2003, p. 197), the "strongly disagree [1] to strongly agree [7]" scale was used as it is highly relevant to ask the respondents on their levels of agreement on the particular statements/issues. The seven-point Likert scale was based on Jabar, Soosay, and Santa (2011), and Sekaran (2003) as shown in Table 3.17.

Table 3.17
A 7-Point Likert Scale for the Study

Strongly Disagree	**Disagree**	**Slightly Disagree**	**Neutral**	**Slightly Agree**	**Agree**	**Strongly Agree**
1	-	-	-	-	-	7

3.4.6 Summary of Measurement Items and Scales

This study was designed to gather information from the respondents' experiences on the completed NPD projects within five years ago in the context of Malaysian manufacturing sector. As for this reason, all items in Sections A to E of the questionnaire were built from various related studies, as summarised in Table 3.18.

Table 3.18
The Summary of Measurement Items and Scales

Sec	**Concept**	**Variable/Dimension**	**Item**	**Scale**	**Original Source**
A	NPD Performance	Financial Performance	4	7-point Likert scale	Priem, Rasheed and Kotulic (1995)
		Nonfinancial Performance: Innovativeness Performance Quality Performance	 6 6		Kusunoki, Nonaka and Nagata (1998); Atuahene-Gima, Li and DeLuca (2006); Yalcinkaya, Calantone and Griffith (2007)
B	Organisational Learning	Exploitation Capability Exploration Capability	5 5		Atuahene-Gima (2005)
C	Organisational Ambidexterity	Structural Ambidexterity	6		Jansen, Tempelaar, Bosch and Volberda (2009)
		Contextual Ambidexterity	5		Birkinshaw and Gibson (2004); Mom, Bosch and Volberda (2009)
D	Environmental Turbulence	Market Turbulence Technological Turbulence Competitive Intensity	5 4 6		Jaworski and Kohli (1993)
E	Firm's Demographic	Respondent's Position	1	Nominal scale	Rauniar, Doll, Rawski, and Hong (2008)
		Respondent's Length of Service	1		Loderer and Waelchli (2009)
		Types of NPD	1		Mat and Jantan (2009)
		Age of Firms	1		Loderer and Waelchli (2009)
		Number of Employees	1		FMM Directory 2011
		Types of Industry	1		MIDA (2011)
Total items			58		

As shown in the table, there were 52 items in the questionnaire under ten dimensions/variables of NPD performance (Section A), organisational learning (Section B), organisational ambidexterity (Section C), and environmental turbulence (Section D) that are measured with a seven-point Likert scale. Meanwhile, six questions on the firm's demographics (Section E) such as the respondent's position, respondent's length of service, type of NPDs, age of firm, number of employees, and type of industry were adopted and measured with a nominal scale. All-in-all, there were 58 items in the questionnaire from Sections A to E.

3.5 Goodness of Measures

To ensure the instruments used in this study were indeed accurate, where the items belong to the instruments and measured what they should measure, while the outcome is repeatedly consistent when used at different times, the validity and reliability test must be performed (Sekaran, 2003). Prior to these tests, the researcher sought advice from the Statistical Consulting Unit from the Centre for Testing, Measurement, and Appraisal, UUM regarding the statistical issues and overall design of questionnaire. As the result, there were no major issues found in the questionnaire.

3.5.1 Validity of Measures

The questionnaire was pre-tested to improve its quality and to evaluate the validity of constructs (Cao, Zhao, & Nagahira, 2011). Validity that is crucial in the process of research (Onwuegbuzie & Johnson, 2006; Sim & Arnell, 1993) refers to "the extent to which a test measures what we actually wish to measure" (Cooper & Schindler, 2008, p. 289). This study performed two types of validity tests, in which face validity will be performed at this preliminary study, while construct validity will be performed with factor analysis (Chapter Four).

Since face validity is "really based on the personal opinions of those either taking or giving a test" (Sim & Arnell, 1993, p. 104), the researcher had approached three experts in the related fields to validate the questionnaire. The selection of these experts was made based on their knowledge on the processes in empirical research, their background in NPD and/or related fields, and their in-depth experience in manufacturing industry. As they understand the importance of getting the questionnaire validated, they tend to give the best of opinions.

To maintain a clear direction, this study had limited the discussion to focus on three aspects of the questionnaire, namely (1) the relevance of measurement items in the questionnaire, (2) the level of their understanding of the questions, phrasing, wording, and jargon, and (3) the arrangement of the questionnaire itself. The first discussion was held on the 1st of March 2012 with Expert 1 (anonymity of these experts was preserved), a senior lecturer possessing a PhD with 15 years of experience as a former manager in electrical and electronics industry. The second discussion was held on the 2nd of March 2012 with NPD practitioner (Expert 2), a manager who is currently an active practitioner in the semiconductor industry possessing PhD in NPD with previous experience as an academician. The third discussion was held on the 5th of March 2012 with Expert 3, a senior lecturer possessing PhD in NPD.

In the discussions that lasted between 30 to 90 minutes each, the researcher took note on the following issues: Experts 1 and 3 were vocal on the jargon issue regarding the term "ambidexterity" that needed to be explained further or replaced with a different term that has similar meaning. They also commented on several items that needed more justification, while complementing on others. Overall, they were satisfied with the questionnaire and approved it for data collection. Meanwhile, Expert 2 was more vocal and critical in the opinion by (1) questioning the relevance of some items in the questionnaire and suggested the items with "and" needed to be separated into two different items as they are similar to two contradicting statements being asked under one item, (2) advising to rephrase some of the statement as they are difficult to understand, (3) asking for clarity on the term "ambidexterity" and other jargon words, and (4) questioning the relevance of asking the firm's demographics in the survey. However, just like Experts 1 and 3, Expert 2 complemented on some questions such as the types of NPD. As a result, the researcher had revised the questionnaire according to the expert opinions as follows:

i The words "Exploitation Capability" and "Exploration Capability" were changed to "Exploitative NPD" and "Explorative NPD", and "Structural Ambidexterity" and "Contextual Ambidexterity" were changed to "Structure for NPD" and "Behavioural Context for NPD" respectively. Change was also made to the other related jargon.

ii The definitions of related variables were rephrased to be friendlier.

iii Some items in the related variables were added or removed. For example, the items in Exploitative NPD and Explorative NPD were added from five to six each because of "and" in the statements.

iv Questions on the firm's demographics were maintained due to the fact that they were asked for a purpose, such as to identify the representativeness of the samples to population.

After revision, the final number of items increased from 58 to 62. See Appendix 3E for the example of a revised and final questionnaire.

3.5.2 Reliability of Measures

Reliability test was performed to measure the "accuracy and precision of a measurement procedure" (Cooper & Schindler, 2008, p. 289), and the extent to which the measurement is consistent "across time and across the various items in the instrument" (Sekaran, 2003, p. 203). As this study is using a Likert scale, the internal consistency that is to test the consistency of respondents' answers with a Cronbach's coefficient alpha should be performed (Gliem & Gliem, 2003).

As such, to pre-test the reliability of questionnaire, the first 30 samples received from the respondents were analysed using the SPSS v.19 statistical technique. Only 30 samples were involved in the pre-test as it is very time consuming to get a bigger and better number of samples for this preliminary study without affecting the whole time period for data collection. For the record, it took more than a month to get the first 30 usable responses from respondents. In addition, 30 samples were the minimum acceptable sample size to perform the analysis (Sekaran, 2003). This is because "the questionnaire should be piloted on a smaller sample of intended respondents, but with a sample size sufficient to perform systematic appraisal of its performance" (Rattray & Jones, 2007, p. 237). So it would be appropriate to do the pre-test with just 30 samples. The result of the reliability test is summarised in Table 3.19.

Table 3.19
Summary of Reliability Pre-Test

Types	**Variables**	**Reliability**
NPD Performance (Dependent Variable)	Financial Performance	.892
	Innovativeness Performance	.884
	Quality Performance	.809
Organisational Capabilities (Independent Variable)	Exploitation Capability	.924
	Exploration Capability	.881
	Structural Ambidexterity	.926
	Contextual Ambidexterity	.888
Environmental Turbulence (Moderating Variable)	Market Turbulence	.630
	Technological Turbulence	.714
	Competitive Intensity	.766

Based on the table, nine variables in NPD performance, organisational capabilities, and environmental turbulence had achieved the Cronbach's coefficient alpha of more than .7 (from .714 for technological turbulence to .926 for structural ambidexterity), in which .7 is the minimum acceptable level of reliability (Nunnally, 1978). The result implies that the measurement used to measure each of the nine variables is consistent across time and items in the instrument.

Meanwhile, the measure for market turbulence that was adapted from Jaworski and Kohli (1993) had achieved the reliability of just .63. However, the reliability tests from previous studies had revealed that the same measure recorded a reliability of just .61 in Workman, Homburg, and Jensen (2003), and .68 in Jaworski and Kohli (1993), which were consistently below .7. This implies that with the same measurement, the respondents' answers for market turbulence are still consistent across various studies and time (Sekaran, 2003) even though the value is less than .7.

In addition, low reliability of the measurement for market turbulence may suggest it had suffered from the following conditions: (1) the value of Cronbach's coefficient alpha tends to get smaller since the number of items in the scale is small (Pallant, 2007), (2) the Cronbach's coefficient alpha "is used more often as a measure of the test's internal consistency than as an estimate of reliability" (Sijtsma, 2009, p. 107), and (3) the reliability test is necessary but it is not sufficient to examine "the psychometric properties of a survey instrument" (Litwin, 1995, p. 33).

Besides that, even though by removing the related items can increase the reliability of market turbulence, the decision to remove the items is only relevant during factor analysis of the completed data set[3]. As such, the researcher has decided to maintain all items in market turbulence. Since it would be inappropriate to remove the items at this stage, while there was no modification is extremely needed in the questionnaire, all 30 samples were retained, and reused for actual analysis to increase response rate.

[3] As will be seen in Chapter Four, the reliability of market turbulence is improved to .745 after performing factor analysis.

3.6 Data Analysis and Interpretation

The data was processed, analysed, and interpreted with the SPSS v.19 statistical technique. All necessary processes such as data gathering, coding, editing, and dealing with incomplete responses were performed. Similarly, the assumptions for parametric analysis such as outlier and normality were also performed with SPSS.

In a more detail, the firm's demographic, and the univariate characteristics of the main variables were analysed and interpreted with descriptive analysis, such as frequency, percentage, and means distribution. Descriptive analysis was selected as it helps to determine the way things are such as who, what, when, where, and how (Cooper & Schindler, 2008). Meanwhile, the bivariate relationships (Objectives 1 and 2) were analysed and interpreted with the correlation analysis that "involves collecting data in order to determine whether, and to what degree, a relationship exists between two or more quantifiable variables" (Gay & Diehl, 1992, p. 318). Accordingly, the multivariate relationships (Objectives 3 and 4) were analysed and interpreted with the hierarchical multiple regression analysis that is used to examine the multivariate or causal relationships between two variables under environmental turbulence. This analysis was chosen to test the statistical hypotheses (Cooper & Schindler, 2008) with its ability to inference the population according to the samples' behaviour (Banning, Camstra, & Knottnerus, 2012; Gay & Diehl, 1992).

3.7 Chapter Summary

This chapter discussed the research methodology, such as research design, sampling procedure, survey administration, measurement of items, goodness of measures, and data analysis and interpretation. In a more detail, this study was referred to FMM directory 2011 to get the sample of various Malaysian manufacturing firms, in which

700 of them were selected with a random sampling technique. The questionnaire was then devised to adapt with the well-established measurement items from various related studies. The questionnaire was mailed to the product/production managers with premium post services since they are the most suitable respondents for this study. Prior to actual analysis, the questionnaire was face validated by three experts, and a pilot test was performed to confirm its reliability. Since all of the related methodologies have been followed, the actual data analysis and its interpretation with SPSS v.19 statistical technique can be performed, which will be discussed in next chapter.

CHAPTER FOUR:
DATA ANALYSES AND HYPOTHESES TESTING

4.0 Introduction

This chapter is designed to analyse the data, and to test the hypotheses. For analysis of data, descriptive statistics where “the numerical, graphical, and tabular techniques for organising, analysing, and presenting data” was used (Argyrous, 2011, p. 20). Specifically, the analysis of data reports on the overview of data collection such as nonresponse bias, response rate, and respondent’s profile, the preparation of data such as data screening and cleaning, dealing with outliers and assessing normality, the processes of reducing numbers of items and components for validity purposes, and reliability of scale. Meanwhile, to achieve the objectives of this study through hypothesis testing, descriptive analysis was performed to report on the means of each univariate variables, bivariate analysis was performed to test the hypothesis on the direct relationships between each of organisational capabilities and NPD performance with correlation analysis (for Objectives 1 and 2), and last but not least multivariate analysis was performed to test the hypotheses on moderating effects of environmental turbulence in the relationships between each of organisational capabilities and NPD performance with hierarchical multiple regression analysis (for Objectives 3 and 4). This chapter is completed with the summary of analyses.

4.1 Overview of Data Collection

Data collection was overviewed in order to understand the characteristics of data such as nonresponse bias, response rate, and respondents’ profile that might affect the generalisation of sample to population (Tsang & Williams, 2012; Armstrong & Overton, 1977), which are discussed in the following sections.

4.1.1 Nonresponse Bias

The response rate is only one indicator of sample quality, and no matter how high or low the response rate is, the nonresponse bias should be performed (Baruch & Holtom, 2008). This is because even though the response rate is low, it can still be accepted if the nonresponse bias recommend the respondents who responded to the survey is no different from those who did not responded at all (Ahmed, 2011; Armstrong & Overton, 1977). With no nonresponse bias, the samples are suggested to infer the population from where they are taken from (Sturgis, 2006).

As the literature suggests, nonresponse bias can be estimated with the time trends by comparing early and late responses since the behaviour of those who respond late to the survey may resemble those who did not respond at all (Ahmed, 2011; Armstrong & Overton, 1977). For this study that used premium postal service, two weeks between sending and receiving the questionnaires should be reasonable enough to be considered as early response times. For comparison, three weeks were considered as early response times for ordinary postal service (Ahmed, 2011). Table 4.1 shows the summary of statistics between early and late categories.

Table 4.1
Comparing Early and Late Response Categories

Response Types	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Early response	59	48.0	48.0	48.0
Late response	64	52.0	52.8	100.0
Total	123	100.0	100.0	

As shown in the table, the frequencies of responses between early and late categories are almost equal in size that is 59 (48%) for early response group and 64 (52%) for late response group. This statistics is suggesting the number of respondents who responded within two weeks after questionnaire sent has not much different from those who responded after two weeks, which is a good sign for comparison purpose. As such, these equal numbers of responses between early and late categories allow a test for nonresponse bias to be performed with sufficient sample size.

Since the data is yet to be processed and distribution of data is still unknown, and since the normality of data is not a concern at this stage, a nonparametric test was performed (Chan, 2003; Hamburg, 1987) with the Independent-Samples Mann-Whitney U Test. This test is performed to determine if the two groups of samples (e.g., early and late) are coming from the same population (Nachar, 2008; Pfaffenberger & Patterson, 1981) by comparing the median distribution of the groups (Pallant, 2007). The median distribution of the groups was used since the normality of the mean distribution is still unknown (Nardi, 2003). As shown in Appendix 4A, it was found that the significance values of all variables that ranged from .260 to .993 have well exceeded the significance level of .05. This result shows the median distribution of all ten variables is similar across early and late response categories that imply the nonresponse bias does not exist in this study.

4.1.2 Response Rate

A total of 700 questionnaires were sent in various batches and sizes between April and July 2012 with the due date at the end of September 2012 – the process that ran for six months – that is a normal period for a one-time data collection method. The total number of responses and response rate is summarised in Table 4.2.

Table 4.2
Response Statistics

Types of Response	Num of Response	Response Rate (%)
Total responses	136	19.43
Not usable responses	13	1.86
Usable responses	123	17.57

As shown in the table, 136 respondents responded to the survey giving a 19.43% response rate, which is slightly below the common ranges of 20% to 30% for the mail-based questionnaire (Nardi, 2003). Further inspection on the responses found 13 of the samples as being not usable where 10 questionnaires were returned empty, one questionnaire was answered less than a half, one was answered with all “4” in the scale, and another one with all “5” in the scale. This left 123 responses, giving the final percentage of 17.57% response rate – not bad in the time where the trend of low response rate is being reported (Baruch, 1999). This response rate also falls within the expected target between 15% and 35% (see Section 3.3.2 in Chapter Three). As for comparison, a recent study on the organisational ambidexterity of Italian technology-based firms was only capable of getting 17.4% usable response rate (Aloini, Martini, & Neirotti, 2012), and 18% response rate in the NPD study of Singapore’s manufacturing sector (Bauly, 2004).

Low response rate does not necessarily suggest that the sample estimation is biased (Sturgis, 2006). It has been suggested that smaller sample can be more representative to the population as the response representativeness is more important than the response rate itself (Cook, Heath, & Thompson, 2000). Meanwhile, it was suggested that high response rate is only feasible if the time taken in the survey is a lot longer (Armstrong & Overton, 1977), whereas the use of incentives and reminders is not relevant to increase the response rate (Baruch & Holtom, 2008).

As previously addressed in Chapter Three, the suitable sample size for the population of 2171 should be 324 based on Bartlett, Kotrlik, and Higgins (2001) formula. However, with the acceptable response rate for mail-based survey being 30% (Pallant, 2007), it was suggested the minimum responses to represent the population is 97 if 30% response rate from 324 samples is ever achieved, as shown in Table 4.3.

Table 4.3

Comparisons of the Response Rate between the Study's Sample Size and the Bartlett, Kotrlik, and Higgins's Sample Size

Descriptions	From 700 Samples	From 324 Samples
Numbers of usable response	123	97
Response rate over sample (%)	17.57	30
Population	2171	2171
Response rate over population (%)	5.67	4.47

As the table shows, even though the response rate for the study is low at just 17.57%, when comparing number to number, 17.57% (n = 123) from 700 samples is actually larger than 30% (n = 97) from 324 samples for the same population (N = 2171). This is critical because a larger sample size (123 > 97) will increase the statistical power of the tests (Fife-Schaw, 2006). Nevertheless, the sample size (n = 123) for this study is sufficient that falls within the acceptable range of 30 and 500 (Sekaran, 2003). Moreover, it was suggested that only fewer elements (e.g., respondents) is needed to get the representativeness of sample size if the population is homogenous (Nardi, 2003), which is in this case is the product/production managers.

Meanwhile, Table 4.4 specifies some of the known reasons for low response rate from 67 respondents who had not responded to the survey.

Table 4.4

Reasons for No Response

Reasons	Number of Cases
Change address/shifted	25*
Unclaimed	17*
No cooperation/no interest	6
Busy with audit	5
Firm policy	4
Not relevant	3
Change business	1
Firm close up	1*
Unknown reason	5*
Total	67

*Returned by Pos Malaysia

The above table is suggesting at least eight known reasons for no response. For instance, 25 questionnaires did not reach the respondents as their addresses have changed. Changing of business addresses might be a sign of some turbulence on the current businesses. Together with the other reasons, these might give some clue to why the other 497 respondents also did not respond to the survey.

4.1.3 Profile of Respondents

With no nonresponse bias and with sufficient response rate, the profile of respondents and background of firms such as the position of respondent, length of service, type of NPD, age of firm, number of employees, and type of industry should have reflected the general profile and background of the population, which are discussed in the following sections.

4.1.3.1 Position of Respondents

This survey was responded by 84 product/production managers and 37 non-product/production managers. After considering two missing values, it was found that 69.4% of the respondents were product/production managers. Table 4.5 shows the related statistics on the position of respondents.

Table 4.5
Position of Respondents

Position of Respondents	Frequency	Percent	Valid Percent	Cumulative Percent
Product/production manager	84	68.3	69.4	69.4
Equivalent to product/production manager	37	30.1	30.6	100.0
Total	121	98.4	100.0	
Missing	2	1.6		
Total	123	100.0		

As shown in the table, two thirds of the respondents were product/production managers. Since this study is targeted the product/production managers as a main respondent, it was found that all the efforts to get them into this study were justified. In contrast, 30.6% of the respondents were non-product/production managers. The positions of these 37 non-product/production managers are summarised in Table 4.6.

Table 4.6
Positions of Non-Product/Production Managers

Job Position	Frequency	Percent
Manager (of Business, Engineering, Factory/Plant, Quality, Regional, General, Line, Operation, R&D, Product & Process Dev., etc.)	13	35.1
Assistant manager (of R&D, QA, Lab & Process, etc.)	6	16.2
Director (of Managing, Commercial)	2	5.4
Supervisor	2	5.4
Chemist	1	2.7
Executive (of Product Development)	1	2.7
Senior Engineer (of New Product Innovation)	1	2.7
Vice president	1	2.7
Other (Management, Sales & Development, Strategic Business Development)	4	10.8
Not specified	6	16.2
Total	37	100.0

This table is showing various positions of non-product/production managers, in which 35.1% of them were related to NPD projects directly, such as factory/plant, quality, and R&D managers. Besides that, there were also senior engineer and executive of NPD responded to this study. As will be shown by the Independent-Samples Mann-Whitney U Test that is to test the differences between product/production and non-product/production groups, all of them were appeared to be relevant for this study.

As shown in Appendix 4B, the test showed the significance values of all variables ranging from .056 to .985 had exceeded the significance level of .05. As such, the median distribution of data between product/production and non-product/production groups is similar across all variables. In other words, the knowledge of non-product/production managers was suggested to be equivalent to product/production managers when it comes to answering the questionnaires.

4.1.3.2 Respondent's Length of Service

For the study that is asking for the knowledge of respondents from the previous five years of completed NPD projects, it appeared 26 respondents (or 21.7%) have five years or less experience, 47 respondents (or 39.2%) have six to 10 years of experience, 35 respondents (or 29.2%) have 11 to 20 years of experience, and 12 respondents (or 10%) have over 21 years of experience. See Table 4.7 for details.

Table 4.7
Respondent's Length of Service

Respondent's Length of Service	Frequency	Percent	Valid Percent	Cumulative Percent
1 to 5 years	26	21.1	21.7	21.7
6 to 10 years	47	38.2	39.2	60.8
11 to 20 years	35	28.5	29.2	90.0
21 to 30 years	7	5.7	5.8	95.8
over 30 years	5	4.1	4.2	100.0
Total	120	97.6	100.0	
Missing	3	2.4		
Total	123	100.0		

As shown in the table, it was found that this survey was successfully responded by more than two thirds of suitable respondents (or 78.3%) who have at least six years of experience. However, 21.7% of respondents who have experiences of five years or less were still considered relevant for this study since the completed NPD projects can be the most recent within their levels of experience. Furthermore, the NPD projects of those with less than five years of experience might be more innovative in nature as they were not bounded to any existing routines (more than five years) from the previous NPD projects. As such, their responses should not be taken for granted.

4.1.3.3 Types of NPD

The respondents were asked on the types of NPD project completed by firms in the previous five years. The respondents were allowed to tick for more than one answer, since they might involve in various NPD projects. The result is shown in Table 4.8.

Table 4.8
Types of NPD

Types of NPD	Responses		Percent of Cases
	N	Percent	
Existing Product Modification	93	33.9	76.2
Product Line Extension	86	31.4	70.5
Me-Too-Product (e.g., following competitor)	47	17.2	38.5
True Innovation Product (radical product innovation)	48	17.5	39.3
Total	274	100.0	224.6

As shown by the statistics in Table 4.8, 93 respondents (equivalent to 76.2% of all responses) involved in NPD projects for the extension of existing product line, 86 respondents (or 70.5%) involved in NPD projects for the additional product line, 47 respondents (or 38.5%) involved in NPD projects of “me-too-product”, and 48 respondents (39.3%) involved in NPD projects for true product innovation. In a more detail, the first three types of NPD can be considered as incremental product innovation, while true innovation product is a radical product innovation. Thus, when comparing between incremental and radical, it was observed 82.5% of Malaysian manufacturing firms were carrying out incremental product innovation within the last five years. This is implying the innovation activities is not very sophisticated (Bauly, 2004). This result is expected since firms use exploitation capability to improve existing products (incremental innovation) more commonly and frequently than exploration capability to explore new product (radical innovation) opportunities in NPD projects (Cooper, 2005; Veryzer, 1998).

4.1.3.4 Age of Firms

Age of firms can be a sign of maturity in NPD, such as where the established firms might have survived several turbulences in environment. The respondents were asked for the age of their firms in five categories from “1 to 5 years” to “over 30 years”. The statistics is summarised in Table 4.9.

Table 4.9
Age of Firms

Age of Firms	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
1 to 5 years	12	9.8	9.8	9.8
6 to 10 years	9	7.3	7.4	17.2
11 to 20 years	44	35.8	36.1	53.3
21 to 30 years	32	26.0	26.2	79.5
over 30 years	25	20.3	20.5	100.0
Total	122	99.2	100.0	
Missing	1	.8		
Total	123	100.0		

From the statistics in Table 4.9, there were 122 valid responses to the question on the age of firms. Accordingly, 12 firms were established between one to five years that represented 9.8% of all responses in the survey, nine firms (7.4%) were established between six to 10 years, 44 firms (36.1%) were established between 11 to 20 years, 32 firms (26.2%) were established between 21 to 30 years, and 25 firms (20.5%) were established for more than 30 years. Meanwhile, previous study has suggested the age of firms that ranged between 5 and 49 years can be a sign of their survival during turbulence environment (Tinoco, 2009). Since majority of respondents falls within this range, it is suggested most firms in this survey should have survived some turbulence in the environment previously (e.g., the world financial crisis in 2009).

4.1.3.5 Number of Employees

Similar to the age of firms and respondent's length of service, the size of firms that were represented by number of employees is a critical firm's profile for this study. The respondents were asked with three items that ranged from "1-50" to "more than 150". The summary of statistics is shown in Table 4.10.

Table 4.10
Number of Employees

Number of Employees	Frequency	Percent	Valid Percent	Cumulative Percent
1-50	36	29.3	29.5	29.5
51-150	38	30.9	31.1	60.7
More than 150	48	39.0	39.3	100.0
Total	122	99.2	100.0	
Missing	1	.8		
Total	123	100.0		

As shown in the statistics, 36 respondents (29.5%) were coming from small enterprise, 38 respondents (31.1%) from medium enterprises, and 48 respondents (39.3%) from large corporations. In a more detail, FMM has categorised the first two groups (1-150) as small and medium enterprises (SMEs). Since SMEs represented

60.7% of firms in the survey, it was found that this study was dominated by SMEs, which is not uncommon since majority of the FMM members were categorized under SMEs. On the other hand, smaller size means most of them can be vulnerable to the environmental factors as they have limited numbers of resources. However, smaller size also means they can be more flexible and will response better to the change.

4.1.3.6 Types of Industry

For this question, the respondents were allowed to choose more than one industry because some firms have subsidiaries running under various industries and some others (without subsidiaries) are doing business in more than one industry. Based on the statistics in Table 4.11, it was observed that the top three industries with at least 15 respondents came from electrical and electronics (20 respondents or 16.4% of all responses), petrochemical and polymer (18 respondents or 14.8% of all responses), and food processing (15 respondents or 12.3% of all responses), which represents approximately one thirds or 37.1% of all manufacturing industries in the study.

Table 4.11
Types of Industry

Types of Industry	Responses		Percent of Cases
	N	**Percent**	
Electrical and electronics	20	14.0	16.4
Petrochemical and polymer	18	12.6	14.8
Food processing	15	10.5	12.3
Electronics manufacturing services	14	9.8	11.5
Rubber products	14	9.8	11.5
Engineering supporting	11	7.7	9.0
Basic metal products	8	5.6	6.6
Machinery and equipment	7	4.9	5.7
Pharmaceuticals	6	4.2	4.9
Wood-based	4	2.8	3.3
Textiles and apparel	3	2.1	2.5
Medical devices	1	.7	.8
Other industries	22	15.4	18.0
Total	143	100.0	117.2

In contrast, the bottom three industries with less than five respondents were from wood-based products (four respondents or 3.3% of all responses), textiles and apparel (three respondents or 2.5% of all responses), and medical devices (one respondent or 0.8% of all responses). Further inspection of the table is suggesting 49.0% of firms were related either directly or indirectly to the high-tech industries (e.g., electrical and electronics, petrochemical and polymer, etc.) that almost equal in size with the low-tech industries. Meanwhile, Table 4.12 shows the statistics of 22 responses from "other industries" category that represented 18% of all responses.

Table 4.12
The Details of "Other Industries" for 22 Respondents

Type of Industries	Frequency	Valid Percent
Construction & building material	4	18.2
Manufacturing & packaging	4	18.2
Automotive & component	3	13.6
Furniture hardware	3	13.6
Paper roll & board	2	9.1
Aircraft composite	1	4.5
Ceramic	1	4.5
Footwear	1	4.5
Lighting	1	4.5
Security seal	1	4.5
Silverware	1	4.5
Total	22	100.0

As shown in this table, apart from the aircraft composite, all of the firms were related directly/indirectly to the low-tech industries (e.g., footwear). Further inspection has shown that the industries in this table were not uncommon to the main categories of manufacturing industries as listed by MIDA. Meanwhile, judging from the lists of industries above, majority of these firms can be traced back to the SMEs category. For this reason, the responses of these 22 respondents should also be taken seriously.

4.2 Preparation of Data

The next step after viewing the data for nonresponse bias, response rate, and respondents' profile was to prepare the data, which is crucial before any analysis is performed (Tabachnick & Fidell, 2007). This is for achieving normal distribution, which is the precondition and/or assumption for many analyses (Hinkle, Wiersma, &

Jurs, 2003). For these reasons, even though data preparation seems to be simple and sometime overlooked, it is actually worth detailed attention. The readiness of data for analysis can be assured by screening, cleaning, and removing outliers (Pallant, 2003), which are discussed in the following sections.

4.2.1 Data Screening and Cleaning

For screening purposes, a cross-check of SPSS dataset with the original data in questionnaire was done to identify any typing or human error. Meanwhile, detection of extreme values was done by inspecting the descriptive analysis of data. Since the range of scale was from one to seven, it was observed no item had any extreme value outside this range. The negative items were reverse-coded and the range scores for each of items were calculated. With n = 123 cases and a seven-point Likert scale being used, the range should be extended from 123 (if all respondents answered one) to 861 (if all respondents answered seven). After considering missing values, it was observed none of the items had scored outside this range.

4.2.2 Dealing with Univariate and Bivariate Outliers

Outlier refers to the data that has clearly deviated away from the others in sample (Grubbs, 1969). The presence of outliers can be simply caused by human error, such as during data entry (Tabachnick & Fidell, 2007), or because it comes from a different population (Grubbs, 1969). Outlier can also be part of the population itself, but it simply has more extreme value than normal distribution (Tabachnick & Fidell, 2007). Since human error is assured not to exist in this study (see Section 4.2.1), any presence of outliers was genuinely because of the latter reasons.

Meanwhile, cases that have substantially different values from the rest of the cases were considered as outliers themselves (Hair, Anderson, Tatham, & Black, 1995).

For this reason, instead of dealing with outliers in the cases, this study treated the cases themselves as the outlier (Argyrous, 2011). Since the extreme value in the cases influences the statistics, these cases might have more impact on the regression coefficient (Tabachnick & Fidell, 2007) than any other cases.

Since this study includes univariate, bivariate, and multivariate analyses, various types of outliers were addressed. In a more detail, univariate outlier refers to the case with extreme values in the scores of a variable, while multivariate outlier is the case with extreme values in the scores of two or more combinations of variables (Tabachnick & Fidell, 2007). From the multivariate definition, it was suggested the bivariate outlier that is the outlier within two combination of variables (Zechmeister & Posavac, 2003) is also part of multivariate outlier.

The multivariate outlier is not addressed here since inspecting for the normality of data can be done simply by cleaning the univariate outlier. Furthermore, "the assumption of multivariate normality is not readily tested because it is impractical to test an infinite number of linear combinations of variables for normality" (Tabachnick & Fidell, 1989, p. 70). However, the multivariate outlier is discussed separately under the multivariate analysis (see Section 4.7) as this is where the multivariate outlier is critically important to be dealt with.

Univariate and bivariate outliers can be identified by visually examining the Boxplots of the variables (Hinkle, Wiersma, & Jurs, 2003). Boxplot is very suitable to identify outliers (Dawson, 2011; Blaisdell, 1993) by "eye-balling" the existence of little circles with numbers attached to it. The little circle appears when the case extended 1.5 box-lengths from the edge of the box, while the outlier marked with * is the extreme value that is extended three box-lengths (Pallant, 2007).

Besides Boxplot, Scatterplot that is usually "used to explore the relationship between two continuous variables" (Pallant, 2007, p. 72), where the strength and direction of relationship can be affected by outliers, was also used to inspect the bivariate outliers (Argyrous, 2011). Since the interest of the study was also to see a linear relationship existed between two variables (besides normality), spotting of outliers in Scatterplot can be of any point that had markedly deviated away from the dominant pattern where the straight line is assumed (Blaikie, 2003).

There are 56 items in 10 variables where univariate outliers can exist in both of them (item and variable). Hence, for a more accurate inspection of univariate outliers, the process of eye-balling included Boxplots of both items and variables. Meanwhile, for bivariate outliers, the eye-balling process on the Boxplot and Scatterplot of the variables was performed. The data to generate Scatterplot for the eye-balling process of the bivariate outliers were taken from the Cooks output that was saved from the regression analysis of the 21 possible combinations of bivariate relationships. The results from the eye-balling process of univariate and bivariate outliers was summarised in Table 4.13 (see Appendix 4C for the details of outliers).

Table 4.13
Top Twelve Cases in Four Types of Outlier

Rank	Univariate Outlier		Bivariate Outlier	
	Outlier in Items' Boxplot	**Outlier in Variables' Boxplot**	**Outlier in Variables' Boxplot**	**Outlier in Variables' Scatterplot**
1	33	10	33	33
2	42	33	65	10
3	97	22	97	22
4	107	42	22	65
5	113	65	42	97
6	41	97	107	42
7	46	107	113	71
8	10	113	71	107
9	65	28	2	113
10	71	46	10	118
11	22	71	41	28
12	81	123	46	46

Based on this table, 10 cases appeared in all four types of outliers, which are 10, 22, 33, 42, 46, 65, 71, 97, 107, and 113. To meet the assumptions for analyses (e.g., factor analysis), these 10 cases were considered for removal. Meanwhile, since not all outliers have big influence on factor analysis (Pison, Rousseeuw, Filzmoser, & Croux, 2003), cases 28 and 41 that only appeared twice, and cases 81 and 123 that only appeared once were considered to be retained. This was because certain outliers might have valuable information about the population (Yuan & Zhang, 2012) that warrants special consideration (Hinkle, Wiersma, & Jurs, 2003). Thus, before removing cases (with outliers) can be considered, it would be appropriate to investigate them so that the right treatment can be identified (Tabachnick & Fidell, 2007). As such, Table 4.14 shows the profile of 10 cases that need to be investigated before considering their removal.

Table 4.14
Profile of 10 Cases with the Most Outliers

Profile	Dimension	Frequency	Percentage
Position of respondents	Product/production manager	6	60.0
	Equivalent to product/production manager	4	40.0
Respondents' length of services	1 to 5 years	1	11.1
	6 to 10 years	4	44.4
	11 to 20 years	3	33.3
	Over 30 years	1	11.1
Type of NPDs	Existing product modification	7	70.0
	Product line extension	6	60.0
	Me-too-product	2	20.0
	True radical innovation	1	10.0
Age of firms	1 to 5 years	2	20.0
	6 to 10 years	5	50.0
	11 to 20 years	1	10.0
	Over 30 years	2	20.0
Size of employees	1-50	3	30.0
	51-150	2	20.0
	More than 150	5	50.0
Type of industries	Basic metal products	1	10.0
	Electronics manufacturing services	2	20.0
	Food processing	1	10.0
	Petrochemical and polymer	1	10.0
	Pharmaceuticals	1	10.0
	Rubber products	1	10.0
	Other industries	3	30.0

Based on the table, it was found that all six profiles of the 10 respondents (cases) have similarity to the general profile of the respondents in Section 4.1.3. In other words, there is no obvious pattern in the 10 cases that is different from the majority, such as representing the specific size of firms, or specific type of industries. Therefore, these 10 cases are assumed to come from the same population as the rests of other cases.

As for the treatment, it was suggested that the influence of the extreme values in these cases can be reduced by transforming or changing the scores to less extreme values (Tabachnick & Fidell, 2007). However, since there are not many extreme values (marked with *) in the outliers of the 10 cases and the number of outliers to be handled is quite a lot in each of the cases, it was found that data transformation would not give any general benefits (Jiang, Cukic, & Menzies, 2008). Since the suggested treatment may not be suitable, while retaining the 10 cases would badly affect the normality of data distribution, the decision to remove these cases was confirmed.

4.2.3 Normality Assessment

Assessment for normality of data distribution was performed so the appropriate methods that required certain statistical procedure for analysis can be applied (Blaikie, 2003). Hence, by inspecting the normality of data, the types of test performed such as parametric or nonparametric was decided (Chan, 2003; Conover & Iman, 1981). As such, the interpretation and inferences of the results would be more reliable and/or valid (Razali & Wah, 2011). Normal distribution that is known for its normal curve or bell-shaped curve (Frankfort-Nachmias & Leon-Guerrero, 2009) has many scores in the middle of the scale with fewer scores progressively going out to both extremes (Hinkle, Wiersma, & Jurs, 2003). Normality can be identified either with a graphical methods, numerical methods, and/or formal normality tests (Razali & Wah, 2011). Since some of the methods are quite sensitive to the sample size, it was advised to use more than one method to “assess the actual degree of departure from normality” (Hair, Anderson, Tatham, & Black, 1992, p. 43). For these reasons, all three methods were applied in this study. Since the criteria for removing outliers were based on the assumed normal distribution (Hodge & Austin, 2004; Grubbs, 1969), the normality of data distribution is only assessed after removal of the 10 cases.

4.2.3.1 Graphical Methods: Boxplot

Boxplot was also used to identify normality of data distribution by inspecting “the rectangle [that] represents 50 per cent of the cases, with the whiskers (the lines protruding from the box) going out to the smallest and largest value” and the median value line was located in the middle of the rectangle (Pallant, 2007, p. 62). With these guidelines, the Boxplots of all variables were visually inspected (see Appendix 4D). Throughout the inspection, it was observed that only a few outliers had appeared outside the boxes and there is no extreme values (marked with *) at all, while 50% of the cases were inside the rectangle and the median value line was in the middle of the rectangle of all Boxplots. Therefore, the data distribution of all variables was suggested to be approximately normal.

4.2.3.2 Numerical Methods: Skewness and Kurtosis Test

Skewness refers to the symmetrical data distribution, while Kurtosis refers to the peakedness of data distribution, in which both are compared to normal distribution (Hair, Anderson, Tatham, & Black, 1995). As Skewness and Kurtosis tests are descriptive statistics (Razali & Wah, 2011), they can be interpreted as follows: data distribution is perfectly normal if the values of Skewness and Kurtosis is zero. Positive skew is where the right tail is too long with many cases piling up to the left. Negative skew is just the opposite of the positive skew (Tabachnick & Fidell, 2007). Meanwhile, positive Kurtosis refers to data distribution that is peaked. In contrast, negative Kurtosis refers to data distribution that is flat (Pallant, 2007). With these guidelines, the summary of Skewness and Kurtosis were analysed as in Table 4.15.

Table 4.15
Numerical Methods

Types	Variables	Skewness		Kurtosis	
		Statistic	Std. Error	Statistic	Std. Error
NPD Performance (Dependent Variable)	Financial Performance	-.060	.227	.096	.451
	Innovativeness Performance	-.187	.228	.460	.453
	Quality Performance	-.158	.227	-.368	.451
Organisational Capabilities (Independent Variable)	Exploitation Capability	-.342	.230	.131	.457
	Exploration Capability	-.105	.228	.146	.453
	Structural Ambidexterity	-.378	.229	.268	.455
	Contextual Ambidexterity	-.016	.228	-.385	.453
Environmental Turbulence (Moderating Variable)	Market Turbulence	-.232	.230	.308	.457
	Technological Turbulence	-.141	.229	.341	.455
	Competitive Intensity	.332	.228	-.128	.453

As the table shows, all variables have the standard error for Skewness ranging from .227 to .230, and Kurtosis ranging from .451 to .457. Descriptively, it appears that while the Skewness of nine variables was negative, the Skewness of competitive intensity was positive. Meanwhile, seven variables had peaked data distribution and the other three (quality performance, contextual ambidexterity, and competitive intensity) had flat data distribution.

To identify how skewed the data distribution could be, a simple calculation to get the range value of standard error can be performed by multiplying the standard error of the variable by 2. The data can be considered less skewed if the statistic value of the data falls within the range (Price, 2000). For example, as shown in the table, the range of standard error for financial performance is from -.454 to .454 (.227*2) where the statistic value (-.060) falls within the range (-.454 < -.060 < .454), which suggest that the data distribution for financial performance was not badly skewed. With the same calculation, it was shown that other variables were also not badly skewed. Since the same result was also observed for Kurtosis, it had been proven that the data distribution of all variables is approximately normal.

4.2.3.3 Formal Normality Tests: Shapiro-Wilk Test

Shapiro-Wilk test, Kolmogorov-Smirnov test, Lilliefors test, and Anderson-Darling test are among the common tests for normality, but previous study suggested Shapiro-Wilk test is the most powerful among them (Razali & Wah, 2011). Even though Shapiro-Wilk test is originally recommended for the sample size of less than 25 (Burdenski, 2000), previous study had suggested that the test is actually not so powerful for small sample size (e.g., < 30) (Razali & Wah, 2011). In a different study, it was suggested that Shapiro-Wilk test can handle a sample size as large as 2000 (Royston, 1982), while other literature had recommended the use of Shapiro-Wilk test for any size of sample between three and 5000 (Royston, 1995). Since the sample size in the study was 113, where 3 < 113 < 5000, Shapiro-Wilk test should be the most suitable to use for its power compared to the other tests. Table 4.16 shows the results of formal normality test.

Table 4.16
The Results of Shapiro-Wilk Normality Test

Types	**Variables**	**Shapiro-Wilk**		
		Statistic	***Df***	***Sig.***
NPD Performance (Dependent Variable)	Financial Performance	.977	113	.052
	Innovativeness Performance	.984	112	.212
	Quality Performance	.984	113	.203
Organisational Capabilities (Independent Variable)	Exploitation Capability	.978	110	.060
	Exploration Capability	.982	112	.147
	Structural Ambidexterity	.984	111	.204
	Contextual Ambidexterity	.979	112	.074
Environmental Turbulence (Moderating Variable)	Market Turbulence	.982	110	.142
	Technological Turbulence	.986	111	.323
	Competitive Intensity	.979	112	.075

Based on the table, the *Sig.* values of all variables were ranged from .052 to .323. Since all values exceeded the significance level of .05, the data distribution of all variables is approximately normal. This result was also consistent with the previous two tests because "once the sample size is greater than 100, the sampling distribution of sample means will be approximately normal" (Argyrous, 2011, p. 291).

4.3 Factor Analysis

Validity refers to the degree of scale that measures what it is supposed to measure. There are three types of validity, namely content validity, criterion validity, and construct validity (Pallant, 2007). Since validity can be evidenced by studying the internal structure of the scale that is commonly assessed with factor analysis (Rattray & Jones, 2007), construct validity that can be performed with variable reduction technique (Conway & Huffcutt, 2003) is the focus of this section.

Factor analysis that is a very powerful statistical technique (Suhr, 2006) and usually used for exploratory purposes (Tabachnick & Fidell, 2007) was applied here. This happens due to this study is exploratory in nature where the use of constructs in the context of Malaysian manufacturing sector is quite new as they were adapted instead of adopted, and some of the constructs were even adapted from qualitative study (see Section 3.4.5).

For this study, factor analysis was performed with the principal component analysis, which is probably the best and oldest multivariate technique (Jolliffe, 2002), and also the most commonly (Rattray & Jones, 2007) and widely used statistics tool for dimension reduction (Candes, Li, Ma, & Wright, 2011) in various forms of data analysis (Shlens, 2005) by almost all scientific disciplines (Abdi & Williams, 2010). In addition, principal component analysis is an effective tool to reduce the number of items (Matsunaga, 2010) in components/factors (Rattray & Jones, 2007) that allows some of the original measures to be excluded in the analysis (DeCoster, 1998), especially those that are redundant and/or unnecessary (Rattray & Jones, 2007).

4.3.1 Data Readiness and Preparation for Factor Analysis

Data readiness and preparation are important before performing factor analysis. As such, all issues regarding sample size, outliers, correlation, and sampling adequacy are dealt with as discussed in the following sections.

4.3.1.1 Sample Size

To perform factor analysis, the sample size should be more than 50, but the size of 100 and above is more preferable (Hair, Anderson, Tatham, & Black, 1995). However, the required sample size for factor analysis has been reduced over the years as the result of various research efforts on that topic (Pallant, 2007). For instance, the strict rules of sample size for exploratory factor analysis have almost disappeared (Costello & Osborne, 2005). Even though the minimum acceptable ratio of observation (sample size) to variable (items) for factor analysis is 5:1 (Gorsuch, 1983), the ratio of 4:1 is also recommended as a general rule (Hammond, 2006). However, in many instances, researchers are forced to factor analyse variables when the ratio is only 2:1 (Hair, Anderson, Tatham, & Black, 1995). Similarly, it has been suggested that the minimum sample size for factor analysis is 100 with the ratio of 2:1 to the variable (Rattray & Jones, 2007). For these reasons, the sample size for the study that is 113 (after removing outliers) with 16 items for dependent variable (7.1:1), 25 items for independent variable (4.5:1), and 15 items for moderating variable (7.5:1) met the minimum requirement (4:1 ratio) to perform factor analysis.

4.3.1.2 Outliers

Outlier can lead to very poor factor analysis (Chen, 2002; Comrey, 1985). Even though it is not possible to remove all outliers in the data as this will affect the number of sample to perform the analysis, only cases with the most outliers were removed. This issue has been dealt with in Section 4.2.2, while the normality was addressed in Section 4.2.3.

4.3.1.3 Correlation

The use of factor analysis can be considered if the Correlation Matrix table shows many correlation coefficients of 0.3 and above (Pallant, 2007). As such, any item with very low correlation (below 0.3) to all or most of the items, and items with very high correlation (above 0.9) should not be included in the analysis (Blaikie, 2003). As suggested by the output of factor analysis (as shown in Tables 4.17, 4.18, and 4.19), it was shown that most of the correlation coefficients were at least 0.3 and none of them were more than 0.9. As such, factor analysis can be safely performed for the study.

4.3.1.4 Sampling Adequacy

Factor analysis can be safely performed if the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) is at least 0.6, while the value of less than 0.5 is considered as unsatisfactory (Blaikie, 2003). Similarly, the Anti-image Correlation (the MSA) for the individual item has to exceed 0.6. Meanwhile, the Bartlett's Test of Sphericity has to be statistically significant at $p < 0.05$. In a similar result to correlation, the KMO MSA, Anti-image Correlation, and Bartlett's Test of Sphericity from the outputs of factor analysis suggested that these assumptions were also met by the data under study (details of analyses will be discussed in Section 4.3.3 to 4.3.5).

4.3.2 Guidelines for Interpreting Factor Analysis

For ease of interpretation, NPD performance, organisational capabilities, and environmental turbulence were factor analysed separately as they are different categories of variables. In other words, as they are multidimensional to be factor analysed simultaneously, it is common to divide them into subtests (Osterlind, 2010). Meanwhile, since factor analysis is a complex, multi-step (Costello & Osborne, 2005), and iterative processes (Rattray & Jones, 2007) that should be repeated after removal of items (Pallant, 2007), only the final outputs are discussed here. Following are the guidelines to interpret the outputs from this analysis.

4.3.2.1 Factor Rotation

Factor rotation is used to maximise high correlation variables and minimise low correlation variables, which is usually performed after factor extraction (Tabachnick & Fidell, 2007). Factor rotation makes the pattern of loading easier for interpretation (Abdi & Williams, 2010; Pallant, 2007). Two approaches for factor rotation are orthogonal and oblique. While orthogonal factor solution consists of Varimax, Quartimax, and Equamax, oblique factor solution consists of Direct Oblimin and Promax, in which both approaches are offered in the SPSS (Pallant, 2007). For the study, Varimax was chosen not only because it is the most commonly used method (Tabachnick & Fidell, 2007; Costello & Osborne, 2005) for principal component analysis, but also the easiest to interpret (Abdi & Williams, 2010).

4.3.2.2 Factor Extraction

Factor extraction is used to determine the best number of factors to represent the interrelationship of variables (Pallant, 2007). Three common criteria to retain number of factors are Kaiser’s criterion, screen test, and parallel analysis, which are based on eigenvalues (Brown, 2006) where the solution that explained 60% of total variance is not uncommon in social science (Hair, Anderson, Tatham, & Black, 1995).

According to the Kaiser's criterion, the number of factors with eigenvalues is obtained from the input correlation matrix (Brown, 2006) where the rule-of-thumb is to retain factors with eigenvalue that is greater than 1.0 (Blaikie, 2003). Meanwhile, based on the screen test criterion, the cut-off point where the maximum number of factors to be extracted is determined by the point where the curve in the screen plot begins to straighten out (Hair, Anderson, Tatham, & Black, 1995). Alternatively, according to parallel analysis, the number of factors to be retained can be based on the point where the real eigenvalue from the analysis crosses the eigenvalue from the random generation of data (Brown, 2006). The computation of eigenvalue for parallel analysis can be performed with the Watkins' Monte Carlo PCA program (Matsunaga, 2010). Meanwhile, since the interpretations in factor analysis is quite subjective (Matsunaga, 2010) there is no exact way to decide the ideal number of factors to be retained.

4.3.2.3 Rule-of-thumb for Item Removal[4]

Principal component analysis is very versatile (Abdi & Williams, 2010). It can be used for reducing the number of items (Matsunaga, 2010) that is redundant or unnecessary (Rattray & Jones, 2007). The problematic items that have caused the loading table to be not interpretable (Costello & Osborne, 2005) can be considered for removal if they have poor-loading (or weak) value, wrong-loading (or unnecessary) value, and/or cross-loading (or redundant) value (Indu, Remadevi,

[4] Even though the term variable is commonly used in factor analysis, some authors such as Matsunaga (2010) are using the term item. To avoid confusion, the study is using the term item as there are 56 items within 10 variables (not the variables themselves) to be factor analysed. Meanwhile, the 10 variables in the study are termed as factor/component.

Vidhukumar, Anilkumar, & Subha, 2011). Alternatively, removal of items can also be considered if the Communalities value of the item is below 0.3 (Pallant, 2007). As the decision to retain/remove items is quite subjective, a certain degree of judgment is needed in the procedure (Matsunaga, 2010). Since principal component analysis usually produces low loading value (Park, Dailey, & Lemus, 2002), the minimum rule-of-thumb for item removal is applied, which are discussed as follows:

i Removing Poor-loading (or weak) Items

Items should be retained if “each of the variables [or items] loading strongly on only one component, and each component being represented by a number of strongly loading variables [or items]” (Pallant, 2007, p. 183). In this case, the rule-of-thumb is to retain items with loading value of 0.4 and above (Matsunaga, 2010) in the Rotated Component Matrix. Since loading value of 0.3 is also recommended (Blaikie, 2003), this value will be used in the (Unrotated) Component Matrix. In other words, items with loading value of less than 0.4 in Rotated Component Matrix and/or less than 0.3 in Component Matrix can be considered as poor-loading items and they should be considered for removal.

ii Removing Cross-loading (or redundant) Items

Items should also be retained if they “load clearly and strongly onto one component/factor while showing small to nil loadings onto other components/factors” (Matsunaga, 2010, p. 101). In this case, retaining items can be considered if the discrepancies of cross-loading value between factors is not less than 0.2 (Sun & Wang, 2009) such as 0.6/0.4 (0.6 – 0.4 = 0.2), which is not uncommon in previous studies (Matsunaga, 2010). Therefore, cross-loading items with discrepancy value of less than 0.2 should be considered for removal.

iii Removing Wrong-loading (or unnecessary) Items

Since “the resultant pool should contain only items that tap theoretically meaningful and interpretable factors, but not those that reflect insubstantial noises or measurement/sampling errors”, removal of items can also be considered if they have no factor loading or loading on the wrong factor. In other words, items can be removed if it does not emerge as expected (Matsunaga, 2010, p. 103).

4.3.3 Factor Analysis on NPD Performance

NPD performance is factor analysed to measure the interrelationships of related items and how these items can be explained under financial performance, innovativeness performance, and quality performance.

After removal of two high cross-loading value items (InnovateQ2e and QualityQ3c) from the initial analysis, a final factor analysis was performed with the outputs displayed in Table 4.17. From the table, the final data was deemed suitable for analysis, as shown by the overall KMO MSA value of 0.765, and the individual items’ MSA ranging from 0.669 to 0.878, which is above the required value of 0.6. Meanwhile, the Bartlett’s Test of Sphericity was also significant at $p < 0.05$, with fair amount of correlation (the coefficient of 0.3 and above).

Based on Kaiser’s criterion that retain factors with eigenvalues of 1.0 and above, the Total Variance Explained table suggests three factors that explain about 62.64% of total variance, which has exceeded the recommendation of 60% (Hair, Anderson,

Table 4.17

Summary of Final Factor Analysis for NPD Performance

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	797.498
	Df	91
	Sig.	.000

Rotation Sums of Squared Loadings	62.637

Items	**Anti-image Correlation**	**Communalities**	**Component Matrix**			**Rotated Component Matrix**		
			1	**2**	**3**	**1**	**2**	**3**
FinanceQ1a	.699	.715	.590	.576			**.814**	
FinanceQ1b	.718	.562	.517	.501			**.726**	
FinanceQ1c	.700	.720	.487	.649			**.844**	
FinanceQ1d	.700	.736	.529	.652			**.842**	
InnovateQ2a	.824	.726	.659	-.483		**.835**		
InnovateQ2b	.847	.781	.757	-.440		**.821**		.323
InnovateQ2c	.848	.779	.696	-.394	-.372	**.867**		
InnovateQ2d	.878	.582	.691			**.697**		
InnovateQ2f	.824	.583	.643	-.319		**.736**		
QualityQ3a	.669	.297	.400		.344			**.507**
QualityQ3b	.736	.371	.538					**.538**
QualityQ3d	.808	.525	.556		.415			**.658**
QualityQ3e	.680	.806	.621		.648			**.885**
QualityQ3f	.709	.586	.630		.436			**.714**

Table 4.17 (Continue)

Correlation	Finance Q1a	Finance Q1b	Finance Q1c	Finance Q1d	Innovate Q2a	Innovate Q2b	Innovate Q2c	Innovate Q2d	Innovate Q2f	Quality Q3a	Quality Q3b	Quality Q3d	Quality Q3e	Quality Q3f
FinanceQ1a	1.000													
FinanceQ1b	.704	1.000												
FinanceQ1c	.521	.428	1.000											
FinanceQ1d	.577	.434	.799	1.000										
InnovateQ2a	.141	.196	.068	.106	1.000									
InnovateQ2b	.258	.221	.085	.120	.730	1.000								
InnovateQ2c	.301	.249	.141	.145	.689	.725	1.000							
InnovateQ2d	.217	.121	.235	.258	.475	.603	.549	1.000						
InnovateQ2f	.158	.159	.223	.186	.523	.532	.571	.583	1.000					
QualityQ3a	.066	.222	.011	.083	.285	.223	.232	.238	.151	1.000				
QualityQ3b	.278	.208	.219	.190	.316	.337	.261	.264	.241	.333	1.000			
QualityQ3d	.376	.337	.225	.269	.145	.276	.197	.209	.291	.252	.374	1.000		
QualityQ3e	.238	.144	.195	.278	.244	.418	.197	.344	.206	.284	.411	.513	1.000	
QualityQ3f	.300	.172	.227	.275	.297	.431	.254	.427	.313	.228	.197	.343	.725	1.000

Tatham, & Black, 1995). According to the Rotated Component Matrix table, factor 1 was dominated by items from innovativeness performance, factor 2 with items from financial performance, and factor 3 with items from quality performance. For these reason, factor 1 is defined as innovativeness performance, factor 2 as financial performance, and factor 3 as quality performance.

Accordingly, the Communalities of all items were acceptably high ranging from 0.371 to 0.806, which established that the items fit well with the related factors, except for one item (QualityQ3a) which was slightly below 0.3 at 0.297. However, this item was retained as it has loading value of 0.507 in the Rotated Component Matrix, which is way above the cut-off point of 0.4. Meanwhile, the Component Matrix table revealed that all items had loading value exceeding 0.3, while the Rotated Component Matrix showed all items were loaded from 0.507 to 0.885. There was only one item with cross-loading value (InnovateQ2b), but since the cross-loading value did not violate the rule-of-thumb (e.g., discrepancy value of 0.2), it was retained. As a result, factor analysis confirmed that NPD performance has three factors, namely financial performance, innovativeness performance, and quality performance that is consistent with the literature review of this study.

4.3.4 Factor Analysis on Organisational Capabilities

Organisational capabilities was factor analysed to measure the interrelationships of the related items and how these items can be explained under exploitation capability, exploration capability, structural ambidexterity, and contextual ambidexterity.

Based on the factor analysis output in Table 4.18, it can be observed that the data is comfortably fit for analysis, as supported by the KMO MSA value of 0.862, the Anti-Image Correlation for the individual items that ranging from 0.760 to 0.936, and the

Table 4.18

Summary of Final Factor Analysis for Organisational Capabilities

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.862
Bartlett's Test of Sphericity	Approx. Chi-Square	1907.341
	Df	300
	Sig.	.000

Rotation Sums of Squared Loadings	65.674

Items	Anti-image Correlation	Communalities	Component Matrix				Rotated Component Matrix			
			1	2	3	4	1	2	3	4
ExploitQ4a	.885	.732	.692	-.424			**.794**			
ExploitQ4b	.894	.789	.690	-.456		-.323	**.840**			
ExploitQ4c	.907	.724	.665	-.443			**.802**			
ExploitQ4d	.870	.748	.670	-.348		-.410	**.825**			
ExploitQ4e	.936	.753	.764	-.311			**.763**			
ExploitQ4f	.885	.687	.742	-.330			**.699**	.350		
ExploreQ5a	.884	.553	.638		-.371		.372			**.588**
ExploreQ5b	.822	.605	.650		-.369		.304			**.658**
ExploreQ5c	.784	.569	.597		-.371					**.666**
ExploreQ5d	.882	.640	.645		-.325					**.702**
ExploreQ5e	.760	.717	.460	.421	-.534					**.835**
ExploreQ5f	.851	.653	.562	.303	-.364	.336		.303		**.736**
StructureQ6a	.879	.619	.660		.362			.410	**.634**	
StructureQ6b	.790	.667	.561	.355	.475			.387	**.718**	
StructureQ6c	.798	.611	.500	.370	.472			.372	**.685**	
StructureQ6d	.884	.670	.606	.509					**.677**	
StructureQ6e	.812	.675	.599	.453					**.754**	
StructureQ6f	.845	.656	.557	.493					**.743**	
StructureQ6g	.826	.535	.481	.367					**.680**	
ContextQ7a	.865	.673	.695			.375		**.737**		
ContextQ7b	.835	.719	.660			.434		**.800**		
ContextQ7c	.898	.740	.731			.333	.329	**.762**		
ContextQ7d	.892	.630	.709				.429	**.632**		
ContextQ7e	.874	.397	.537					**.553**		
ContextQ7f	.869	.655	.658			.395		**.743**		

Table 4.18 (Continue)

Correlation	Exploit Q4a	Exploit Q4b	Exploit Q4c	Exploit Q4d	Exploit Q4e	Exploit Q4f	Explore Q5a	Explore Q5b	Explore Q5c	Explore Q5d	Explore Q5e	Explore Q5f	Structur Q6a	Structur Q6b	Structur Q6c	Structur Q6d	Structur Q6e	Structur Q6f	Structur Q6g	Context Q7a	Context Q7b	Context Q7c	Context Q7d	Context Q7e	Context Q7f
ExploitQ4a	1.000																								
ExploitQ4b	.816	1.000																							
ExploitQ4c	.676	.721	1.000																						
ExploitQ4d	.666	.683	.719	1.000																					
ExploitQ4e	.664	.716	.631	.700	1.000																				
ExploitQ4f	.631	.638	.600	.673	.772	1.000																			
ExploreQ5a	.362	.409	.415	.362	.501	.534	1.000																		
ExploreQ5b	.289	.332	.350	.399	.485	.450	.595	1.000																	
ExploreQ5c	.257	.287	.314	.379	.410	.306	.383	.720	1.000																
ExploreQ5d	.344	.285	.290	.284	.389	.358	.493	.420	.492	1.000															
ExploreQ5e	.146	.136	.067	.178	.235	.261	.406	.440	.502	.642	1.000														
ExploreQ5f	.263	.175	.197	.187	.330	.348	.474	.496	.440	.547	.630	1.000													
StructurQ6a	.307	.360	.340	.312	.414	.413	.407	.395	.305	.418	.157	.286	1.000												
StructurQ6b	.225	.265	.195	.262	.298	.308	.219	.331	.296	.248	.183	.350	.662	1.000											
StructurQ6c	.137	.176	.150	.251	.251	.269	.131	.332	.272	.226	.217	.269	.561	.806	1.000										
StructurQ6d	.306	.249	.260	.299	.307	.278	.340	.467	.424	.510	.401	.419	.460	.437	.419	1.000									
StructurQ6e	.315	.251	.288	.268	.367	.333	.230	.313	.377	.436	.286	.337	.493	.424	.385	.691	1.000								
StructurQ6f	.264	.243	.194	.289	.275	.195	.290	.337	.363	.462	.311	.259	.437	.426	.345	.638	.669	1.000							
StructurQ6g	.244	.246	.218	.250	.285	.228	.238	.311	.278	.259	.249	.139	.393	.315	.292	.446	.603	.628	1.000						
ContextQ7a	.478	.415	.431	.315	.418	.452	.414	.301	.321	.440	.227	.390	.375	.360	.308	.285	.386	.276	.258	1.000					
ContextQ7b	.401	.380	.413	.310	.437	.465	.336	.243	.294	.387	.159	.382	.412	.365	.335	.255	.310	.182	.182	.817	1.000				
ContextQ7c	.504	.480	.485	.417	.492	.467	.391	.355	.298	.370	.220	.360	.415	.336	.313	.284	.271	.304	.276	.656	.685	1.000			
ContextQ7d	.492	.500	.498	.464	.557	.548	.367	.375	.360	.344	.220	.295	.407	.287	.257	.269	.237	.270	.268	.548	.537	.771	1.000		
ContextQ7e	.322	.337	.280	.321	.395	.396	.373	.303	.160	.281	.163	.194	.321	.213	.197	.192	.206	.240	.218	.387	.352	.530	.494	1.000	
ContextQ7f	.450	.419	.396	.304	.419	.475	.346	.323	.340	.405	.201	.318	.461	.318	.312	.236	.257	.249	.095	.553	.580	.637	.564	.565	1.000

Bartlett's Test of Sphericity that was significant at $p < 0.05$, with fair amount of correlation (the coefficient of 0.3 and above). Meanwhile, based on Kaiser's criterion that only retains factors with eigenvalue of 1.0 or greater, the Total Variance Explained table exhibits four factors that explain about 65.67% of total variance. Since all items were loaded strongly on the related factors, it appears that factor 1 can be identified as exploitation capability, factor 2 as contextual ambidexterity, factor 3 as structural ambidexterity, and factor 4 as exploration capability.

In a more detail, the Rotated Component Matrix table shows all items ranging from 0.533 to 0.840 on the related factors that exceeded the minimum loading value of 0.4, and when compared to the more strict rule for sample size of 100, it appears that all items had also exceeded the minimum loading value of 0.51 (Blaikie, 2003). As a result, even though there were 10 items with cross-loading values, it appears that none of them had violated the rule-of-thumb. Moreover, as Communalities table highlights, all items have the variance explained ranging from 0.397 to 0.789. It appears that all items had no problems to fit into their factors. Thus, all items were retained. Eventually, with none of the items removed, the results from factor analysis were consistent with the literature review that recommended four types of organisational capability, namely exploitation capability, exploration capability, structural ambidexterity, and contextual ambidexterity.

4.3.5 Factor Analysis on Environmental Turbulence

Environmental turbulence was factor analysed to measure the interrelationships of the related items and how these items can be explained under market turbulence, technological turbulence, and competitive intensity.

After removal of six items (MarketQ8a, MarketQ8e, TechnoQ9b, CompeteQ10b, CompeteQ10c, and CompeteQ10d) for violating the rule-of-thumb in the initial analyses, a final factor analysis was performed with the outputs displayed in Table 4.19. The result showed that the data is fit for analysis as the KMO MSA value was at 0.817 and the Bartlett's Test of Sphericity was significant at $p < 0.05$. In addition, all individual items' MSA exceeded 0.6, ranging from 0.741 to 0.877, while most of the items' correlation coefficient was above 0.3.

Meanwhile, the Total Variance Explained table confirmed that three factors with eigenvalue above 1.0 were retained, which in combination, explained about 74.73% of total variance. Accordingly, the Rotated Component Matrix table showed that most items that contribute toward higher loading values in factor 1 came from technological turbulence, factor 2 from competitive intensity, and factor 3 from market turbulence. As a result, factor 1 was named after technological turbulence, factor 2 after competitive intensity, and factor 3 after market turbulence. In a similar vein, the Communalities of all items that ranged from 0.627 to 0.882 suggested that they fit well with their related factors.

In addition, the Component Matrix table exhibits that all items had loading value above 0.3, while the Rotated Component Matrix confirmed that all items were loaded on the correct factors from 0.688 to 0.920, which are way above 0.4. Since none of the cross-loading value violated the rule-of-thumb, all remaining items were retained. Even though all factors had only three items each, they were still proven stable and strong enough because only factors with less than three items can be considered as unstable and weak (Costello & Osborne, 2005). Nevertheless, the analysis suggested three factors for environmental turbulence, namely market turbulence, technological turbulence, and competitive intensity which are consistent with the literature review.

Table 4.19

Summary of Final Factor Analysis for Environmental Turbulence

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.817
Bartlett's Test of Sphericity	Approx. Chi-Square	484.958
	Df	36
	Sig.	.000

Rotation Sums of Squared Loadings	74.730

Items	**Anti-image Correlation**	**Communalities**	**Component Matrix**			**Rotated Component Matrix**		
			1	**2**	**3**	**1**	**2**	**3**
MarketQ8b	.825	.627	.688		.393	.317		**.693**
MarketQ8c	.832	.721	.772		.350	.408		**.699**
MarketQ8d	.822	.702	.480		.684			**.836**
TechnoQ9a	.877	.693	.802			**.688**	.336	.327
TechnoQ9c	.745	.882	.734	-.495	-.314	**.920**		
TechnoQ9d	.795	.832	.751	-.487		**.877**		
CompeteQ10a	.805	.761	.588	.506	-.399		**.854**	
CompeteQ10e	.850	.718	.646	.547			**.746**	.402
CompeteQ10f	.820	.789	.771	.335		.373	**.786**	

Correlation	Market Q8b	Market Q8c	Market Q8d	Techno Q9a	Techno Q9c	Techno Q9d	Compete Q10a	Compete Q10e	Compete Q10f
MarketQ8b	1.000								
MarketQ8c	.672	1.000							
MarketQ8d	.384	.432	1.000						
TechnoQ9a	.404	.553	.350	1.000					
TechnoQ9c	.344	.442	.170	.677	1.000				
TechnoQ9d	.460	.510	.234	.592	.794	1.000			
CompeteQ10a	.306	.331	.072	.352	.284	.293	1.000		
CompeteQ10e	.356	.449	.338	.415	.250	.248	.473	1.000	
CompeteQ10f	.396	.418	.254	.573	.482	.447	.628	.604	1.000

4.3.6 Summary of Factor Analysis

After considering the assumptions for factor analysis and the guidelines for removal of items with high cross-loading value, the initial analyses had resulted in the removal of two items from NPD performance, six items from environmental turbulence, and no item from organisational capabilities. Table 4.20 shows the summary of the final factor analyses.

Table 4.20
Summary of the Final Factor Analyses

Factor Analysis	Num. of Items	Items Remained	Items Removed	Component Name	Item in Comp.
NPD Performance (Dependent Variable)	16	14	InnovateQ2e QualityQ3c	Financial Performance Innovativeness Performance Quality Performance	4 5 5
Organisational Capabilities (Independent Variable)	25	25	-	Exploitation Capability Exploration Capability Structural Ambidexterity Contextual Ambidexterity	6 6 7 6
Environmental Turbulence (Moderating Variable)	15	9	MarketQ8a MarketQ8e TechnoQ9b CompeteQ10b CompeteQ10c CompeteQ10d	Market Turbulence Technological Turbulence Competitive Intensity	3 3 3

As the table shows, all remaining items loaded sufficiently on the right factors according to this study. In addition, the number of items remained after final factor analyses were ranged from three to seven on the related factors. As a result of construct validity, all variables can now be safely measured with at least three items.

4.4 Reliability of Scale

After construct validity was achieved with factor analysis, it was recommended that the reliability of the variables was to be inspected next as both of them are interrelated conditions (Hair, Anderson, Tatham, & Black, 1995). Reliability is a degree to which the position of a given score in the score distribution is stable when measured at different times or ways (Tabachnick & Fidell, 2007). It is usually indicated by the test-retest reliability and internal consistency (Pallant, 2007). For this study, the internal consistency with Cronbach's coefficient alpha was applied to indicate the correlation of all items in the related scale. In general, higher Cronbach's coefficient alpha indicates higher reliability. However, depending on the context, different levels of reliability may be required (Pallant, 2007). Table 4.21 is comparing the reliability of all variables before and after factor analysis.

Table 4.21
Summary of Reliability Test before and after Factor Analysis

Types	**Variables**	**Reliability**	
		Before FA	**After FA**
NPD Performance (Dependent Variable)	Financial Performance	.845	.845
	Innovativeness Performance	.807	.879
	Quality Performance	.772	.736
Organisational Capabilities (Independent Variable)	Exploitation Capability	.930	.930
	Exploration Capability	.862	.862
	Structural Ambidexterity	.877	.877
	Contextual Ambidexterity	.883	.883
Environmental Turbulence (Moderating Variable)	Market Turbulence	.561	.745
	Technological Turbulence	.705	.864
	Competitive Intensity	.710	.797

As shown in the table, the reliability of all variables that ranged from 0.736 to 0.93 after performing factor analysis had exceeded the minimum acceptable level of 0.7, which established that internal consistency of all variables was reliably good. Prior to performing factor analysis, the reliability for market turbulence was less than 0.6 that means factor analysis has improved its reliability to 0.745. This study adopted the Cronbach's coefficient alpha of 0.7 as the minimum acceptable level of reliability (Iacobucci & Duhachek, 2003; Nunnally, 1978) that is in general representing acceptable/good reliability (Gliem & Gliem, 2003; Litwin, 1995).

4.5 Univariate Analysis: Descriptive Analysis of Main Variables

The univariate analysis was performed by descriptively analysing the mean statistics of variables that was measured with the interval ratio extended from scale 1 for strongly disagree to scale 7 for strongly agree. Table 4.22 displays the outputs of analysis with the minimum, maximum, and mean score of variables.

Table 4.22
Descriptive Analysis of the Univariate Variables

Types	Univariate Variable	Minimum	Maximum	Mean	Group Mean
		Statistic	Statistic	Statistic	
NPD Performance (Dependent Variable)	Financial Performance	1.75	7.00	4.8650	5.1136
	Innovativeness Performance	1.40	7.00	4.9643	
	Quality Performance	3.00	7.00	5.5115	
Organisational Capabilities (Independent Variable)	Exploitation Capability	2.33	7.00	5.3909	5.034
	Exploration Capability	2.17	7.00	4.8095	
	Structural Ambidexterity	1.29	7.00	4.5985	
	Contextual Ambidexterity	3.00	7.00	5.3378	
Environmental Turbulence (Moderating Variable)	Market Turbulence	1.33	7.00	4.7636	4.750
	Technological Turbulence	1.33	7.00	4.8859	
	Competitive Intensity	1.33	7.00	4.6018	

As shown in this table, the minimum score of variables ranged from 1.29 (for structural ambidexterity) to 3.00 (for quality performance and contextual ambidexterity), while the maximum score was 7.00 for all variables. Accordingly, the highest range score belonged to structural ambidexterity with 5.71 (7.00 – 1.29), while the lowest range score belonged to quality performance and contextual ambidexterity with 4.00 (7.00 – 3.00). This implies structural ambidexterity has a wider range of respondents' answers when compared to quality performance and contextual ambidexterity. As a result, structural ambidexterity had the lowest mean score of 4.5985, while quality performance had the highest mean score of 5.5115.

In a similar vein, the average mean score for the groups of NPD performance, organisational capabilities, and environmental turbulence were 5.1136, 5.034, and 4.750, respectively. As the mean scores of all variables (and the group of variables) were above 4.00 and around 5.00, it was shown that the score of all variables falls within the "agree region". For these reasons, the results descriptively indicated that the respondents were collectively in agreement with the statements on all variables.

4.6 Bivariate Analysis: Correlation Analysis

The measure of association is a good way to evaluate relationships (Nardi, 2003). Since correlation analysis is used to explain the strength and describe the direction of linear relationship between two variables (Pallant, 2007), it suits Objectives 1 and 2 of the study, which was interested in knowing the relationship between two variables without considering the causal effect between them. As such, the correlation analysis was applied for testing the hypotheses on Objectives 1 and 2. Even though one limitation for using correlation analysis is that it does not indicate which variable is the cause and which is the effect (Pearl, 2009; Hamburg, 1987), it was deemed that this limitation was not applicable for Objectives 1 and 2 that were not to determine the cause and effect between organisational capabilities and NPD performance.

4.6.1 Data Readiness for Correlation Analysis

Prior to performing correlation analysis, the assumptions discussed in Sections 4.2 for data preparation (e.g., outlier, normality) were revisited. This is performed after removal of some items during factor analysis. Since some variables have becoming slightly not normal, the related outliers were removed. The summary of normality test after factor analysis is shown in Table 4.23.

Table 4.23
Normality Test for Correlation Analysis

Types	**Variables**	**Shapiro-Wilk**		
		Statistic	***df***	***Sig.***
NPD Performance (Dependent Variable)	Financial Performance	.978	111	.067
	Innovativeness Performance	.982	110	.132
	Quality Performance	.980	111	.091
Organisational Capabilities (Independent Variable)	Exploitation Capability	.977	109	.057
	Exploration Capability	.984	110	.201
	Structural Ambidexterity	.987	110	.347
	Contextual Ambidexterity	.978	110	.071
Environmental Turbulence (Moderating Variable)	Market Turbulence	.978	108	.076
	Technological Turbulence	.978	109	.068
	Competitive Intensity	.979	111	.073

As the table suggests, all variables have the *Sig.* values exceeded 0.05 that ranged from 0.057 for exploitation capability to 0.347 for structural ambidexterity. This implies the distributions of all data were approximately normal. As for this reason, the normality assumption for correlation analysis is met.

4.6.2 Guidelines for Interpreting Correlation Analysis

Correlation analysis is a measure of strength and direction of linear relationship between two variables (Pallant, 2007). It can be obtained by computing the Pearson's product-moment correlation coefficient that is frequently used in behavioural sciences and denoted with *r*. By taking any values from -1 to +1 (Hinkle, Wiersma, & Jurs, 2003), it helps to indicate how well two variables are closely related to each other (MacCallum, Zhang, Preacher, & Rucker, 2002; Litwin, 1995). A perfect relationship exists if the *r* value is 1, while no relationship exists if the value is 0 (Pallant, 2007). The *r* value also indicates the direction of relationship (Argyrous, 2011) where positive relationship suggests an increase in one variable would also increase the other one, while a negative relationship suggests an increase in one variable would decrease the other one (Pallant, 2007).

However, the criteria to interpret the *r* value are arbitrary. As such, the interpretation of *r* value should depend on the specific application (Garcia, 2010; Hamburg, 1983). For this study, the strength of relationship was considered small if *r* value was between 0.1 and 0.3, medium if *r* value was between 0.3 and 0.5, and strong if *r* value was between 0.5 and 1.0 (Garcia, 2010; Cohen, 1988). Nevertheless, this categorisation should be treated as a guideline because it is not a precise mathematical cut-off (Zechmeister & Posavac, 2003). Meanwhile, a more meaningful measure of linear relationship between two variables can be obtained with coefficient of determination, denoted with *r* square that explains the proportion of variance in dependent variable (DV) by the variation in independent variable (IV) (MacCallum, Zhang, Preacher, & Rucker, 2002; Pfaffenberger & Patterson, 1981).

4.6.3 Selection of Significance Level

Even though the significance level of $p < 0.05$ is commonly applied in the social science, since the sample size of this study is just slightly above 100, the acceptable significance level that was used throughout this study is $p < 0.1$ or at the 90% confidence level. This significance level is chosen for this study because with "all things being equal, standard errors will be larger in smaller data sets, so it may make sense to choose 0.1 [as significance level] in a smaller data set" (Noymer, 2008, p.18). In other words, by using the significance level of $p < 0.1$, the possibility of not finding support to an alternative hypothesis that was blindsided by larger standard errors can be reduced (if using $p < 0.05$). As such, the type II error that fails to reject the null hypothesis can be avoided (Tabachnick & Fidell, 2007).

Furthermore, since the recommended (suitable) sample size for this study is 324 (according to the calculation in Section 3.2.4), whereas the actual sample size is just above 100, it was shown that the actual sample size is small. Therefore, the significance level of 0.1 is suitable for this study. Nevertheless, although $p < 0.1$ is accepted as the minimum significance level for this study (for the above mentioned reasons), higher significance levels, such as $p < 0.05$ and $p < 0.01$ were also be applied when necessary. Hence, by default, this significance level ($p < 0.1$) was referred for interpreting the correlation and multiple regression analyses in this study.

4.6.4 Results of Correlation Analysis

The correlation analysis that involved 45 possible bivariate relationships between organisational capabilities (exploitation and exploration capabilities, and structural and contextual ambidexterity), environmental turbulence (market and technological turbulences, and competitive intensity), and NPD performance (financial, innovativeness, and quality performance) was performed where the outputs are displayed in Table 4.24, and the results were interpreted according to the guidelines.

In general, the table shows the range of valid cases between 106 and 110, which is implying the maximum number of missing value was five from a total of 111 cases when the "Exclude Cases Pairwise" option was selected. Meanwhile, the direction of relationship is identified by inspecting the sign in front of the r value. The presence of a negative sign suggests that the relationship between the two variables is negative. As shown in the table, none of the 45 bivariate relationships had the negative sign, which implies that all of them have a positive relationship. In addition, it appears that the strength of all 45 relationships were varied from as strong as 0.569 to as weak as 0.076. As a consequence, the researcher is only confident in the correlation of 40 bivariate relationships that were significant at the $p < 0.1$ level.

In specific, the correlation analysis was performed to address 12 bivariate relationships between organisational capabilities (independent variable) and NPD performance (dependent variable) according to the hypotheses building (for Objectives 1 and 2). For each type of NPD performance, the table shows that exploitation capability had the strongest relationship to financial performance with the correlation coefficient of 0.357, exploration capability has the strongest relationship to innovativeness performance (0.475), and contextual ambidexterity has

Table 4.24

The Result of Correlation Analysis

		Financial Performance	Innovativeness Performance	Quality Performance	Exploitation Capability	Exploration Capability	Structural Ambidexterity	Contextual Ambidexterity	Market Turbulence	Technological Turbulence	Competitive Intensity
Financial Performance	Pearson Correlation	1									
	Sig. (2-tailed)										
	N	111									
Innovativeness Performance	Pearson Correlation	.265***	1								
	Sig. (2-tailed)	.005									
	N	110	110								
Quality Performance	Pearson Correlation	.367***	.445***	1							
	Sig. (2-tailed)	.000	.000								
	N	111	110	111							
Exploitation Capability	Pearson Correlation	.357***	.423***	.476***	1						
	Sig. (2-tailed)	.000	.000	.000							
	N	109	108	109	109						
Exploration Capability	Pearson Correlation	.259***	.475***	.400***	.426***	1					
	Sig. (2-tailed)	.006	.000	.000	.000						
	N	110	109	110	109	110					
Structural Ambidexterity	Pearson Correlation	.117	.294***	.282***	.364***	.506***	1				
	Sig. (2-tailed)	.222	.002	.003	.000	.000					
	N	110	109	110	108	109	110				
Contextual Ambidexterity	Pearson Correlation	.344***	.363***	.551***	.596***	.484***	.438***	1			
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000				
	N	110	109	110	108	109	110	110			
Market Turbulence	Pearson Correlation	.125	.366***	.204**	.292***	.222**	.281***	.344***	1		
	Sig. (2-tailed)	.198	.000	.034	.002	.021	.003	.000			
	N	108	107	108	106	107	107	107	108		
Technological Turbulence	Pearson Correlation	.161*	.440***	.383***	.444***	.414***	.425***	.392***	.485***	1	
	Sig. (2-tailed)	.094	.000	.000	.000	.000	.000	.000	.000		
	N	109	108	109	107	108	108	108	108	109	
Competitive Intensity	Pearson Correlation	.076	.135	.124	.242**	.225**	.220**	.225**	.432***	.465***	1
	Sig. (2-tailed)	.431	.160	.194	.011	.018	.021	.018	.000	.000	
	N	111	110	111	109	110	110	110	108	109	111

***$p < 0.01$ level (2-tailed), **$p < 0.05$ level (2-tailed), *$p < 0.1$ level (2-tailed) the strongest relationship to quality performance (0.551). Meanwhile, structural ambidexterity has the weakest relationships to all types of NPD performance with the correlation coefficients of just 0.117 to financial performance, 0.294 to innovativeness performance, and 0.282 to quality performance.

Accordingly, by squaring the *r* value and multiplying it by 100 (r^2*100), the variance shared by two variables in the relationship can be identified. From the calculation, as much as 12.74% of the variance in financial performance was explained by the variation in exploitation capability (0.357^2*100), 22.56% of the variance in innovativeness performance was explained by the variation in exploration capability, and 30.36% of the variance in quality performance was explained by the variation in contextual ambidexterity.

Consequently, at the significance level of $p < 0.1$, it was shown that 11 relationships in the related hypotheses were significant with p values ranging from 0.000 to 0.006, while one relationship was observed to be not significant with $p = 0.222$ (between structural ambidexterity and financial performance). As such, the researcher is confident in the results of 11 relationships, but not in the relationship between structural ambidexterity and financial performance. Therefore, 11 hypotheses were supported, while one hypothesis was rejected, which is summarised in Table 4.25.

Table 4.25
Summary of the Results of Hypothesis Testing on Correlation Analysis

Hypothesis	Statement on Bivariate Relationship	Decision
Hypothesis 1	(a) Exploitation capability is positively related to financial performance	Support
	(b) Exploitation capability is positively related to innovativeness performance	Support
	(c) Exploitation capability is positively related to quality performance	Support
Hypothesis 2	(a) Exploration capability is positively related to financial performance	Support
	(b) Exploration capability is positively related to innovativeness performance	Support
	(c) Exploration capability is positively related to quality performance	Support
Hypothesis 3	(a) Structural ambidexterity is positively related to financial performance	**Reject**
	(b) Structural ambidexterity is positively related to innovativeness performance	Support
	(c) Structural ambidexterity is positively related to quality performance	Support
Hypothesis 4	(a) Contextual ambidexterity is positively related to financial performance	Support
	(b) Contextual ambidexterity is positively related to innovativeness performance	Support
	(c) Contextual ambidexterity is positively related to quality performance	Support

As shown in the table, even though one of the 12 hypothesised relationships between organisational capabilities and NPD performance was not supported, it is suggested that the relationships of these variables should exist in the multivariate analysis as most of the correlation coefficients were more than 0.3. Moreover, all relationships between organisational capabilities and NPD performance were positive as hypothesised (to achieve Objectives 1 and 2).

4.7 Multivariate Analysis: Hierarchical Multiple Regression Analysis

To achieve Objectives 3 and 4, the hierarchical multiple regression analysis was used to examine the moderating effect of environmental turbulence in the relationships between organisational capabilities and NPD performance. By using SPSS v.19 statistical technique, all of the related variables were included in order within three models: Model 1 for the organisational capabilities, Model 2 for the environmental turbulence, and Model 3 for the interactions between organisational capabilities and environmental turbulence. Table 4.26 summarises the number of analyses to be performed in accordance with environmental turbulence in Objective 3 and 4.

Table 4.26
Nine Hierarchical Regression Analyses

Analysis	Description on Multivariate Analysis
Analysis 1	To test the moderating effects of market turbulence in the relationship between organisational capabilities and financial performance
Analysis 2	To test the moderating effects of market turbulence in the relationship between organisational capabilities and innovativeness performance
Analysis 3	To test the moderating effects of market turbulence in the relationship between organisational capabilities and quality performance
Analysis 4	To test the moderating effects of technological turbulence in the relationship between organisational capabilities and financial performance
Analysis 5	To test the moderating effects of technological turbulence in the relationship between organisational capabilities and innovativeness performance
Analysis 6	To test the moderating effects of technological turbulence in the relationship between organisational capabilities and quality performance
Analysis 7	To test the moderating effects of competitive intensity in the relationship between organisational capabilities and financial performance
Analysis 8	To test the moderating effects of competitive intensity in the relationship between organisational capabilities and innovativeness performance
Analysis 9	To test the moderating effects of competitive intensity in the relationship between organisational capabilities and quality performance

As shown in the table, nine analyses were performed according to the hypotheses building. Specifically, Analyses 1 to 3 were performed to test the moderating effects of market turbulence (Section 4.7.3), Analyses 4 to 6 to test the moderating effects of technological turbulence (Section 4.7.4), and Analyses 7 to 9 to test the moderating effects of competitive intensity (Section 4.7.5).

4.7.1 Data Readiness for Regression Analysis

As mentioned earlier (see Section 4.2.2), the assumptions for multivariate analysis are a bit different from the previous assumptions (e.g., factor analysis) because what is not an outlier in univariate analysis can be the source of outlier in bivariate and multivariate analyses (Argyrous, 2011). As such, before regression analysis can be safely performed, the multivariate data needed to be inspected again where the multivariate outliers were identified and removed. With nine variables in every analysis, the critical value for Mahalanobis distance was 27.877 (Argyrous, 2011). As such, any cases with Mahalanobis distance that exceeded this value were identified as an outlier (Pallant, 2007). The summary of nine analyses before and after removal of outliers is displayed in Table 4.27 (see Appendix 4E for the original outputs of analyses after removal of outliers).

Table 4.27
Summary of Analyses before and after Removal of Multivariate Outliers

Analysis	Maximum Value of Mahal's Distances		Percentage of Outliers (%)***		Number of Outliers**		Number of Samples*	
	Before	After	Before	After	Before	After	Before	After
Analysis 1	57.271	43.598	4.50	3.70	5	4	111	108
Analysis 2	57.271	43.563	4.50	2.80	5	3	111	107
Analysis 3	57.271	43.598	4.50	3.70	5	4	111	108
Analysis 4	43.888	34.865	6.31	3.85	7	4	111	104
Analysis 5	43.888	38.830	6.31	1.90	7	2	111	105
Analysis 6	43.888	39.215	6.31	2.83	7	3	111	106
Analysis 7	55.780	35.562	7.21	4.76	8	5	111	105
Analysis 8	55.780	44.942	7.21	4.67	8	5	111	107
Analysis 9	55.780	43.155	7.21	3.85	8	4	111	104

***Common percentage of outliers in analysis is 1%
**Number of outliers that exceed Mahal's Distance critical value of 27.877
*Minimum sample size for analysis is 100

As shown in the table, even though the maximum Mahal's Distance value after removal of outlier was still greater than 27.877, the value, however, had been reduced. For instance, the maximum Mahal's Distance value for Analysis 1 was reduced from 57.271 to 43.598. Accordingly, the percentage of multivariate outliers that remained in the analysis after removal of outliers was also reduced. For instance, the percentage of multivariate outliers for Analysis 5 was reduced from 6.31% to just 1.90%. This implied that some multivariate outliers still existed even after transformation of variables and changing of score (Tabachnick & Fidell, 2007; Chen 2002). As such, it is completely normal for a small percentage of multivariate outliers to remain in the analysis (Pallant, 2007).

Apparently, Table 4.27 also showed that the number of sample sizes that is between 104 and 108 after removal of multivariate outliers met the minimum size to perform the analyses, which is five cases for every independent variable or 45 samples (Tabachnick & Fidell, 2007) or at least four observations per predictor (or 36 samples) depending on the analysis to be performed, such as in the case of *R* square (Hair, Anderson, Tatham, & Black, 1995). In comparisons, previous studies had performed the analysis with just 112 samples in the case of ambidexterity (Aloini, Martini, & Neirotti, 2012), and 80 samples in the case of NPD (Adis & Razli, 2009).

In addition, Appendix 4F shows the *P-P* plots and Scatterplot figures of the nine analyses after removal of the related multivariate outliers for normality purposes. To be approximately normal, the probability plot (*P-P* plot) should exhibit a fairly diagonal straight line of the standardised residual values from the bottom left to the top right of the graph (Pallant, 2007). As suggested in the appendix, the *P-P* plots of the nine analyses were consistently showing that the standardised residual values were plotting fairly around the diagonal straight line from bottom left to top right of the graphs with some of the values being plotted above and some plotted below the lines in intermittent style. For these reasons, it was observed that the assumption for normality was met. Alternatively, outliers can also be inspected in the Scatterplot of standardised residual value with the value of more than +/-3.3 (Tabachnick & Fidell, 2007). As shown in the appendix, the Scatterplot figures of the nine analyses were exhibiting that most of the standardised residual values were concentrated or centred approximately at the 0 point in the graphs. By rights, the visual inspections of all figures have suggested they were all approximately normal with very few outliers.

Meanwhile, the existence of highly correlated IVs would suggest the existence of multicollinearity (Hair, Anderson, Tatham, & Black, 1995), which would cause the regression coefficient to be poorly estimated and less reliable (Paul, 2006; Hamburg, 1983; Pfaffenberger & Patterson, 1981). Multicollinearity can be identified by inspecting the Coefficients Table from the SPSS output where the values of Tolerance and Variance Inflation Factor (VIF) are provided. Tolerance value that is not less than 0.1 and the VIF value that is not more than 10 (Pallant, 2007) were accepted as a cut-off points to suggest low effects of multicollinearity (Hair, Anderson, Tatham, & Black, 1995). Table 4.28 shows the results of multicollinearity diagnostics for the nine analyses.

Table 4.28
Summary of Tolerance and VIF for Diagnosing Multicollinearity

Analysis	**Tolerance**		**VIF**	
	Minimum	**Maximum**	**Minimum**	**Maximum**
Analysis 1	.398	.883	1.133	2.652
Analysis 2	.381	.866	1.155	2.628
Analysis 3	.398	.883	1.133	2.652
Analysis 4	.314	.666	1.501	3.187
Analysis 5	.366	.664	1.506	2.732
Analysis 6	.366	.665	1.504	2.732
Analysis 7	.371	.905	1.105	2.696
Analysis 8	.315	.905	1.105	3.174
Analysis 9	.347	.855	1.169	2.885
Cut-off points	No less than 0.1		No more than 10.00	

Based on this table, it was observed that the minimum and maximum Tolerance values for all analyses ranged from 0.315 to 0.905, which is greater than 0.1, and the VIF values ranged from 1.105 to 3.187, which is less than 10. Even though the cut-off points for the Tolerance and VIF were not violated, it was observed that the effects of multicollinearity still exist, but minimal. For instance, the existence of multicollinearity can be evidenced in the correlation analysis (see Table 4.24) where the coefficient correlations between IVs ranged from 0.220 to 0.596. However, as suggested earlier, IVs can be considered as highly correlated if the value is more than 0.9 (Tabachnick & Fidell, 2007). Since the maximum value was just 0.596 (compared to 0.9), it can be surmised that the effects of multicollinearity to be low.

In summary, even though some of the multivariate outliers still exist in the analyses, the results of the analyses would be a lot better compared to before the removal of outliers. Since all the assumptions were met where the sample size was within the minimum required to perform the analysis, the data were approximately normal, and the multicollinearity was under control, the interpretation of the results should be more accurate based on the following guidelines.

4.7.2 Guidelines for Interpreting Multivariate Analysis

Checking for assumptions is part of the early interpretation on regression analysis (Pallant, 2007). The next step was to interpret the outputs from Model Summary, Coefficient Table (Argyrous, 2011), and types of moderator (Bergkvist, 2004; Sharma, Durand, & Gur-Arie, 1981), which are discussed in the following sections.

4.7.2.1 Model Summary

The correlation coefficient (*r*) and coefficient of determination (*r* square) are also used to indicate the relationship between more than one IV and DV (Argyrous, 2011). As such, the interpretation of *r* for linear regression of two variables (bivariate) is similar to *R* for multiple regressions (multivariate) (Hinkle, Wiersma, & Jurs, 2003). Accordingly, the interpretation of *r* square for bivariate analysis is similar to the *R* square for multivariate analysis (Frankfort-Nachmias & Leon-Guerrero, 2009). The interpretations of *r* and *r* square have been discussed under correlation analysis (see Section 4.6.2).

Interestingly, in multiple regression analysis the *R* square value tends to overestimate variance in DV. As such, the Adjusted *R* square value is referred to (Argyrous, 2011). The interpretation of Adjusted *R* square is quite similar to *R* square, but the difference is where the value is adjusted according to the number of IVs in the equation (Argyrous, 2011), which is very useful in comparing the equations between different numbers of IVs (Hair, Anderson, Tatham, & Black, 1995).

Besides that, *R* square change, *F* value, and *F* change of the model are also highlighted in the Model Summary. If the *R* square change is increased from the former model, it indicates the contribution of the latter model being greater in explaining variance in DV. Meanwhile, the *F*-test is used to test the significance of regression model for more than two IVs (Blackwell, 2008). If $F(v_1, v_2) > F_\alpha$, the decision would be to reject null hypothesis that all $B_i = 0$, but if $F(v_1, v_2) \leq F_\alpha$, the decision would be to retain the null hypothesis, where $v_1 = k - 1$ is the regression sum of square, $v_2 = n - k$ is for the error, k is the number of constants in the regression equation, and F_α is the critical *F* value (Blackwell, 2008; Hamburg, 1987).

4.7.2.2 Coefficient Table

The Coefficient Table provides information on Beta values and *t*-statistics. By transforming the *b* weights of each IVs into Beta (β) coefficients, different IVs that may be measured with different units can be compared (Nardi, 2003). As a result, the comparison is done with the Standardised coefficient, which is basically the Pearson's *r* that "allows us to distinguish the relative importance of each of the independent variable [IV] in determining the value of the dependent variable [DV]" (Argyrous, 2011, p. 262). In addition, the *t*-statistics that is used to identify any significantly different means between groups (Pallant, 2007) was also referred.

4.7.2.3 Types of Moderator

The existence of moderation effects of environmental turbulence in the relationship between organisational capabilities and NPD performance is shown by Model 3 (for interaction variable) in the hierarchical multiple regression analysis. However, the analysis does not specify the types of moderation. Knowing the types of moderation is important because environmental turbulence can either affect the strength of relationship or modify the form of relationship between organisational capabilities and NPD performance. For these reasons, the typology of specification variable that is commonly referred by various studies interested in investigating moderation effects (Bontis & Serenko, 2007) is used to identify the types of moderations, which is displayed in Table 4.29.

Table 4.29
Typology of Specification Variable

	Related to Criterion and/or Predictor	**Not Related to Criterion and Predictor**
No Interaction with Predictor	(1) Not Moderator	(2) Moderator (Homologiser)
Interaction with Predictor	(3) Moderator (Quasi Moderator)	(4) Moderator (Pure Moderator)

According to the quadrants in this table, the specification variable can be a (1) homologiser if it does not interact with the predictor and not related to the criterion (Quadrant 2), (2) quasi moderator if it does interact with the predictor and related to the criterion (Quadrant 3), or (3) pure moderator if it does interact with the predictor but not related to the criterion (Quadrant 4). However, the specification variable cannot be a moderator if it does not interact with the predictor but related to the criterion (Quadrant 1). In addition, while the homologiser affects the strength of relationship, pure and quasi moderators modify the form of relationship between predictor and criterion (Bergkvist, 2004; Sharma, Durand, & Gur-Arie, 1981).

4.7.3 Analysis on Moderating Effects of Market Turbulence

This section focuses on the moderating effects of market turbulence in the relationships between organisational capabilities and NPD performance (namely financial performance, innovativeness performance, and quality performance). For interpretation purposes, the model summary and coefficients table are referred to. Table 4.30 (for Analyses 1, 2, and 3) shows the model summary where the model fit can be described with the F value.

As shown by the F value of Model 1 in Table 4.30a, b, and c for financial performance (4.733), innovativeness performance (16.264), and quality performance (13.175), respectively, it was revealed that the model exists for all independent variables (organisational capabilities) and NPD performance at $p < 0.01$ level. With the model being in existence, it would be meaningful if the sources of variance in the NPD performance were to be identified. As such, the R square in Model 1 of Table 4.30a, b, and c indicates that 15.5% of variance in financial performance, 38.9% in innovativeness performance, and 33.8% in quality performance are explained by the variations in organisational capabilities.

Table 4.30a
Model Summary of Market Turbulence with Financial Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	4.733***	3.750***	5.100***
R square	.155	.155	.319
Adjusted *R* square	.122	.114	.256
R square change	.155	.000	.164
F change	4.733***	.000	5.889***

Table 4.30b
Model Summary of Market Turbulence with Innovativeness Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	16.264***	15.854***	9.069***
R square	.389	.440	.457
Adjusted *R* square	.365	.412	.407
R square change	.389	.050	.017
F change	16.264***	9.068***	.769

Table 4.30c
Model Summary of Market Turbulence with Quality Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	13.175***	10.488***	6.075***
R square	.338	.340	.358
Adjusted *R* square	.313	.307	.299
R square change	.338	.001	.019
F change	13.175***	.166	.708

***$p < 0.01$ level, **$p < 0.05$ level, *$p < 0.1$ level

Meanwhile, when market turbulence is included, the *R* square change of Model 2 showed that the additional explanatory power of market turbulence to financial performance (0.00%) in Table 4.30a and quality performance (0.1%) in Table 4.30c was negligible. However, there was an additional of 5% variance in the innovativeness performance explained by the variation in market turbulence (Table 4.30b), which indicated that market turbulence is related to innovativeness performance. This result is supported by the significance of the *F* change of Model 2 (9.068) at $p < 0.01$ level for innovativeness performance.

Next, the interaction between market turbulence and independent variables is provided in Model 3. As shown in each of the tables (4.30a, b, and c, respectively), the variance in the financial performance is further explained by 16.4% of the variations in the interaction variables. In contrast, less than 2% of the additional variance in innovativeness performance (1.7%) and quality performance (1.9%) was explained by the interaction variables. In addition, it was observed that only the interaction variables for financial performance (5.889) was significant as shown by the *F* change of Model 3 that achieved significance at level $p < 0.01$. Following are the equations for Model 3 of analyses 1, 2 and 3, respectively:

NPD financial performance (Y)
$= 4.847 + .164X_1 + .105X_2 - .124X_3 +.226X_4 - .069X_5 - .290X_6 + .310X_7 + .512X_8 - .339X_9 + e$

NPD innovativeness performance (Y)
$= 5.013 + .295X_1 + .238X_2 - .061X_3 +.144X_4 + .210X_5 - .059X_6 + .157X_7 + .079X_8 - .061X_9 + e$

NPD quality performance (Y)
$= 5.555 + .166X_1 + .107X_2 - .058X_3 +.295X_4 - .039X_5 - .119X_6 + .154X_7 - .027X_8 - .027X_9 + e$

Accordingly, the Standardised Coefficients (*ß*) in Table 4.31, which is to identify the contribution of each variable to financial performance (Table 4.31a), innovativeness performance (Table 4.31b), and quality performance (Table 4.31c), was analysed. Since the analysis focused on the moderating effects of environmental turbulence, the *ß* of Model 3 was emphasised.

As shown in Model 3 of Table 4.31a, it appears that all interaction variables for financial performance were significant at the $p < 0.1$ level. This would indicate that market turbulence is moderating the relationships between exploitation capability, exploration capability, structural ambidexterity, and contextual ambidexterity with financial performance with the beta coefficients of -.220, .273, .408, and -.303, respectively. In contrast, it appears that market turbulence has no moderation effects on innovativeness performance (Table 4.31b), and quality performance (Table 4.31c), since none of the interaction variables were significant at $p < 0.1$ level.

Table 4.31a

Coefficients Table of Market Turbulence with Financial Performance

INDEPENDENT VARIABLES	DEPENDENT VARIABLE FINANCIAL PERFORMANCE		
	Model 1	**Model 2**	**Model 3**
Model Variables:			
Exploitation Capability	.228*	.228*	.146
Exploration Capability	.083	.083	.094
Structural Ambidexterity	-.066	-.065	-.108
Contextual Ambidexterity	.193	.193	.211*
Moderating Variable			
Market Turbulence		-.002	-.060
Interaction Variables			
Exploit-Market			-.220**
Explore-Market			.273**
Structure-Market			.408***
Context-Market			-.303**

Table 4.31b

Coefficients Table of Market Turbulence with Innovativeness Performance

INDEPENDENT VARIABLES	DEPENDENT VARIABLE INNOVATIVENESS PERFORMANCE		
	Model 1	**Model 2**	**Model 3**
Model Variables:			
Exploitation Capability	.332***	.310***	.283***
Exploration Capability	.228**	.235**	.230**
Structural Ambidexterity	-.006	-.042	-.058
Contextual Ambidexterity	.187*	.133	.145
Moderating Variable			
Market Turbulence		.241***	.200**
Interaction Variables			
Exploit-Market			-.048
Explore-Market			.152
Structure-Market			.068
Context-Market			-.058

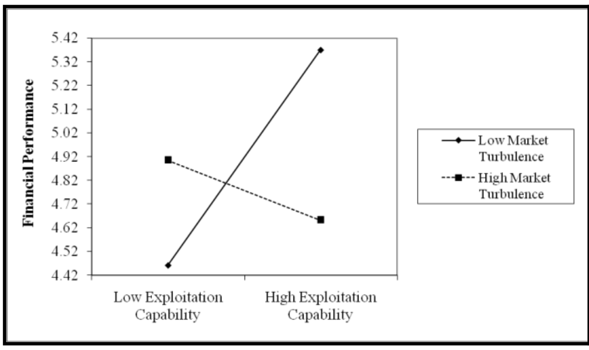
Table 4.31c

Coefficients Table of Market Turbulence with Quality Performance

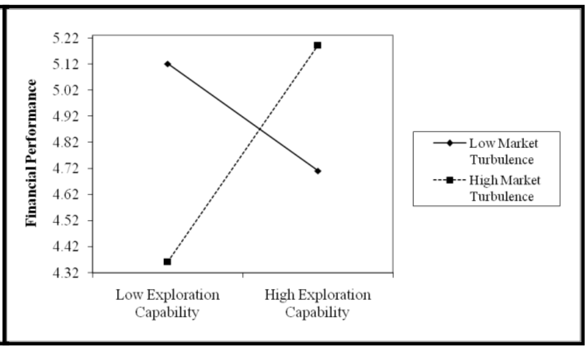
INDEPENDENT VARIABLES	DEPENDENT VARIABLE QUALITY PERFORMANCE		
	Model 1	**Model 2**	**Model 3**
Model Variables:			
Exploitation Capability	.224**	.226**	.206*
Exploration Capability	.094	.095	.133
Structural Ambidexterity	-.062	-.058	-.071
Contextual Ambidexterity	.395***	.402***	.383***
Moderating Variable			
Market Turbulence		-.035	-.047
Interaction Variables			
Exploit-Market			-.125
Explore-Market			.189
Structure-Market			-.029
Context-Market			-.034

***$p < 0.01$ level, **$p < 0.05$ level, *$p < 0.1$ level

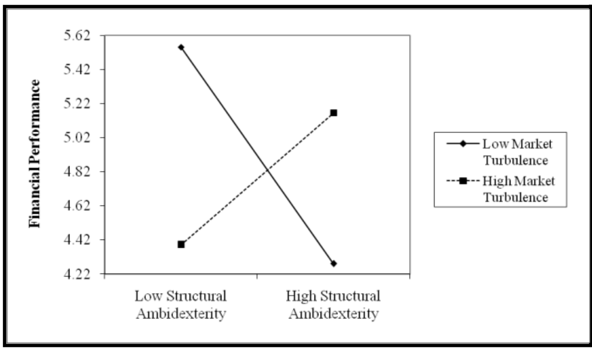
In a more meaningful way, the explanation on the existence of moderating effects of market turbulence on financial performance is graphically explained in Figure 4.1.



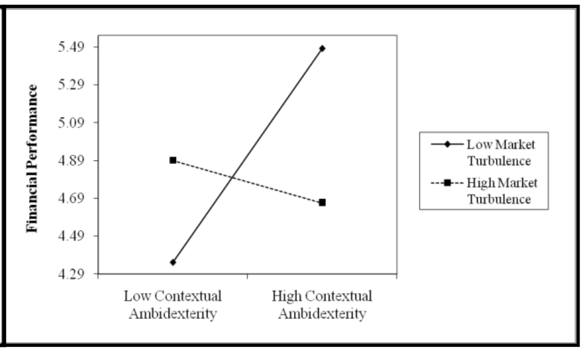
(a) Negative moderating effect of market turbulence in the relationship between exploitation capability and financial performance



(b) Positive moderating effect of market turbulence in the relationship between exploration capability and financial performance



(c) Positive moderating effect of market turbulence in the relationship between structural ambidexterity and financial performance



(d) Negative moderating effect of market turbulence in the relationship between contextual ambidexterity and financial performance

Figure 4.1
The Graphs of Moderation Effects of Market Turbulence in the Relationships between Organisational Capabilities and Financial Performance

According to the figure, high usage of exploitation capability (Figure 4.1a) and contextual ambidexterity (Figure 4.1d) under low-level market turbulence would increase financial performance. In contrast, high usage of exploitation capability and contextual ambidexterity under high-level market turbulence would reduce financial performance. As such, market turbulence has negative moderating effects on both exploitation capability and contextual ambidexterity with financial performance.

The figures also show high usage of exploration capability (Figure 4.1b) and structural ambidexterity (Figure 4.1c) under low-level market turbulence decreases financial performance. Consequently, high usage of exploration capability and structural ambidexterity under high-level market turbulence improves financial performance. As such, market turbulence positively moderates the relationships of both exploration capability and structural ambidexterity to financial performance. The summary of hypotheses testing as discussed above is shown in Table 4.32.

Table 4.32

Summary of the Results of Hypotheses Testing on Market Turbulence

	Ref.	Hypothesis	Decision
Analysis 1	5(a)(1)	The relationship between exploitation capability and financial performance is significantly moderated by market turbulence	**Support**
	6(a)(1)	The relationship between exploration capability and financial performance is significantly moderated by market turbulence	**Support**
	7(a)(1)	The relationship between structural ambidexterity and financial performance is significantly moderated by market turbulence	**Support**
	8(a)(1)	The relationship between contextual ambidexterity and financial performance is significantly moderated by market turbulence	**Support**
Analysis 2	5(a)(2)	The relationship between exploitation capability and innovativeness performance is significantly moderated by market turbulence	Reject
	6(a)(2)	The relationship between exploration capability and innovativeness performance is significantly moderated by market turbulence	Reject
	7(a)(2)	The relationship between structural ambidexterity and innovativeness performance is significantly moderated by market turbulence	Reject
	8(a)(2)	The relationship between contextual ambidexterity and innovativeness performance is significantly moderated by market turbulence	Reject
Analysis 3	5(a)(3)	The relationship between exploitation capability and quality performance is significantly moderated by market turbulence	Reject
	6(a)(3)	The relationship between exploration capability and quality performance is significantly moderated by market turbulence	Reject
	7(a)(3)	The relationship between structural ambidexterity and quality performance is significantly moderated by market turbulence	Reject
	8(a)(3)	The relationship between contextual ambidexterity and quality performance is significantly moderated by market turbulence	Reject

As shown in the table, there were only four hypotheses supported, in which all of the organisational capabilities were moderated by market turbulence on NPD financial performance only. These results would indicate market turbulence that caused obsolete to the existing product and changing the customers' preferences has badly affected the firms' current and existing financial performance. Meanwhile, changing of customers' preferences did not relate to NPD product quality and innovativeness.

Accordingly, with the guidelines from the typology of specification variable (Table 4.29), it was shown that regardless of the moderating effects, market turbulence gives pure moderation in all relationships with financial performance. The pure moderation can be observed by the interaction between market turbulence and organisational capabilities, but no relationship with financial performance (Table 4.30a and 4.31a).

4.7.4 Analysis on Moderating Effects of Technological Turbulence

The three analyses (Analyses 4, 5, and 6) in this section focus on the moderating effects of technological turbulence in relationships between organisational capabilities and NPD performance (namely financial performance, innovativeness performance, and quality performance). Meanwhile, the interpretations are based on the model summary and coefficients table with the priority of analysis on Model 3. The Model summaries for analyses 4, 5, and 6 are depicted in Tables 4.33a, b, and c, respectively.

Table 4.33a

Model Summary of Technological Turbulence with Financial Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	7.264^{***}	6.158^{***}	4.510^{***}
R square	.227	.239	.302
Adjusted *R* square	.196	.200	.235
R square change	.227	.012	.062
F change	7.264^{***}	1.570	2.103^{*}

Table 4.33b

Model Summary of Technological Turbulence with Innovativeness Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	14.305^{***}	13.248^{***}	7.726^{***}
R square	.364	.401	.423
Adjusted *R* square	.339	.371	.368
R square change	.364	.037	.022
F change	14.305^{***}	6.101^{**}	.895

Table 4.33c

Model Summary of Technological Turbulence with Quality Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	11.718***	9.736***	6.079***
R square	.317	.327	.363
Adjusted *R* square	.290	.294	.303
R square change	.317	.010	.036
F change	11.718***	1.552	1.342

***$p < 0.01$ level, **$p < 0.05$ level, *$p < 0.1$ level

Based on *R* square of Model 1 in Table 4.33a, b, and c, respectively, it appears that 22.7% of variance in financial performance, 36.4% in innovativeness performance, and 31.7% in quality performance were explained by the variations in exploitation capability, exploration capability, structural ambidexterity, and contextual ambidexterity. In addition, since *F* value of Model 1 in Table 4.33a (7.264), Table 4.33b (14.305), and Table 4.33c (11.718) was significant at $p < 0.01$ level, it was observed Model 1 for organisational capabilities and NPD performance does exist.

When the moderating variable of technological turbulence is included (Model 2), the additional variance in the financial performance (Table 4.33a), and quality performance (Table 4.33c) only improved by 1.2% and 1%, respectively. With the *F* change of financial performance (1.570) and quality performance (1.552) not being significance even at $p < 0.1$, it was found that technological turbulence is weakly or not related to both financial performance and quality performance since the models do not exist. In contrast, technological turbulence was able to explain an additional of 3.7% of the variance in innovativeness performance (Table 4.33b), where the model was significant with *F* change of 6.101 at $p < 0.05$. As such, technological turbulence was found to be related to innovativeness performance.

Meanwhile, analysis on Model 3 showed that the variations from the interactions between organisational capabilities and technological turbulence was able to explain an additional of 6.2% of variance in financial performance (Table 4.33a), 2.2% in innovativeness performance (Table 4.33b), and 3.6% in quality performance (Table 4.33c). However, the F change showed only the interaction model for financial performance (2.103) being significant at $p < 0.1$ (Table 4.33a). Following are the equations for Model 3 of analyses 4, 5 and 6, respectively:

NPD financial performance (Y)
$= 4.858 + .231X_1 + .182X_2 - .293X_3 + .230X_4 + .184X_5 + .255X_6 - .367X_7 + .268X_8 - .053X_9 + e$

NPD innovativeness performance (Y)
$= 5.037 + .288X_1 + .204X_2 - .154X_3 + .173X_4 + .231X_5 - .152X_6 - .036X_7 + .215X_8 + .007X_9 + e$

NPD quality performance (Y)
$= 5.490 + .115X_1 + .097X_2 - .081X_3 + .271X_4 + .103X_5 + .011X_6 + .025X_7 + .190X_8 - .150X_9 + e$

In addition, as shown in the Coefficient Table (Table 4.34), it appears that some of the interaction variables (Model 3) were significant to NPD performance. In a more detail, at the significance level of $p < 0.1$, the moderating effects of technological turbulence existed between exploration capability and financial performance, structural ambidexterity and financial performance (Table 4.34a), structural ambidexterity and innovativeness performance (Table 4.34b), and structural ambidexterity and quality performance (Table 4.34c).

Table 4.34a
Coefficients Table of Technological Turbulence with Financial Performance

INDEPENDENT VARIABLES	DEPENDENT VARIABLE		
	FINANCIAL PERFORMANCE		
	Model 1	Model 2	Model 3
Model Variables:			
Exploitation Capability	$.287^{**}$	$.258^{**}$	$.208^{*}$
Exploration Capability	.155	.137	.171
Structural Ambidexterity	$-.200^{*}$	$-.241^{*}$	$-.267^{**}$
Contextual Ambidexterity	$.252^{**}$	$.245^{**}$	$.220^{*}$
Moderating Variable			
Technological Turbulence		.135	.159
Interaction Variables			
Exploit-Techno			.207
Explore-Techno			$-.344^{**}$
Structure-Techno			$.232^{*}$
Context-Techno			-.047

Table 4.34b

Coefficients Table of Technological Turbulence with Innovativeness Performance

INDEPENDENT VARIABLES	DEPENDENT VARIABLE INNOVATIVENESS PERFORMANCE		
	Model 1	Model 2	Model 3
Model Variables:			
Exploitation Capability	.346***	.283***	.284***
Exploration Capability	.244**	.229**	.213*
Structural Ambidexterity	-.087	-.158	-.151
Contextual Ambidexterity	.207*	.189*	.179*
Moderating Variable			
Technological Turbulence		.236**	.220**
Interaction Variables			
Exploit-Techno			-.136
Explore-Techno			-.039
Structure-Techno			.201*
Context-Techno			.007

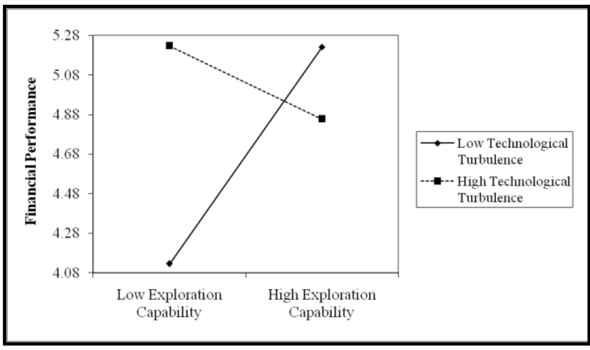
Table 4.34c

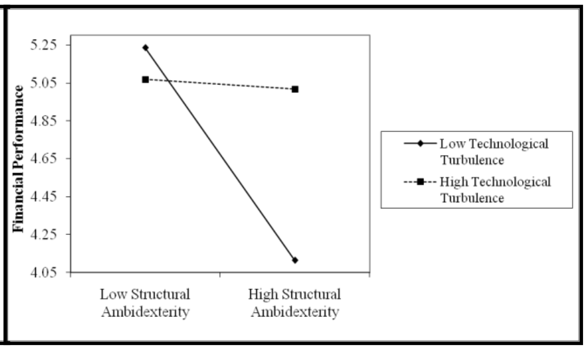
Coefficients Table of Technological Turbulence with Quality Performance

INDEPENDENT VARIABLES	DEPENDENT VARIABLE QUALITY PERFORMANCE		
	Model 1	Model 2	Model 3
Model Variables:			
Exploitation Capability	.189*	.156	.139
Exploration Capability	.162	.154	.123
Structural Ambidexterity	-.056	-.094	-.098
Contextual Ambidexterity	.362***	.353***	.343***
Moderating Variable			
Technological Turbulence		.125	.120
Interaction Variables			
Exploit-Techno			.012
Explore-Techno			.033
Structure-Techno			.218*
Context-Techno			-.177

***$p < 0.01$ level, **$p < 0.05$ level, *$p < 0.1$ level

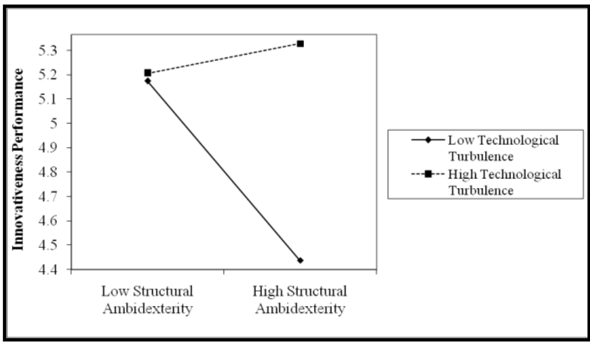
In a more meaningful way, the explanation on the existence of moderating effects of technological turbulence on NPD performance is graphically explained in Figure 4.2. Based on Figure 4.2a, it was found that technological turbulence (with the beta coefficient of -.344) was negatively moderated the relationship between exploration capability and financial performance. This is because when the level of technological turbulence is high, high usage of exploration capability reduces the financial performance. Eventually, financial performance increases with high usage of exploration capability when the level of technological turbulence is low.

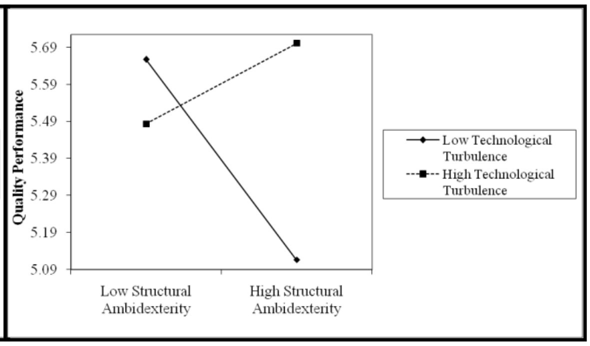




(a) Negative moderating effect of technological turbulence in the relationship between exploration capability and financial performance

(b) Positive moderating effect of technological turbulence in the relationship between structural ambidexterity and financial performance





(c) Positive moderating effect of technological turbulence in the relationship between structural ambidexterity and innovativeness performance

(d) Positive moderating effect of technological turbulence in the relationship between structural ambidexterity and quality performance

Figure 4.2
The Graphs of Moderation Effects of Technological Turbulence in the Relationships between Organisational Capabilities and NPD Performance

Meanwhile, Figure 4.2b shows that regardless of the technological turbulence level, high usage of structural ambidexterity reduces financial performance. Nevertheless, with beta coefficients of 0.232, high usage of structural ambidexterity gave better financial performance during high-level technological turbulence than low-level technological turbulence, which indicated a positive moderation effect.

Besides that, it was found that technological turbulence was also positively moderates the relationships between structural ambidexterity and innovativeness performance (Figure 4.2c), and structural ambidexterity and quality performance (Figure 4.2d). Apparently, with the beta coefficients of 0.201 and 0.218, respectively, both innovativeness and quality performance were increased with high usage of structural ambidexterity under high-level technological turbulence. The summary of hypotheses testing as discussed above is shown in Table 4.35.

Table 4.35
Summary of the Results of Hypotheses Testing on Technological Turbulence

	Ref.	Hypothesis	Decision
Analysis 4	5(b)(1)	The relationship between exploitation capability and financial performance is significantly moderated by technological turbulence	Reject
	6(b)(1)	The relationship between exploration capability and financial performance is significantly moderated by technological turbulence	**Support**
	7(b)(1)	The relationship between structural ambidexterity and financial performance is significantly moderated by technological turbulence	**Support**
	8(b)(1)	The relationship between contextual ambidexterity and financial performance is significantly moderated by technological turbulence	Reject
Analysis 5	5(b)(2)	The relationship between exploitation capability and innovativeness performance is significantly moderated by technological turbulence	Reject
	6(b)(2)	The relationship between exploration capability and innovativeness performance is significantly moderated by technological turbulence	Reject
	7(b)(2)	The relationship between structural ambidexterity and innovativeness performance is significantly moderated by technological turbulence	**Support**
	8(b)(2)	The relationship between contextual ambidexterity and innovativeness performance is significantly moderated by technological turbulence	Reject
Analysis 6	5(b)(3)	The relationship between exploitation capability and quality performance is significantly moderated by technological turbulence	Reject
	6(b)(3)	The relationship between exploration capability and quality performance is significantly moderated by technological turbulence	Reject
	7(b)(3)	The relationship between structural ambidexterity and quality performance is significantly moderated by technological turbulence	**Support**
	8(b)(3)	The relationship between contextual ambidexterity and quality performance is significantly moderated by technological turbulence	Reject

As shown in the table, four hypotheses were supported where the moderating effects of technological turbulence existed to all types of NPD performance. This indicates changing of technology used in NPD not just affecting the firms' financial performance, but also the innovativeness and quality performance of new products.

With a guideline from the typology of specification variable (Table 4.29), Tables 4.33a and 4.34a show that technological turbulence interacted with organisational capabilities, but it was not related to financial performance. As such, technological turbulence performed pure moderation on the relationships between exploration capability and financial performance, and structural ambidexterity and financial performance. On the other hand, the technological turbulence was also a quasi-moderator in the relationship between structural ambidexterity and innovativeness performance (Tables 4.33b and 4.34b), and homologiser in the relationship between structural ambidexterity and quality performance (Tables 4.33c and 4.34c).

4.7.5 Analysis on Moderating Effects of Competitive Intensity

This section (for Analyses 7 to 9) focused on the moderating effects of competitive intensity in the relationships between organisational capabilities and NPD performance. The moderating effects of competitive intensity were interpreted according to interaction variables (Model 3) of model summary and coefficient table. The Model summaries for analyses 7, 8, and 9 are depicted in Tables 4.36a, b, and c, respectively.

Table 4.36a

Model Summary of Competitive Intensity with Financial Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	9.366^{***}	7.426^{***}	5.459^{***}
R square	.273	.273	.341
Adjusted *R* square	.243	.236	.278
R square change	.273	.000	.068
F change	9.366^{***}	.030	2.455^{*}

Table 4.36b

Model Summary of Competitive Intensity with Innovativeness Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	12.775^{***}	10.356^{***}	6.177^{***}
R square	.334	.339	.364
Adjusted *R* square	.308	.306	.305
R square change	.334	.005	.025
F change	12.775^{***}	.789	.968

Table 4.36c

Model Summary of Competitive Intensity with Quality Performance

	Model 1 Independent variable	**Model 2 Moderating variable**	**Model 3 Interaction variable**
F value	11.258^{***}	9.248^{***}	5.830^{***}
R square	.313	.321	.358
Adjusted *R* square	.285	.286	.297
R square change	.313	.008	.038
F change	11.258^{***}	1.143	1.379

***$p < 0.01$ level, **$p < 0.05$ level, *$p < 0.1$ level

Initially, as shown in Table 4.36a, b, and c, respectively, the *R* square of Model 1 showed 27.3% of the variance lies in financial performance, 33.4% in innovativeness performance, and 31.3% in quality performance, which were explained by the variations in organisational capabilities (independent variables). Apparently, it appears that all of the related models existed as the *F* values for financial performance (9.366), innovativeness performance (12.775), and quality performance (11.258) were significant at $p < 0.01$.

As for the moderating variable, it was found that competitive intensity (Model 2) did not contribute remarkably in explaining the additional variance in NPD performance as the *R* square change was 0.00% for financial performance (Table 4.36a), 0.5% for innovativeness performance (Table 4.36b), and 0.8% for quality performance (Table 4.36c). As a result, all of the related moderating models did not exist with the *F* change for financial performance (0.030), innovativeness performance (0.789), and quality performance (1.143), all of which were not significant at $p < 0.1$.

Meanwhile, when the interactions between organisational capabilities and competitive intensity were included in the analysis, it was shown that the interaction variables (Model 3) were able to explain an additional of 6.8% of variance in financial performance (Table 4.36a), 2.5% in innovativeness performance (Table 4.36b), and 3.8% in quality performance (Table 4.36c). Unfortunately, it was found that only the interaction model for financial performance existed with *F* change of 2.455 at the significance level of $p < 0.1$. Following are the equations for Model 3 of analyses 7, 8 and 9, respectively:

NPD financial performance (Y)
$= 4.843 + .276X_1 + .104X_2 - .216X_3 + .298X_4 - .045X_5 + .084X_6 + .268X_7 + .090X_8 - .143X_9 + e$

NPD innovativeness performance (Y)
$= 5.019 + .301X_1 + .229X_2 + .195X_3 + .104X_4 - .074X_5 - .226X_6 - .035X_7 + .107X_8 + .041X_9 + e$

NPD quality performance (Y)
$= 5.530 + .170X_1 + .084X_2 + .006X_3 + .288X_4 - .084X_5 - .179X_6 + .135X_7 + .103X_8 - .063X_9 + e$

Apparently, the existence of moderation effects of competitive intensity in the relationships between organisational capabilities and NPD performance can be usefully identified in Model 3 of the Coefficient Table as shown in Table 4.37.

From this table, it was shown that competitive intensity can moderate the relationships between exploration capability and financial performance (Table 4.37a), exploitation capability and innovativeness performance (Table 4.37b), and exploitation capability and quality performance (Table 4.37c) with the beta coefficients of .257, -.218, and -.193, respectively at the $p < 0.1$ significance level.

Table 4.37a
Coefficients Table of Competitive Intensity with Financial Performance

INDEPENDENT VARIABLES	DEPENDENT VARIABLE FINANCIAL PERFORMANCE		
	Model 1	Model 2	Model 3
Model Variables:			
Exploitation Capability	$.301^{***}$	$.303^{***}$	$.249^{**}$
Exploration Capability	.089	.090	.094
Structural Ambidexterity	-.142	-.139	$-.191^{*}$
Contextual Ambidexterity	$.285^{**}$	$.285^{**}$	$.279^{**}$
Moderating Variable			
Competitive Intensity		-.016	-.042
Interaction Variables			
Exploit-Compete			.073
Explore-Compete			$.257^{**}$
Structure-Compete			.075
Context-Compete			-.149

Table 4.37b
Coefficients Table of Competitive Intensity with Innovativeness Performance

INDEPENDENT VARIABLES	DEPENDENT VARIABLE INNOVATIVENESS PERFORMANCE		
	Model 1	Model 2	Model 3
Model Variables:			
Exploitation Capability	$.268^{**}$	$.275^{***}$	$.291^{***}$
Exploration Capability	$.209^{**}$	$.204^{*}$	$.224^{**}$
Structural Ambidexterity	.150	.163	$.184^{*}$
Contextual Ambidexterity	.103	.116	.101
Moderating Variable			
Competitive Intensity		-.076	-.073
Interaction Variables			
Exploit-Compete			$-.218^{*}$
Explore-Compete			-.037
Structure-Compete			.101
Context-Compete			.044

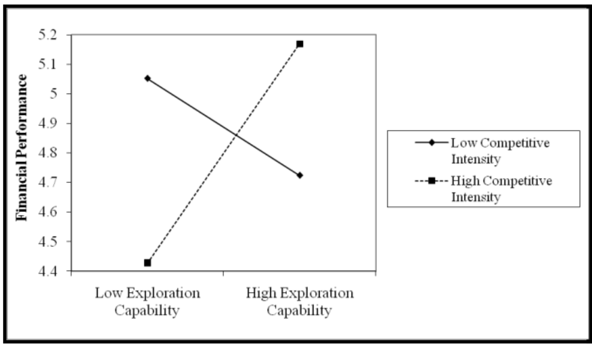
Table 4.37c

Coefficients Table of Competitive Intensity with Quality Performance

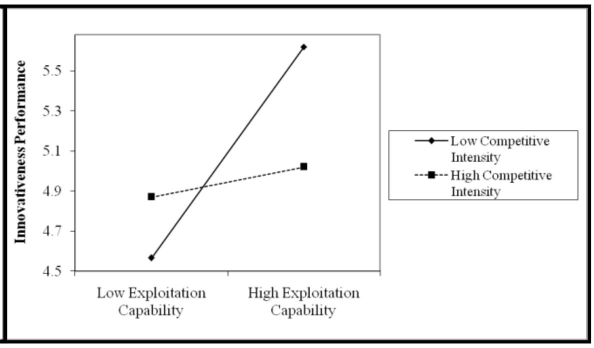
INDEPENDENT VARIABLES	DEPENDENT VARIABLE		
	QUALITY PERFORMANCE		
	Model 1	**Model 2**	**Model 3**
Model Variables:			
Exploitation Capability	.200*	.219**	.208*
Exploration Capability	.099	.091	.104
Structural Ambidexterity	.010	.030	.008
Contextual Ambidexterity	.340***	.352***	.362***
Moderating Variable			
Competitive Intensity		-.096	-.106
Interaction Variables			
Exploit-Compete			-.193*
Explore-Compete			.178
Structure-Compete			.117
Context-Compete			-.083

***p < 0.01 level, **p < 0.05 level, *p < 0.1 level

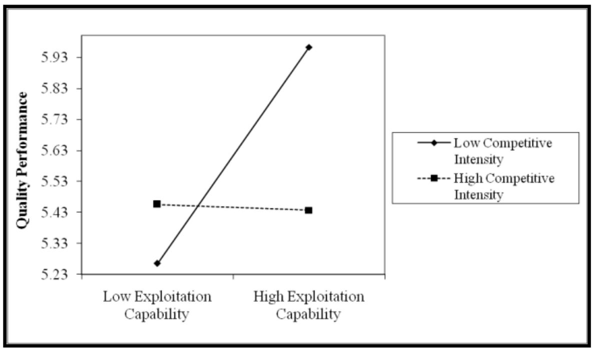
Meanwhile, the moderating effects of competitive intensity can also be graphically explained, which is displayed in Figure 4.3.



(a) Positive moderating effect of competitive intensity in the relationship between exploration capability and financial performance



(b) Negative moderating effect of competitive intensity in the relationship between exploitation capability and innovativeness performance



(c) Negative moderating effect of competitive intensity in the relationship between exploitation capability and quality performance

Figure 4.3

The Graphs of Moderation Effects of Competitive Intensity in the Relationships between Organisational Capabilities and NPD Performance

As shown in Figure 4.3a above, high usage of exploration capability improved financial performance when the level of competitive intensity was also high. Consequently, under low-level competitive intensity, high usage of exploration capability would decrease financial performance, which suggested that competitive intensity positively moderated exploration capability to financial performance. In contrast, competitive intensity negatively moderated exploitation capability to innovativeness performance (Figure 4.3b), and quality performance (Figure 4.3c). As shown in both figures, high usage of exploitation capability had lower effect on innovativeness and quality performance more during high-level competitive intensity than low-level competitive intensity. Interestingly, even though the moderating effect was negative, high usage of exploitation capability during high-level competitive intensity actually improved innovativeness performance (Figure 4.3b), but at a much lower rate than low-level competitive intensity. The summary of hypotheses testing as discussed above is shown in Table 4.38.

Table 4.38
Summary of the Results of Hypotheses Testing on Competitive Intensity

	Ref.	Hypothesis	Decision
Analysis 7	5(c)(1)	The relationship between exploitation capability and financial performance is significantly moderated by competitive intensity	Reject
	6(c)(1)	The relationship between exploration capability and financial performance is significantly moderated by competitive intensity	**Support**
	7(c)(1)	The relationship between structural ambidexterity and financial performance is significantly moderated by competitive intensity	Reject
	8(c)(1)	The relationship between contextual ambidexterity and financial performance is significantly moderated by competitive intensity	Reject
Analysis 8	5(c)(2)	The relationship between exploitation capability and innovativeness performance is significantly moderated by competitive intensity	**Support**
	6(c)(2)	The relationship between exploration capability and innovativeness performance is significantly moderated by competitive intensity	Reject
	7(c)(2)	The relationship between structural ambidexterity and innovativeness performance is significantly moderated by competitive intensity	Reject
	8(c)(2)	The relationship between contextual ambidexterity and innovativeness performance is significantly moderated by competitive intensity	Reject
Analysis 9	5(c)(3)	The relationship between exploitation capability and quality performance is significantly moderated by competitive intensity	**Support**
	6(c)(3)	The relationship between exploration capability and quality performance is significantly moderated by competitive intensity	Reject
	7(c)(3)	The relationship between structural ambidexterity and quality performance is significantly moderated by competitive intensity	Reject
	8(c)(3)	The relationship between contextual ambidexterity and quality performance is significantly moderated by competitive intensity	Reject

This table is showing only three hypotheses were supported that implies competitive intensity is the less important environmental turbulence when compared to the market and technological turbulences. Nevertheless, all three types of NPD performance were affected by competitive intensity, which indicates the competitors' actions did affect the firms' NPD financial, innovativeness, and quality performance.

According to the typology of specification variable (Table 4.29), Table 4.36a showed that competitive intensity interacted with organisational capabilities, but not related to financial performance. As such, the relationship between exploration capability and financial performance was purely moderated by competitive intensity. In contrast, competitive intensity did not interact with organisational capabilities and also was not related to innovativeness performance (Table 4.36b) and quality performance (Table 4.36c). As such, it appeared that competitive intensity was a homologiser in relationships between exploitation capability and innovativeness performance, and exploitation capability and quality performance.

4.8 Chapter Summary

After assuring the normality of data was met and validated with factor analysis, while the reliability was passing the test with internal consistency, and all assumptions for performing correlations and hierarchical regression analyses being considered, the related analyses were performed.

For the correlation analysis, the results have found 11 (out of 12) hypothesised bivariate relationships between organisational capabilities and NPD performance were significantly supported (for Objectives 1 and 2). Even though the relationship between structural ambidexterity and financial performance (see Table 4.25) was not supported, it still maintained a positive correlation as hypothesised in this study.

For the hierarchical regression analysis, it was shown even though not all of 36 hypothesised relationships were supported (for Objectives 3 and 4), each type of organisational capability and NPD performance were moderated by at least one type of environmental turbulence. In fact, the results have found while market turbulence had moderated all types of organisational capability to NPD financial performance (see Table 4.32), technological turbulence moderated exploration capability to NPD financial performance and also moderated structural ambidexterity to all types of NPD performance (see Table 4.35). Meanwhile, competitive intensity moderated exploration capability to NPD financial performance and also moderated exploitation capability to NPD innovativeness and quality performance (see Table 4.38).

Nonetheless, the existence of moderating effects of environmental turbulence in 11 related hypotheses between organisational capabilities and NPD performance provide support to previous study that has found environmental turbulence did moderate NPD processes. Meanwhile, since seven (out of 11) hypotheses were related to NPD financial performance, it was shown that this performance is the most moderated NPD performance. This observation confirms previous study that has found most used criteria to measure NPD performance was related to financial performance. These results are very significant as it has identified the relevant types of organisational capability to be deployed under specific environmental turbulence.

In summary, this study was successful in proving and replicating the findings from previous studies positing that different capabilities have different effects on NPD performance under different levels of environmental turbulence. For the hypotheses that were not supported, the rejections were only plausible. As such, future research needs to achieve statistically significant results on the related hypotheses, so they can be definitely supported or rejected at a more significant level.

CHAPTER FIVE:
DISCUSSION AND CONCLUSION OF RESEARCH FINDINGS

5.0 Introduction

This study was initiated to investigate the deployment strategy of organisational capabilities, to achieve greater new product development (NPD) performance, under the influence of environmental turbulence with the concept of dynamic capabilities (DCs). This chapter is organised to report the findings in accordance with the study objectives, which is followed with the discussion of findings on the environmental turbulence in the context of Malaysian manufacturing sector. To conclude, the study's contributions, limitations, recommendations, and summary were discussed.

5.1 Recapitulation of this Study

This section is reporting on the explicit findings extracted from the correlation analysis and hierarchical multiple regression analysis according to the objectives of this study. These findings are discussed in the following sections.

5.1.1 Objective One: Relationship between Organisational Learning and NPD Performance

Objective one of this study was to determine the relationships between each types of organisational learning and NPD performance. Based on the research findings, all of the hypotheses on the relationships between organisational learning and NPD performance were statistically significant, which indicates that exploitation and exploration capabilities indeed positively related to NPD performance.

Explicitly, exploitation capability that refers to the firm's ability to exploit existing products with current knowledge in NPD projects was positively and significantly related to NPD financial, innovativeness, and quality performance with the strength of correlation being 0.357, 0.432, and 0.476, respectively (see Table 4.24). These results of all significant positive correlation between exploitation capability and NPD performance was expected to happen since more than 80% of NPD projects in the Malaysian manufacturing sector were related to the modification of existing product, product line extension, and/or following competitor moves (see Table 4.8). This phenomenon is not unusual since other manufacturing firms such as in Taiwan also heavily emphasise on the exploitation capability (Lin & Peng, 2012).

In a similar vein, exploration capability that refers to the firm's ability to explore new product opportunities with new knowledge is commonly linked to NPDs that are radical, innovative, discontinuous, and revolutionary (see Table 2.5). As a result, only 17.5% of the Malaysian manufacturing firms have involved in the radical NPDs (see Table 4.8) within the last five years. Fortunately, the correlation analysis has shown all hypotheses on exploration capability were positively and statistically related to NPD financial, innovativeness, and quality performance at the correlation values of 0.259, 0.475, and 0.400, respectively. These findings were replicated the all positive results of exploitation capability since it was proven "in many technological histories the new [exploration] is not just better than the old [exploitation]; in some sense the new evolves out of the old" (Nelson & Winter, 1982, p. 255). This result implies even though many firms were focused on exploitation capability, they do realise the importance of exploration capability to NPD performance.

5.1.2 Objective Two: Relationship between Organisational Ambidexterity and NPD Performance

Objective two of this study was to determine the relationships between each types of organisational ambidexterity and NPD performance. Based on the findings, all relationships were proven to hold positive correlation as hypothesised (see Table 4.24). Unfortunately, the hypothesis between structural ambidexterity and NPD financial performance was not supported.

In general, the structural ambidexterity that refers to the firm's ability to create separate structures for simultaneously exploiting and exploring new products has positive correlation in all relationships with NPD performance as hypothesised. However, detailed inspections of the results have indicated only the relationships with NPD innovativeness and quality performance were statistically significant at the coefficient values of 0.294, and 0.282, respectively. Meanwhile, the relationship with NPD financial performance (0.117) was rejected due to the reason that not all NPD activities were affected by the cross-functional integration (Song & Montoya-Weiss, 2001) that is commonly used in the dual-structure for exploiting and exploring new products (Jansen, Tempelaar, Bosch, & Volberda, 2009). As such, the cross-functional integration (in the structural ambidexterity) does not necessarily contribute to the success of NPD and launching of a new product (Gonzales & Palacios, 2002).

Meanwhile, the findings have shown all hypotheses on the relationships between contextual ambidexterity and NPD performance were also positively supported. In details, contextual ambidexterity that allows the firm to effectively manage and divide time and to shift backward and forward between exploitation and exploration of NPDs were significantly related to NPD financial, innovativeness, and quality performance with the correlation values being 0.344, 0.363, and 0.551, respectively. These results were in support of the previous study that has posited contextual ambidexterity was related to firm performance (Gibson & Birkinshaw, 2002), and also in support of another study that has found contextual ambidexterity was being positively related to different types of firm performance (Schudy, 2010).

5.1.3 Objective Three: Moderation Effects of Environmental Turbulence between Organisational Learning and NPD Performance

Objective three of this study was to examine the moderating effects of each types of environmental turbulence in the relationships between organisational learning and NPD performance. When the moderating effects of market turbulence (see Table 4.32), technological turbulence (see Table 4.35), and competitive intensity (see Table 4.38) were included in the relationships between organisational learning and NPD performance, the results have shown not all of the hypothesised relationships were statistically supported. Nevertheless, both of exploitation and exploration capabilities were moderated either positively or negatively by some types of environmental turbulence to the specific types of NPD performance.

Results have shown all the statistically significant hypotheses in the relationships between exploitation capability and NPD performance was negative when moderated by high-level of environmental turbulence. Precisely speaking, exploitation capability was negatively related to NPD financial performance under high-level of market turbulence (see Table 4.31a), and also negatively related to NPD innovativeness (see Table 4.37b) and quality performance (see Table 4.37c) under high-level of competitive intensity. These results were consistent with previous study that has shown customer orientation (exploitation-related) was less effective under uncertainty of demand (market turbulence) (Zhou & Li, 2010). These findings also in support of the recent study that has shown strengthening the exploitation capability was deemed unsuitable under high-level of environmental turbulence (Molina-Castillo, Jimenez-Jimenez, & Munuera-Aleman, 2011). By rights, the all negative moderating effects were confirming that excessive use of exploitation capability will turn into a competency trap I (Liu, 2006). However, from a different point of view, the results have indicated that the use of exploitation capability was relevant to increase NPD performance under low-level of market turbulence and competitive intensity (see Figures 4.3). These results were in support of previous study that has found market orientation (e.g., exploitation-related) was more suitable to be used under less turbulent environment (Calantone, Garcia, & Droge, 2003).

In contrast, results on the moderating effects of environmental turbulence in the relationships between exploration capability and NPD performance have shown both positive and negative effects were existed in the related hypotheses. Specifically, exploration capability was positively related to NPD financial performance when moderated by high-level of market turbulence (see Table 4.31a) and competitive intensity (see Table 4.37a), but negatively related to NPD financial performance under high-level of technological turbulence (see Table 4.34a). The positive moderating effects of high-level of market turbulence and competitive intensity on exploration capability were in consistent with previous study that has concluded the "environmental turbulence and competitive intensity had the greatest positive impact on radical [exploration] innovation" (Tinoco, 2009, p. 7). Meanwhile, the negative effect of technological turbulence in the relationship between exploration capability and NPD financial performance was a result of excessive exploration (Liu, 2006). This happens due to continuous exploration of new products under high-level of technological turbulence has caused the NPD projects to become less relevant (Levitt & March, 1988). This study proven that pushing exploration capability to its upper limit is negatively affects firm performance (He & Wong, 2004).

5.1.4 Objective Four: Moderation Effects of Environmental Turbulence between Organisational Ambidexterity and NPD Performance

Objective four of this study was to examine the moderating effects of each types of environmental turbulence in the relationships between organisational ambidexterity and NPD performance. Even though results have shown not all of the related hypotheses were statistically significant and supported, it was found both structural and contextual ambidexterity were moderated either positively or negatively by some specific types of environmental turbulence to certain types of NPD performance.

Results have shown all of the statistically supported moderating effects of environmental turbulence in the relationships between structural ambidexterity and NPD performance were positive. In a more detail, positive moderating effect exists in the relationships between structural ambidexterity and NPD financial performance under high-level of market turbulence (see Figure 4.1a) and technological turbulence (see Figure 4.2b), and in the relationship between structural ambidexterity and NPD innovativeness (see Figure 4.2c) and quality performance (see Figure 4.2d) under high-level of technological turbulence. These positive results were consistent with previous study that has urged the firms to be not stuck with same structure (all time), and they should apply structural ambidexterity to achieve better NPD performance, as the right structure is needed for the right NPD process (Visser, *et. al.*, 2010). This study was confirming that the "simultaneous success in exploration and exploitation require firms to separate these [exploration and exploitation] initiatives into different units" (Aloini, Martini, & Neirotti, 2012, p. 30). This study was also in support of previous study that has found sustainability in financial performance was achieved with a balance in technological portfolio that "allows an enterprise to offset the obsolescence of its existing technological paradigms [exploit] through disruption or saturation with new technological paradigms [explore]" (Shamshurin, 2011, p. 8-70).

In contrast, finding on the moderated relationships between contextual ambidexterity and NPD performance has shown only one hypothesis was supported that is between contextual ambidexterity and NPD financial performance under high-level of market turbulence with negative effect (see Table 4.31a). The negative effect may possibly happens due to the simultaneous pursuing of exploitation and exploration of new products was not achieved within the contextual attributes that end up creating and elevating the incongruences among themselves (Gibson & Birkinshaw, 2004). With just one hypothesis being statistical supported, it was found that contextual ambidexterity was the less important organisational capability to be considered under environmental turbulence that explained the reason for it being neglected in literature (Schudy, 2010). Another reason for this is that although contextual ambidexterity is easy to imagine to work under given setting, "it is harder to see how it would permit a company to adjust to disruptive or discontinuous changes in technologies and markets" (O'Reilly & Tushman, 2013, p. 12).

5.2 Discussion of Findings: Insights from this Study

According to DCs concept, firms that capable of deploying relevant types of organisational capability under environmental turbulence are able to achieve better NPD performance. Since NPD portfolio management is fundamental to business success (Cooper & Edgett, 2001), this concept is relevant to be addressed in the context of Malaysian manufacturing sector where the success of their NPD projects was affected by environmental factors (Song, Montoya-Weiss, & Schmidt, 1997). For this reason, firms that can dynamically deploy the right organisational capabilities in various NPD projects under specific environmental turbulence are considered as possessing DCs. Insights from this study are discussed next.

5.2.1 Deployment of Organisational Capabilities under Market Turbulence

The statistical outputs of hierarchical multiple regression analyses (via analyses 1, 2, and 3) that examined the moderating effects of market turbulence in the relationships between organisational capabilities and NPD performance have found that changing of customer preferences, and cost and price structures in the marketplace did moderate the hypothesised relationships but limited to the NPD financial performance. Since market turbulence acts as a pure moderator in those hypotheses, it has modified the form of relationships between organisational capabilities and NPD financial performance. The results are summarised in Table 5.1.

Table 5.1
Summary of Moderation Effects of Market Turbulence

Organisational Capability	**NPD Performance**		
	Financial (Analysis 1)	**Innovativeness (Analysis 2)**	**Quality (Analysis 3)**
Exploitation Capability	Negative/ Pure Moderation	x	x
Exploration Capability	Positive/ Pure Moderation	x	x
Structural Ambidexterity	Positive/ Pure Moderation	x	x
Contextual Ambidexterity	Negative/ Pure Moderation	x	x

This table has indicated all types of organisational capability were moderated by market turbulence to NPD financial performance only. In other words, there was not a single moderation effect of market turbulence on NPD innovativeness and quality (nonfinancial) performance. This implies no matter how high or low the level of market turbulence, it does not affects NPD nonfinancial performance, which is suggesting that they do not have any moderation relationships. The absence of the moderating effects of market turbulence on NPD nonfinancial performance can be explained by the correlation analysis in Table 4.24. It was shown that market turbulence is statistically significant with NPD innovativeness performance (r = .366), and quality performance (r = .204), which is indicating a direct correlation (instead of moderating) effects of market turbulence on NPD nonfinancial performance. In contrast, market turbulence did not have any significant correlation with NPD financial performance that explains the existence of pure moderation effects in the hypothesised relationships.

Nevertheless, market turbulence that has moderated all types of organisational capability to NPD financial performance (see Table 5.1) indicates that this performance is the most critical and therefore heavily emphasised by manufacturing firms in Malaysia. This argument is strengthened by the synonymy of the items used to measures both of market turbulence and NPD financial performance. As shown in a questionnaire (see Appendix 3E), market turbulence that is measured with the items that emphasised on customers' needs such as "The demand for the products is coming from customers who never bought them before" were indifferent from the measures for NPD financial performance such as "The firm's sales growth relative to competitors". This implies customers who never bought the product before are increasing the firm's sales growth rate (as they bought the product now).

In details, when looking at Table 4.31a, the analysis on individual organisational capability was indicated structural ambidexterity (β = .408) has the strongest positive relationship with NPD financial performance when compared to exploration capability (β = .273) under high-level of market turbulence. In contrast, contextual ambidexterity (β = -.303) has the strongest negative relationship with NPD financial performance when compared to exploitation capability (β = -.220) also under high-level of market turbulence. These results have implicated that organisational ambidexterity is indeed performing better than organisational learning when moderated by any levels of market turbulence.

Precisely speaking, structural ambidexterity is performing better to NPD financial performance when moderated by high-level of market turbulence since the ability to manage both incremental and radical NPD projects within separate structures allows firm to address current customers' needs while at the same time offers new products to emerging customers. As a result, firm is able to maintain or even increases its NPD financial performance by addressing both current and emerging customers' needs in changing marketplace. This can be compared to the effect of exploration capability that only focuses on building new products with new knowledge to address emerging customer's needs, which is also increases NPD financial performance, but since it does not addresses the needs of current customers the effect is not as strong as structural ambidexterity.

The same logic is also observed when comparing the effects of contextual ambidexterity and exploitation capability on NPD financial performance under low-level of market turbulence. As a result of better NPD portfolio management with contextual ambidexterity where firm is able to divide and shift time between different NPD projects to simultaneously address both current and emerging customers' needs, its effect on NPD financial performance is better than exploitation capability that only focuses on building incremental new products.

Through these results, Malaysian manufacturing firms were found to be quite sensitive on the moderating effects of market turbulence to NPD financial performance. The reasons for this can be explained by observing the profiles of respondents. As shown in Table 4.8, the NPD portfolios of Malaysian manufacturing firms were dominated by 82.5% of various incremental NPD projects. As such, firms' objectives were to improve their short-term financial profits since the purpose of incremental NPD is to improve the existing products offering on current customers' needs. In addition, since more than 60% of Malaysian manufacturing firms were categorised under SMEs (see Table 4.10), it was found that their focus was more on achieving short-term financial gains because they have limited number of resources to spend (e.g., employees, plant size, market coverage, capitals, etc.). On the other hand, serious focus given on NPD financial performance implies that most previous turbulences in Malaysia business environment were affected directly the NPD financial performance. For instance, over the last 30 years, major economic crises from the Commodity Shock in 80's to the Asian Financial Crisis in 90's to the World Financial Crisis in 2000's have affected the financial conditions and survival of Malaysian manufacturing firms. This explains their overwhelming response to NPD financial performance when moderated by market turbulence.

Even though market turbulence was not moderated any of NPD nonfinancial (innovativeness and quality) performance, this does not necessarily means they are not related at all. It can be that the moderation is supposed to be existed but the respondents might have been blindsided by their overwhelming focus on NPD financial performance. For this reason, a study that identify why market turbulence has no moderation effect on NPD nonfinancial performance of Malaysian manufacturing firms should be able to reveal the real causes behind the results.

5.2.2 Deployment of Organisational Capabilities under Technological Turbulence

The statistical outputs of hierarchical multiple regression analyses (via analyses 4, 5, and 6) that examined the moderating effects of technological turbulence in the relationships between organisational capabilities and NPD performance, have found that the rate of change in technology used in NPD projects did moderate some of the hypothesised relationships. The results also showed that technological turbulence acts as a pure moderator to NPD financial performance, quasi-moderator to NPD innovativeness performance, and homologiser that affects the strength of relationship with NPD quality performance. These results are summarised in Table 5.2.

Table 5.2
Summary of Moderation Effects of Technological Turbulence

Organisational Capability	**NPD Performance**		
	Financial (Analysis 4)	**Innovativeness (Analysis 5)**	**Quality (Analysis 6)**
Exploitation Capability	x	x	x
Exploration Capability	Negative/ Pure Moderation	x	x
Structural Ambidexterity	Positive/ Pure Moderation	Positive/ Quasi-Moderation	Positive/ Homologiser
Contextual Ambidexterity	x	x	x

This table has indicated that technological turbulence did not moderate the exploitation capability and contextual ambidexterity to any of NPD performance (as none of the related hypotheses were supported). In other words, Malaysian manufacturing firms have treated exploitation capability and contextual ambidexterity as being not critical under technological turbulence. These results can be understood by looking at the measures used to characterise exploitation capability and technological turbulence (see Appendix 3E). In brief, exploitation capability was measured based on the current knowledge upgrade of familiar products, technologies, and processes, and also on the efficiency, improvement, and competencies of both existing and mature innovation/technologies. As such, exploitation capability was irrelevant to respond to technological turbulence that is characterised by opportunities from rapidly changing technology for the building of breakthroughs new product technologies.

In similar vein, contextual ambidexterity that is also irrelevant under technological turbulence (also irrelevant under competitive intensity as will be discussed in next section) is suggesting this capability is not very popular among Malaysian manufacturing firms. This indicates the environment that promotes contextual ambidexterity is either very low or not existed in firms. In other words, Malaysian manufacturing firms are lacking of the environment to promote a high-performance organisational context in business unit that strives for a high-level performance management and social support with strong interaction between stretch, discipline, support, and trust (see Section 2.4.2 for details).

In contrast, structural ambidexterity appeared to be the only organisational capability that has positive effects on all types of NPD performance when moderated by high-level of technological turbulence. This finding is proving that Malaysian manufacturing firms are possessing structural ambidexterity in general, which is very important for the success of NPD projects. This implies that firms are generally using different/separate structures for various incremental and radical NPD projects. As such, structural ambidexterity that is characterised by separate units for innovation activities, specialised for specific functions, and focused on both short- and long-term objectives, where the department are structurally separated within organisation to serve different customers' needs (see Appendix 3E) is the most critical organisational capability of Malaysian manufacturing firms. This argument is also supported by Table 4.11 that has shown up to 49.0% of respondents were coming from technology-related industries that might have valued technological turbulence as important to them, in which electrical and electronics, and petrochemical and polymer industries alone have formed 26.6% of all firms in this study. As such, under high-level of technological turbulence, these technology-related firms were deploying structural ambidexterity to achieve all-rounder NPD performance.

Meanwhile, exploration capability is the only organisational capability that was negatively moderated by high-level of technological turbulence to NPD financial performance. As shown by the statistics in Table 4.8, true innovation or radical NPD projects was formed only 17.5% of all NPD projects in Malaysian manufacturing firms. This radical NPD projects were performed with exploration capability since it is characterised with the acquisitions of new manufacturing technologies, new managerial/organisational processes, new NPD learning, skills, and processes by the firms that have no prior experience on them (see Appendix 3E). Since not many firms possess the above characteristics, this explains the low percentage of radical NPD projects handled by Malaysian manufacturing firms. In other words, the negative moderating effect of technological turbulence on exploration capability was explained the reason for very few firms taking the risks with radical NPD projects.

In addition, the negative effect appeared to happen since NPD financial performance that is characterised by the growth in sales, market share, profit, and ROI (see Appendix 3E) cannot be increased by introducing radical new products with exploration capability in response to the change of technologies surrounding NPD projects. Since the development costs of these new products were expensive and being not the most preferred by current customers, exploration capability does not provides any short-term benefits to the firm.

Through these results, it was concluded that the structural ambidexterity is the most important organisational capability valued by firms. This capability was moderated positively to all types of NPD performance under high-level of technological turbulence. This is also evidenced in Table 5.1 that shows structural ambidexterity was also positively moderated by market turbulence to NPD financial performance. For these reasons, Malaysian manufacturing firms should be emphasised on this capability when facing high-levels of market and technological turbulences since this capability will increases the positive effects on NPD performance. However, since the separate units or structures are needed for every NPD projects, Malaysian manufacturing firms should focus on the effective teams' coordination and communication so that the issues surrounding the teamwork will not affect the effective deployment of structural ambidexterity.

5.2.3 Deployment of Organisational Capabilities under Competitive Intensity

The statistical outputs from hierarchical multiple regression analyses (via analyses 7, 8, and 9) that examined the moderating effects of competitive intensity in the relationships between organisational capabilities and NPD performance, have shown the degree of competitive strength in a product market relative to the number of competitors and competing areas did moderate some of the hypothesised relationships. It was found that competitive intensity acts as a pure moderator in the relationship with NPD financial performance, and homologiser in the relationships with NPD nonfinancial performance. These results are summarised in Table 5.3.

Table 5.3
Summary of Moderation Effects of Competitive Intensity

Organisational Capability	**NPD Performance**		
	Financial (Analysis 7)	**Innovativeness (Analysis 8)**	**Quality (Analysis 9)**
Exploitation Capability	x	Negative/ Homologiser	Negative/ Homologiser
Exploration Capability	Positive/ Pure Moderation	x	x
Structural Ambidexterity	x	x	x
Contextual Ambidexterity	x	x	x

This table has indicated only organisational learning (exploitation and exploration capabilities) was affected by competitive intensity, while organisational ambidexterity that is contested to be useful under turbulence environment was not moderated in any way. To add more, Table 4.24 has shown none of NPD performance is significantly correlated to competitive intensity. As a result, these findings have implicated that competitive intensity was not really valued as being critical to NPD performance by Malaysian manufacturing firms when compared to the other types of environmental turbulence. This argument was supported by the facts that majority of firms such as SMEs (see Table 4.10) were enjoying various incentives and taxes exemptions from the government of Malaysia that reduce competitive intensity. Furthermore, as 49% of the firms were technology-related (see Table 4.11), they were eligible to apply the technology and innovation funds provided by MOSTI and SME Corporation under RMK-9 and RMK-10 plans (see Section 1.1). For these reasons, Malaysian (local) manufacturing firms were somehow protected under government policies from open (global) competition, which explains the low moderating effects of competitive intensity in this study.

Nevertheless, being given all the incentives, taxes exemptions, etc., these did not protect Malaysian manufacturing firms from competing among themselves. This is shown by the negative moderating effects of competitive intensity between exploitation capability and NPD nonfinancial performance, and the positive moderating effects between exploration capability and NPD financial performance. However, since the moderating effects were small with just β = .257 to NPD financial performance, β = -.218 to NPD innovativeness performance, and β = -.193 to NPD quality performance (see Table 4.37), this has proven that competitive intensity was not critically affecting NPD projects. In fact, the moderating effect of competitive intensity with just β = -.193 between exploitation capability and NPD quality performance was the smallest (among all) in this study.

In details, exploitation capability that was negatively moderated by competitive intensity to NPD innovativeness and quality performance, also negatively moderated by market turbulence to NPD financial performance (see Tables 5.1). This happens due to the exploitation capability that was used in building incremental products with known knowledge has becoming irrelevant when the needs of existing customers are changed (high-level of market turbulence), or number of competing products are increased (high-level of competitive intensity). Besides that, the results of all negative moderation effects on exploitation capability are suggesting that this capability was inappropriate to be deployed under high-level of any environmental turbulence. This finding should not be taken for granted since 82.5% of all NPD projects in manufacturing sector of Malaysia were related to exploitation capability (see Table 4.8). As such, most firms can fall into this trap if they continue to deploy exploitation capability under high-level of environmental turbulence. For this reason, firms should be warned not to deploy exploitation capability without knowing the current environmental conditions.

In contrast, exploration capability that enables firm to differentiate its products (with new features and values) from the existing ones will enable it to win customers and achieve better market share, ROI, and profits. As such, under high-level of competitive intensity, exploration capability was positively moderated to NPD financial performance. Since competitive intensity is a driver for innovation (Sharpe & Currie, 2008), this result suggests Malaysian manufacturing firms must respond to competitive intensity by generating more innovative products with exploration capability (instead of exploitation capability) to achieve better NPD performance.

On the other hand, apart from the reason that competitive intensity was the less critical type of environmental turbulence since it moderated only three hypotheses that none of them related to organisational ambidexterity, it is suggested the organisational ambidexterity was not always needed under all types of environmental turbulence. As such, it was treated as being irrelevant by Malaysian manufacturing firms to address NPD performance under competitive intensity. This explains why the hypotheses on structural ambidexterity and contextual ambidexterity were not supported. In contrast, organisational learning still can find it relevant place under competitive intensity. However, since the effects of exploitation and exploration capabilities were of opposite directions, this finding provides evidence on the incongruences between them.

5.2.4 Summary of Discussion of Findings

This study has concluded that manufacturing firms in Malaysia put more emphasis on market turbulence. Since market turbulence is the most frequently to happen, it was found to moderate NPD financial performance such as during the previous economic recession (Cheng, 2003). On the other hand, competitive intensity that is the less emphasised by firms should not be taken for granted since hypotheses testing have found this turbulence did moderate all types of NPD performance compared to market turbulence that only moderates NPD financial performance. Thus, since NPD nonfinancial performance is a foundation to create future financial performance, Malaysian manufacturing firms are advised to balance their NPD projects according to the types of environmental turbulence for the benefits of their own future.

Meanwhile, this study also found that structural ambidexterity is the most valued type of organisational capability by manufacturing firms in Malaysia. This shows although majority of firms in this study were SMEs (60.7%) where most of their NPD projects are incremental (82.5%), they preferred to use different structures for different NPD projects rather than focusing on similar structure for different projects. As such, these firms do have NPD portfolio consisting of various projects assigned to different units. The ability of these SMEs to deploy structural ambidexterity shows that small firms are agile and flexible in managing NPDs.

In a wider perspective, this study that was responded largely by product/production managers (69.4%), who have served for up to 20 years (90.0%) in the Malaysian manufacturing firms, that were established mostly for less than 30 years ago (79.5%), and focused on incremental NPD projects (82.5%), have answered the NPD issues addressed in Chapter one (see Section 1.2), which are discussed as follows:

Firstly, when comparing between two types of organisational learning under environmental turbulence, this study has shown the effective environments for exploitation capability were dissimilar from exploration capability. For instance, exploitation capability was negatively moderated by market turbulence and competitive intensity, but these same types of environmental turbulence were positively moderated exploration capability. This means the trade-off between them can be managed or even avoided since the best time to deploy each of them is not the same. By rights, this finding has answered the first issue addressed in Chapter one.

Secondly, regardless of the types of environmental turbulence, structural ambidexterity was appeared to be the most moderated organisational capabilities, in which all of the moderation effects were positive. This means structural ambidexterity was performing better than organisational learning (exploitation and exploration capabilities) under environmental turbulence. Since organisational ambidexterity was argued to be the answer to the incongruences between exploitation and exploration of new products, by rights, this study has provided an empirical evidence for the argument. Hence, the second issue was answered.

Thirdly, contextual ambidexterity was appeared to be the less moderated type of organisational capability. It was only moderated once by market turbulence to NPD financial performance with negative effect. In contrast, all of the existed moderating effects of environmental turbulence between structural ambidexterity and NPD performance were positive. As these results suggest, contextual ambidexterity and structural ambidexterity were found not to complement each other. This shows the organisational ambidexterity also has limitation of use. This finding was answering the third issue in this study.

Fourthly, when comparing between different types of environmental turbulence, it appeared market turbulence has moderated all types of organisational capability, but only in the relationships with NPD financial performance. In contrast, technological turbulence and competitive intensity have moderated certain types of organisational capability, but the effects were wide-spreading across all types of NPD performance. Meanwhile, it was also found that competitive intensity was the less critical type of environmental turbulence. This means different types of environmental turbulence have different moderating effects in the relationships between organisational capabilities and NPD performance. In response to the fourth issue, this finding shows the types of environmental turbulence should always be specified in future studies.

Fifthly, when addressing the moderating effects of environmental turbulence with DCs concept, the findings have shown different types of organisational capability have dissimilar effects on certain types of NPD performance when moderated by specific types of environment turbulence. These findings allow this study to suggest the right types of organisational capability to be deployed under different types of environmental turbulence. This implies firm that has the ability to deploy organisational capabilities under environmental turbulence to achieve better NPD performance is indeed possessing DCs, which answered the fifth issue in this study.

5.3 Contributions of this Study

This study that looks at exploitation and exploration capabilities, and structural and contextual ambidexterity as different types of organisational capability to represent the concept of DCs has contributed to the understanding on the effects of these capabilities either directly or indirectly through the moderating effect of environmental turbulence on NPD performance. Since there is a growing number of scholars from both NPD and resource-based fields that are interested and have begun to study NPD with the concept of DCs (Pavlou & Sawy, 2011; Marsh & Stock, 2003; Danneels, 2002; Deeds, DeCarolis, & Coombs, 2000), the contributions of this study on the theoretical aspect of DCs, knowledge aspect of NPD, and the practical aspect of Malaysian manufacturing firms are discussed in the following sections.

5.3.1 Theoretical Contributions on DCs

Past research had shown the relationships between DCs, technological competencies and success were largely ignored in the context of NPD (Acur, Kandemir, Weerd-Nederhof, & Song, 2010). The results in this study enhance the development of DCs concept since this concept is still considered to be relatively new. The contributions of this study on the development of DCs concept can be explained as follows:

Firstly, since organisational capabilities which representing the skills and knowledge for NPD process can be considered as the firm’s core capabilities (Kusunoki, Nonaka, & Nagata, 1998; Leonard-Barton, 1992), the study has supported previous findings on the exploitation and exploration capabilities, in which they are the firm's core capabilities that can turn into core rigidities under specific types of environmental turbulence. Meanwhile from DCs perspective, organisational capabilities that are difficult-to-duplicate by competitors help to sustain the firm's competitive advantage as it is the source of heterogeneity between firms that cause differences in performance (Katila & Ahuja, 2002), and therefore there is a need for them to be deployed at the right time. For these reasons, since DCs is a multidimensional construct (Winter, 2003; Helfat & Peteraf, 2003), the implications of the study to the concept of DCs in achieving greater NPD performance are shown through combining organisational capabilities of exploitation and exploration with structural and contextual ambidexterity that have not been investigated together in the previous studies.

Secondly, most DCs studies only highlighted environmental turbulence either in general or according to specific types of change such as rapidly changing technology (Teece, 2007; Teece, Pisano, & Shuen, 1997). However, other types of environmental turbulence such as competitive intensity are also critical and need to be responded to by the firm. For instance, it was empirically evidenced that DCs is positively related to the highly competitive environment (Wu, 2010). At the same time, while DCs is originally designed to respond to the rapidly changing environment (Teece, 2007), some scholars have argued that DCs can also be used under the stable environment (Eisenhardt & Martin, 2000), and some others have even claimed DCs is not necessarily related to environmental conditions (Zahra, Sapienza, & Davidsson, 2006). As such, the study has left an implication to the concept of DCs by clarifying and detailing the types and levels of environmental turbulence. These types include market turbulence, technological turbulence, and competitive intensity (Barreto, 2010), all of which has to be responded to by the firm to achieve greater NPD performance.

5.3.2 Knowledge Contributions on NPD

Even though research in NPD is heading toward maturity where most of the issues addressed in literature have been touched upon (Page & Schirr, 2008), it does not necessarily mean the field is stagnant. Instead, it means the field needs to consider new research streams in investigating variables and NPD performance (Chakravarthy, 1997). Since the level of knowledge needs to be improved through re-evaluating the previous approaches in NPD for a more systematic research agenda (Craig & Hart, 1992), this study has contributed to new and current knowledge on NPD through a new research stream of DCs that challenges the previous thoughts. The contributions of this study on NPD knowledge are comprehended as follows:

Firstly, the study promotes the issue of building and sustaining NPD performance under environmental change. The challenges of maintaining NPD performance is further elevated when the product lifecycle becomes ever shorter, when new products substitute the existing one, and when meeting consumer needs gets more difficult. Therefore, by stressing on the influences of environmental turbulence on NPD performance, it gives implication and clarification on the types of organisational capability to be pursued further under different types and levels of environmental turbulence in order to achieve better NPD performance.

Secondly, previous studies in NPD on capabilities mainly focused on the functional capabilities such as R&D, marketing, and operations (Krasnikov & Jayachandran, 2008), where their influences on NPD performance have been well researched.

However, as evidenced by the previous literature, NPD projects are either implemented to improve the existing product (exploitation capability) and/or to produce a completely new one (exploration capability). This suggests that organisational capabilities are also strongly related to NPD performance (Kyriakopoulos & Moorman, 2004). As these capabilities are gaining interest in the recent NPD literature, this study has enriched the current knowledge base related to organisational capabilities and its effect on NPD performance.

Thirdly, since the environment is continuously changing, a new stream of research that promotes the simultaneous pursuit of exploitation and exploration of new products has emerged. This has been initially called organisational ambidexterity (Birkinshaw & Gibson, 2004). However, even though the simultaneous pursuit of exploitation and exploration of new products had been argued to be positively related to NPD performance (Rothaermel & Alexandre, 2009), the field is still relatively new where explicit empirical research on organisational ambidexterity is still relatively rare. Since there is "no prior study [that] has explicitly focused on the measurement, antecedents, and consequences of organisational contextual ambidexterity" (Gibson & Birkinshaw, 2004, p. 212), many questions would start to arise, such as "under what conditions might ambidexterity be especially important?" (O'Reilly & Tushman, 2008, p. 195). This and many more questions are yet to be answered, but this research findings have provided further understanding on the contradiction between the exploitation and exploration of new products, and demonstrated how the concept of structural and contextual ambidexterity comes into play in creating balance between the exploitation and exploration of new products. For these reasons, the implication of the study on NPD knowledge is shown through the explicit and empirical investigation of structural and contextual ambidexterity on NPD performance under the influence of environmental turbulence.

Fourthly, previous study had suggested that organisational capabilities that are usually the concern of high-level management need more focus in NPD literature. This is because, even though many conceptual works were done on organisational capabilities, very few comprehensive empirical studies have analysed them as a multidimensional construct (Kusunoki, Nonaka, & Nagata, 1998). Since organisational capabilities can be a source of competitive advantage when managed well, renewed, and/or deployed heterogeneously, this study has given an implication on the knowledge of NPD by demonstrating organisational capabilities as the source of NPD performance with the concept of DCs in mind.

Fifthly, this study has applied the financial and nonfinancial criteria to measure NPD performance where the relationships with organisational capabilities are different under environmental turbulence. Moreover, since the correlation analysis has shown both of innovativeness (r = .265) and quality (r = .367) performance are positively correlated to financial performance, this study implies the nonfinancial performance provides the firm with a future source to make a living. For these reasons, this study contributes to the NPD knowledge with the types of organisational capability to be deployed under environmental turbulence in achieving better NPD performance, and also the relevant measures of NPD performance with the nonfinancial criteria.

Sixthly, when the business environment was relatively stable 20 to 30 years ago (Ernst, 2002), many of the previous NPD studies were based on theories that put less consideration on change factors. As a result, the firm’s resources and environment are still rarely researched in NPD (Page & Schirr, 2008). For these reasons, the study not just focused on the moderating effects of environmental turbulence, but also demonstrated three specific types of environmental turbulence, which are the market turbulence, technological turbulence, and competitive intensity in the relationships between organisational capabilities and NPD performance. As they are rarely addressed together in previous NPD study especially in the context of Malaysian manufacturing sector, this study's implication on NPD knowledge is not just simply presented by the moderating effects of environmental turbulence, but specifically by the three types of environmental turbulence to NPD performance.

5.3.3 Practical Contributions on Manufacturing Sector

The descriptive analysis of the variables have shown all types of NPD performance, organisational capabilities, and environmental turbulence are important to the Malaysian manufacturing firms based on their agreement level on the variables (see Section 4.5). Accordingly, the analysis on firm profile has suggested most firms are performing several NPD projects to serve different market needs as they have realised the exploitation and exploration of new products in combination contributes to better NPD performance (He & Wong, 2004). However, even though exploitation and exploration capabilities might not be new to the firms, they are somehow still fighting for the same resources (March, 1991). In return, the trade-off between the natures of exploitation and exploration capabilities might have negatively affected NPD performance (He & Wong, 2004), which is evidenced in this study.

With these findings, the results should be able to signal the top management or decision-makers in avoiding two types of errors in NPD projects, which are: (1) the potential failure project that proceeded because the managers have ignored the risk signals, and (2) the potentially successful project that is prematurely terminated because of scarce evidences for its success (Bonabeau, Bodick, & Armstrong, 2008). For these reasons, since strategic choice is made by top management that affects the overall strategic planning (Grant, 2003), the results are valuable in decision making process when deciding the types of organisational capability to be deployed under environmental turbulence to achieve better NPD performance, which will also help the firms to become flexible and eventually agile manufacturers of new products.

5.4 Limitations of this Study

In general, this study has achieved the objectives and demonstrated the appropriate organisational capabilities to be deployed, for specific types of NPD performance, under certain types of environmental turbulence, with the concept of DCs. Even though the contributions of this study were significant, it was also constrained in several ways. For instance, this study was constrained by limited amount of time and money for data collection. Even though more than 100 samples were received during six months period of data collection, further efforts to increase the response rate were limited by the availability of time and money. In addition, the constraints in data collection also happened due to limited cooperation from respondents, that was caused by various factors, such as firm policy, bureaucracy, and/or simply because of respondent being uninterested in completing the survey (see Table 4.4 for details).

Meanwhile, the limitations for this study that happens during and after the analysis of data can be caused by the following reasons. Firstly, this study was using parametric methods that need to meet some required assumptions such as outliers. However, it is quite impossible to remove all outliers from the analyses. As such, even though outliers in the univariate, bivariate, and multivariate analyses have been dealt with, some of them were still exist. Consequently, as normality is achieved after removal of outliers, it is however approximately normal. The same situation was also observed for multicollinearity, where both Tolerance and TIF values did not achieve 1.0. However, as the values are more than 0.1 for Tolerance and less than 10.0 for TIF, the effect of multicollinearity and singularity was still within the acceptable threshold limit. Meanwhile, the sample size for this study was just slightly above the minimum acceptable number of samples to perform analyses. As for comparisons, recent study on organisational ambidexterity had only analysed 112 samples with the hierarchical regression analysis (Aloini, Martini, & Neirotti, 2012), which is also at minimum but within an acceptable limit. In other words, even though all of the assumptions were achieved, as they are not perfectly met, the power of analyses may be affected and the results might have limited generalisability especially when the "information from a random sample is not always an accurate reflection of the population from which the sample is drawn" (Argyrous, 2011, p. 295).

Secondly, there were a number of rejected hypotheses in this study for not achieving the significance level. However, these results do not necessarily mean that the hypotheses are wrong, but instead, these hypotheses failed to be significant because of insufficient evidence in the data to support them. Thus, due to the limitations and weaknesses described, the results should not be seen as conclusive. In addition, even if the hypotheses are not significant, with good theoretical grounds, the hypotheses still can be suspected to be significant, which should be the basis for future research. This is because as the "inference tests do not prove anything; they are usually evidence in an ongoing discussion or debate that rarely reaches a decisive conclusion" (Argyrous, 2011, p. 313), the results should be interpreted with care, even if they found to support, replicate, or contradict previous studies.

Thirdly, according to previous literature, operations management, engineering design, marketing, and organisations are the main perspectives of product development that view NPD differently from each other (Krishnan & Ulrich, 2001). For instance, the interpretations of exploitation and exploration capabilities are quite inconsistent even though their literature had contributed greatly to knowledge (Li, Vanhaverbeke, & Schoemakers, 2008). As such, even though this study had specified the interpretations of exploitation and exploration capabilities, structural and contextual ambidexterity, types of environmental turbulence, and NPD performance, the results can still be argued if viewed from different angles with the other concepts/perspectives. For these reasons, the findings of this study and their interpretations should be limited by the scope and within the concept of DCs.

Fourthly, even though the research findings were able to recommend the deployment strategy of organisational capabilities to achieve greater NPD performance under environmental turbulence, it is however not inclusive of all. For instance, there is no deployment strategy of organisational capabilities that can be recommended to achieve better NPD nonfinancial performance under market turbulence. Consequently, there may be other types of organisational capability that can be deployed to achieve near optimal NPD nonfinancial performance under market turbulence, but has not been investigated in this study. As such, the deployment strategy as recommended by this study cannot be treated as inclusive and conclusive.

5.5 Recommendations for Future Study

It appears the limitations and constraints of this study have created opportunities for future research agendas, which are discussed as follows:

Firstly, based on Table 4.11 of Chapter Four, 60.7% of manufacturing firms in the study were categorised as SMEs, while the rest were large corporations. Since the study does not differentiate between SMEs and large corporations, the relevant deployment of organisational capabilities as recommended by this study may be a bit general. For this reason, it may be quite interesting for future research to focus on the differences in deployment of organisational capabilities between small and large firms. It may also be interesting to see if the size of firms in the context of Malaysian manufacturing sector determines the ability to adapt DCs concept. This is because previous study has hypothesised "small share firms are more flexible and better able to adapt to changing market circumstances than larger firms which tend to be more bureaucratic" (Gale, 1972, p. 415). In contrast, larger firms that have more slack resources (Jansen, Bosch, & Volberda, 2006) are able to increase their competitive intensity (Barnett, 1997). For instance, previous study had shown that ambidexterity positively affects the revenues of large firms (Voss & Voss, 2013), which is suggesting the effective strategy for small firms may not be the same for large firms.

Secondly, even though different firms are facing the same level of competitive intensity, but they have different opportunities in different technology industries (Ang, 2008). As such, future study is recommended to focus on the specific types of industries where the similarities and dissimilarities in deployment strategy of organisational capabilities can be meaningfully identified. This happens due to the same capability that is at the explorative level of one firm can be at the exploitative level of another firm (He & Wong, 2004), which means the levels of organisational capability may not be treated as absolute (Winter, 2003) to all types of industries. For instance, firms in biotechnology use different types of exploitation and exploration alliances at different stages of NPD process (Rothaermel & Deeds, 2004).

Thirdly, the research findings has shown that the Malaysian manufacturing firms are more oriented toward the exploitation capability (e.g., incremental NPD projects), more focused on achieving NPD financial performance, and the market turbulence (e.g., changing customers' preferences) has more influences on NPD financial performance. Since they are not the only factors that have affected the NPD, future research should consider investigating in depth the forces that drives or motivates the Malaysian manufacturing firms to put more emphasis on incremental NPD projects, NPD financial performance, and market turbulence.

Fourthly, researchers should also consider investigating in depth the role of exploration capability and how it can benefit the firms during high-level environmental turbulence in order to achieve better NPD performance. This is because even though the Malaysian manufacturing firms were more inclined toward the exploitation capability (e.g., incremental NPD projects), the firms also realise that the exploration capability can be the future source that contribute to better NPD financial performance, as changes in the current customer preferences can cause obsolescence in the firms' current product offering.

Fifthly, even though the importance of creating balance between exploitation and exploration of new products has been well stressed within organisational literature, there is however no consensus on how the balance can be achieved (Benner & Tushman, 2003). For instance, organisational ambidexterity can be performed either by simultaneous or sequential pursuit of exploitation and exploration of new products (Raisch, Birkinshaw, Probst, & Tushman, 2009; Chen & Katila, 2008; O'Reilly & Tushman, 2008). This implies that there is no single way to become ambidextrous (Gibson & Birkinshaw, 2004). In addition, while previous study had shown contextual ambidexterity is an intermediate output to structural ambidexterity

(Aloini, Martini, & Neirotti, 2012), this study has shown different result, where contextual ambidexterity is negatively related to NPD financial performance under high-level of market turbulence, which is opposite to the result of structural ambidexterity. Since the inconsistency of previous results suggests the literature of contextual ambidexterity is at the infancy level (Venkatraman, Lee, & Iyer, 2007), future study should do more empirical research on contextual ambidexterity to enhance understanding on organisational ambidexterity.

Sixthly, study on technology sourcing mix has identified the trade-off situations does not just happen between known (exploitation) and new (exploration) technologies, but also between internal and external technology sourcing (Rothaermel & Alexandre, 2009). Thus, it would be important to understand how successful firms manage different combinations of search depth (e.g., exploitation capability) and search scope (e.g., exploration capability) as compared to those who fail to manage them (Katila & Ahuja, 2002). By doing this, the best way to deploy organisational capabilities could be identified from the success firms, which will provide more benefits to the practical aspect and knowledge of NPD, and/or theory of DCs.

Seventhly, as DCs is not just for enhancing but also for retiring the capability (e.g., NPD) in its lifecycle (Ambrosini, Bowman, & Collier, 2009; Helfat & Peteraf, 2003), the deployment strategy can also be considered when deciding to layoff the capability. This is because the deployment of specific types of organisational capability has been studied according to the firm's exit strategy (Gerasymenko & Arthurs, 2010). As such, future study should expand the deployment issues of organisational capability on the other aspects of NPD, besides performance itself.

Eighthly, the deployment strategy as recommended by this study is not inclusive of all factors, as was evidenced when the deployment strategy for NPD nonfinancial performance under market turbulence cannot be recommended by any of the four organisational capabilities. Since the deployment strategy is not conclusive, future study is advised to include other types of organisational capability that can possibly be deployed to achieve the related NPD performance under the related environmental turbulence, i.e., to fill the gaps in the knowledge base.

Ninthly, in different streams of study, DCs was conceptually described as high-order capabilities that impacts low-order capabilities (Ambrosini, Bowman, & Collier, 2009). This notion is supported by previous empirical study where the indirect positive effects of DCs (as high-order capabilities) to the firm's performance is achieved through marketing and technological capabilities (as low-order capabilities) (Protogerou, Caloghirou, & Lioukas, 2012). Similarly, previous study had shown the customer and technological capabilities that are treated as first-order DCs is developed through the second-order DCs of marketing and R&D capabilities (Danneels, 2008). As such, since DCs has direct positive effects on resource base and indirect effects on firm's performance (Ambrosini, Bowman, & Collier, 2009), and since there is a difference between dynamic (high-order) and operating (low-order) capabilities that are contextually dependent and locally defined according to what they do (not what they are) (Kay, 2010; Winter, 2003), it would be interesting for future study to investigate the relationships between organisational ambidexterity (as high-order DCs) and organisational learning (as low-order DCs), and how the interaction between these different order of DCs can affect NPD performance.

5.6 Chapter Summary

This study was multidisciplinary in nature that combined the disciplines of strategic management (e.g., organisational capabilities), technology management (e.g., NPD), and change management (e.g., environmental turbulence). Since a new strategy is needed to deal with the difficulty in building and maintaining firm's competitive advantage under environmental change, this study had applied DCs concept that enables the firm to sustain competitive advantage under rapidly changing environment. To demonstrate this concept, organisational learning that is a popular topic addressed in NPD literature has been treated as DCs. Similarly, the organisational ambidexterity that is "the ability of a firm to simultaneously explore and exploit, [which] enables a firm to adapt over time" (O'Reilly & Tushman, 2008, p. 185) and to deal with the incongruences exist between exploitation and exploration of new products is also treated as another form of DCs.

Meanwhile, simply possessing and controlling organisational capabilities (organisational learning and organisational ambidexterity) do not guarantee they can be the source of competitive advantage. Instead they have to be built, configured, and deployed when necessary. Since NPD projects are not only different between firms but also different within a firm, the deployment of different types of organisational capability depends on the types of NPD performance to be achieved and the types of environmental turbulence faced. The results have shown even though all types of organisational capability are important to NPD performance, their effects are quite different from one another under specific types of environmental turbulence.

With DCs concept in mind, this study has found even though the incongruence between exploitation and exploration capabilities (organisational learning) can negatively affect NPD performance, the incongruence between them does not need to be balanced at all times since their individual effects on NPD performance can be positive. Similarly, even though organisational (structural and contextual) ambidexterity is important to create balance between exploitation and exploration of new products, organisational ambidexterity is not necessarily needed all the time as it can also negatively affect NPD performance in some cases. Nevertheless, this study has found that structural ambidexterity, market turbulence, and NPD financial performance as being the most responded by Malaysian manufacturing firms. For these reasons, the findings had indicated the concept of DCs that stresses on building the firm's ability to deploy organisational capabilities in NPD projects under different types of environmental turbulence should be able to assist these firms in creating balance in their NPD portfolio and decision making for NPD strategy.

As for concluding remarks, this study has answered the research question by offering possible types of organisational capability to be deployed under certain types and levels of environmental turbulence in order to achieve the specific types of NPD performance. As a result, this study has come to the conclusion that even though all capabilities are imperative to NPD performance, under different environmental conditions firm must select the appropriate capabilities for the right environments. In other words, firm that is able to deploy the right capability for NPD project in response of environmental turbulence will achieve better NPD performance.

REFERENCES

Abdi, H., & Williams, L. J. (2010). Principal Component Analysis. *Wiley Interdisciplinary Reviews: Computational Statistics*, *2*(4), 433-459.

Abdullah, N. L., & Salleh, A. L. (2011). To Continue Prospecting: Performance Implications of Combinative Capabilities and Explorative Learning. *Procedia-Social and Behavioural Sciences*, *24*, 1107-1123.

Acur, N., Kandemir, D., Weerd-Nederhof, P. C. d., & Song, M. (2010). Exploring the Impact of Technological Competence Development on Speed and NPD Program Performance. *Journal of Product Innovation Management*, *27*, 915-929.

Adis, A. A. A., & Razli, I. A. (2009). Factors Affecting New Product Development in Malaysian Manufacturing Industry. *International Bulletin of Business Administration* (4).

Ahmed, A. Y. M. (2011). *Internet Technology Factors, Quality Information Delivery and Supply Chain Information Performance in Malaysian Manufacturing Companies* (Doctoral dissertation, Universiti Utara Malaysia).

Ahn, J.-H., Lee, D.-J., & Lee, S.-Y. (2006). Balancing Business Performance and Knowledge Performance of New Product Development: Lessons from ITS Industry. *Long Range Planning*, *39*, 525-542.

Akgun, A. E., Byrne, J. C., Lynn, G. S., & Keskin, H. (2007). New Product Development in Turbulence Environments: Impact of Improvisation and Unlearning on New Product Performance. *Journal of Engineering Technology Management*, *24*, 203-230.

Aloini, D., Martini, A., & Neirotti, P. (2012). Unpack It: Organisational Ambidexterity between Structure, Knowledge and Performance. An empirical analysis.

Al-Shalabi, A., & Rundquist, J. (2009). Use of Processes and Methods in NPD - A Survey of Malaysian Industry. *International Journal of Innovation and Technology Management*, *6*(4), 379-400.

Al-Shalabi, A., Omar, M. K., & Rundquist, J. (2010). Outsourcing and Organising of NPD: A Survey of Malaysian Industry.

Ambrosini, V., & Bowman, C. (2009). What are Dynamic Capabilities and are They a Useful Construct in Strategic Management? *International Journal of Management Review, 11*(1), 29-49.

Ambrosini, V., Bowman, C., & Collier, N. (2009). Dynamic Capabilities: An Exploration of How Firms Renew Their Resource Base. *British Journal of Management, 20*, 9-24.

Andriopoulos, C., & Lewis, M. W. (2009). Exploitation-Exploration Tensions and Organisational Ambidexterity: Managing Paradoxes of Innovation. *Organisation Science, 22*(4), 696-717.

Ang, S. H. (2008). Competitive Intensity and Collaboration: Impact on Firm Growth Across Technological Environments. *Strategic Management Journal, 29,* 1057-1075.

Angelopoulos, G., Giamouridis, D., & Vlismas, O. (2012). Inferring the Value of Intangible Assets. *Available at SSRN 1786285*.

Aral, S., & Weill, P. (2007). IT Assets, Organisational Capabilities, and Firm Performance: How Resource Allocations and Organisational Differences Explain Performance Variation. *Organisation Science*, *18*(5), 763–780.

Argyrous, G. (2011). *Statistics for Research: With a Guide to SPSS* (3rd ed.). London: SAGE Publications Ltd.

Ariff, M. (2008). *New Perspectives on Industry Clusters in Malaysia*, in Ariff, M. (ed.), Analyses of Industrial Agglomeration, Production Networks and FDI Promotion, ERIA Research Project Report 2007-3, Chiba: IDE-JETRO, pp.368-397.

Armstrong, J. S., & Overton, T. S. (1977). Estimating Nonresponse Bias in Mail Surveys. *Journal of Marketing Research*, *14*(3), 396-402.

Asgari, N., & Eslami, H. (2012). Balancing between Exploration and Exploitation across Acquisitions and Alliances. Paper to be presented at the DRUID 2012, CBS, Copenhagen, Denmark. Retrieved April 24, 2013, from http://druid8.sit.aau.dk/acc_papers/t2fyryjikb9e76itiro698i4mjyy.pdf

Athukorala, P. C. (2010). *Malaysian Economy in Three Crises* (No. 2010-12), Retrieved June 10, 2014, from https://crawford.anu.edu.au/acde/publications/publish/papers/wp2010/wp_econ_2010_12.pdf

Atuahene-Gima, K. (2005). Resolving the Capability–Rigidity Paradox in New Product Innovation. *Journal of Marketing, 69*, 61–83.

Atuahene-Gima, K., & Li, H. (2004). Strategic Decision Comprehensiveness and New Product Development Outcomes in New Technology Ventures. *Academy of Management Journal, 47*(4), 583-597.

Atuahene-Gima, K., & Murray, J. Y. (2007). Exploratory and Exploitative Learning in New Product Development: A Social Capital Perspective on New Technology Ventures in China. *Journal of International Marketing, 15*(2), 1-29.

Atuahene-Gima, K., Li, H., & De Luca, L. M. (2006). The Contingent Value of Marketing Strategy Innovativeness for Product Development Performance in Chinese New Technology Ventures. *Industrial Marketing Management*, *35*(3), 359-372.

Auh, S., & Menguc, B. (2005). Balancing Exploration and Exploitation: The Moderating Role of Competitive Intensity. *Journal of Business Research*, *58*, 1652-1661.

Aun, L. H. (2004). Development in Malaysia: Economics and Politics of an Idea. *Akademika*, *64*, 65-81.

Aydin, B., & Ceylan, A. (2009). The Effect of Spiritual Leadership on Organisational Learning Capacity. *African Journal of Business Management*, *3*(5), 184-190.

Banbury, C. M., & Mitchell, W. (1995). The Effect of Introducing Important Incremental Innovations on Market Share and Business Survival. *Strategic Management Journal, 16*, 161-182.

Banning, R., Camstra, A., & Knottnerus, P. (2012). *Sampling Theory: Sampling Design and Estimation Methods*. The Hague: Statistics Netherlands.

Barbaroux, P., & Gode-Sanchez, C. (2007). *Acquiring Core Capabilities through Organisational Learning: Illustrations from the U.S. Military Organisations*, Retrieved November 13, 2011, from http://hal.archives-ouvertes.fr /docs/00/29/35/34/PDF/EGOS-Final-PB-CGS.pdf

Barczak, G., & Wilemon, D. (1991). Communications Patterns of New Product Development Team Leaders. *IEEE Transactions on Engineering Management, 38*(2), 101-109.

Barczak, G., Griffin, A., & Kahn, K. B. (2009). Perspective: Trends and Drivers of Success in NPD Practices: Results of the 2003 PDMA Best Practices Study. *Journal of Product Innovation Management*, *26*(3-23).

Barnett, W. P. (1997). The Dynamics of Competitive Advantage. *Administrative Science Quarterly, 42*(1), 128-160.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99-120.

Baron, R. M., & Kenny, D. A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management, 36*(1), 256-280.

Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). Organisational Research: Determining Appropriate Sample Size in Survey Research. *Information Technology, Learning, and Performance Journal, 19*(1), 43-50.

Baruch, Y. (1999). Response Rate in Academic Studies - A Comparative Analysis. *Human Relations, 52*(4), 421-438.

Baruch, Y., & Holtom, B. C. (2008). Survey Response Rate Levels and Trends in Organisational Research. *Human Relations, 61*(8), 1139-1160.

Bauly, J. A. (2004). *NPD in Manufacturing Companies - Use of Surveys to Determine Overall Status in a Country or Region, and Changes over Time.* Paper presented at the International Engineering Management Conference 2004.

Beiner, S., Schmid, M. M., & Wanzenried, G. (2011). Product Market Competition, Managerial Incentives and Firm Valuation. *European Financial Management*, *17*(2), 331-366.

Benner, M. J., & Tushman, M. L. (2003). Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited. *Academy of Management Review, 28*(2), 238-256.

Bergkvist, L. (2004). *Does Confidence Moderate or Predict Brand Attitude and Purchase Intention?* Retrieved June 8, 2014, from http://ro.uow.edu.au/cgi/viewcontent.cgi?article=3938&context=commpapers

Bhatnagar, J. (2006). Measuring Organisational Learning Capability in Indian Managers and Establishing Firm Performance Linkage. *The Learning Organisation, 13*(5), 416-433.

Bhattacharya, S., Krishnan, V., & Mahajan, V. (1998). Managing New Product Definition in Highly Dynamic Environments. *Management Science, 44*(11-part-2), S50-S64.

Bhuiyan, N., Gerwin, D., & Thomson, V. (2004). Simulation of the New Product Development Process for Performance Improvement. *Management Science, 50*(12), 1690-1703.

Bhutto, A. (2005). Managing Interindustry Differences through Dynamic Capabilities: The Case Study of Nokia. *International Journal of Innovation and Technology Management*, *2*(3), 235-257.

Biedenbach, T., & Soderholm, A. (2008). The Challenge of Organising Change in Hypercompetitive Industries: A Literature Review. *Journal of Change Management, 8*(2), 123-145.

Birkinshaw, J., & Gibson, C. (2004). Building Ambidexterity into an Organisation. *MIT Sloan Management Review*, 47-55.

Bitar, J. (2003). Strategy in Turbulent Environment Continuous Innovation and Generic Dynamic Capabilities (p. 1-27). Montréal.

Blaikie, N. (2003). *Analysing Quantitative Data: From Description to Explanation*. London: SAGE Publications Ltd.

Blaisdell, E. A. (1993). *Statistics in Practice*. Florida: Saunders College Publishing.

Blaug, R., & Lekhi, R. (2009). *Accounting for Intangibles: Financial Reporting and Value Creation in the Knowledge Economy*. Work Foundation.

BNM (October 31, 2011). *Economic and Financial Data for Malaysia*, Bank Negara Malaysia (BNM), Retrieved November 1, 2011, from http://www.bnm.gov. my/index.php?ch=111

Boccardelli, P., & Magnusson, M. G. (2006). Dynamic Capabilities in Early-Phase Entrepreneurship. *Knowledge and Process Management*, *13*(3), 162-174.

Bonabeau, E., Bodick, N., & Armstrong, R. W. (2008). A More Rational Approach to New-Product Development. *Harvard Business Review*, 96-102.

Bontis, N., & Serenko, A. (2007). The Moderating Role of Human Capital Management Practices on Employee Capabilities. *Journal of Knowledge Management*, *11*(3), 31-51.

Botchkarev, A., Andru, P., & Chiong, R. (2011). A Return on Investment as a Metric for Evaluating Information Systems: Taxonomy and Application. *Interdisciplinary Journal of Information, Knowledge & Management*, *6*.

Brentani, U. d., Kleinschmidt, E. J., & Salomo, S. (2010). Success in Global New Product Development: Impact of Strategy and the Behavioural Environment of the Firm. *Journal of Product Innovation Management*, *27*, 143-160.

Brown, S. L., & Eisenhardt, K. M. (1995). Product Development: Past Research, Present Findings, and Future Directions. *The Academy of Management Review*, *20*(2), 343-378.

Brown, T. A. (2006). *Confirmatory Factor Analysis for Applied Research*. New York: The Guilford Press.

Burdenski, T. (2000). Evaluating Univariate, Bivariate, and Multivariate Normality Using Graphical and Statistical Procedures. *Multiple Linear Regression Viewpoints, 26*(2), 15-28.

Bustinza, O. F., Molina, L. M., & Arias-Aranda, D. (2010). Organisational Learning and Performance: Relationship between the Dynamic and the Operational Capabilities of the Firm. *Afr. J. Bus. Manage. Journal Business Management*, *4*(18), 4067-4078.

Calantone, R. J., Schmidt, J. B., & Song, X. M. (1996). Controllable Factors of New Product Success: A Cross-National Comparison. *Marketing Science, 15*(4), 341-358.

Calantone, R., Garcia, R., & Droge, C. (2003). The Effects of Environmental Turbulence on New Product Development Strategy Planning. *Journal of Product Innovation Management*, *20*, 90-103.

Caminal, R., & Vives, X. (1996). Why market Shares Matter: An Information-Based Theory. *The RAND Journal of Economics, 27*(2), 221-239.

Candes, E. J., Li, X., Ma, Y., & Wright, J. (2011). Robust Principal Component Analysis?. *Journal of the ACM (JACM)*, *58*(3), 11.

Cao, Y., Zhao, L., & Nagahira, A. (2011). The Impact of Front End Innovation in New Product Development in Japanese Manufacturing Companies. *Nankai Business Review*, *2*(1), 98-113.

Carbonara, N., & Scozzi, B. (2006). Cognitive Maps to Analyse New Product Development Processes: A Case Study. *Technovation*, *26*, 1233-1243.

Cepeda, G., & Vera, D. (2007). Dynamic Capabilities and Operational Capabilities: A Knowledge Management Perspective. *Journal of Business Research, 60*, 426-437.

Chakravarthy, B. (1997). A New Strategy Framework for Coping with Turbulence. *Sloan Management Review*, 69-82.

Chan, Y. H. (2003). Biostatistics 102: Quantitative Data–parametric & Non-Parametric Tests. *Blood Pressure*, *140*(24.08), 79-00.

Chandra, M., & Neelankavil, J. P. (2008). Product Development and Innovation for Developing Countries: Potential and Challenges. *Journal of Management Development*, *27*(10), 1017-1025.

Chen, E. L., & Katila, R. (2008). Rival Interpretations of Balancing Exploration and Exploitation: Simultaneous or Sequential? In S. Shane (Editor), *Handbook of Technology and Innovation Management* (pp. 197-214): John Wiley & Sons.

Chen, H. (2002). Principal Component Analysis with Missing Data and Outliers. *Electrical and Computer Engineering Department Rutgers University*.

Chen, H.-H., & Lee, P.-Y. (2009). The Driving Drivers of Dynamic Competitive Capabilities: A New Perspective on Competition. *European Business Review, 21*(1), 78-91.

Chen, J., Reilly, R. R., & Lynn, G. S. (2005). The Impacts of Speed-to-Market on New Product Success: The Moderating Effects of Uncertainty. *IEEE Transactions on Engineering Management, 52*(2), 199-212.

Cheng, M. Y. (2003). Economic Fluctuations and Growth: an Empirical Study of the Malaysian Economy. *The Journal of Business in Developing Nations*, *7*(1), 51-73.

Cho, H.-J., & Pucik, V. (2005). Relationship between Innovativeness, Quality, Growth, Profitability, and Market Value. *Strategic Management Journal*, *26*, 555-575.

Chu, C.-P., Li, C.-R., & Lin, C.-J. (2011). The Joint Effect of Project-Level Exploratory and Exploitative Learning in New Product Development. *European Journal of Marketing*, *45*(4), 531-550.

Cohen, J. (1988). Statistical Power Analysis for the Behavioural Sciences (2nd ed.). New Jersey: Lawrence Erlbaum.

Cohen, J. D., McClure, S. M., & Angela, J. Y. (2007). Should I Stay or Should I Go? How the Human Brain Manages the Trade-off between Exploitation and Exploration. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *362*(1481), 933-942.

Cohen, M. A., Eliashberg, J., & Ho, T.-H. (1996). New Product Development: The Performance and Time-to-Market Tradeoff. *Management Science* (42), 2.

Comrey, A. L. (1985). A Method for Removing Outliers to Improve Factor Analytic Results. *Multivariate Behavioural Research, 20*(3), 273-281.

Conover, W. J., & Iman, R. L. (1981). Rank Transformations as a Bridge between Parametric and Nonparametric Statistics. *The American Statistician, 35*(3), 124-129.

Conway, J. M., & Huffcutt, A. I. (2003). A Review and Evaluation of Exploratory Factor Analysis Practices in Organisational Research. *Organisational Research Methods*, *6*(2), 147-168.

Cook, C., Heath, F., & Thompson, R. L. (2000). A Meta-Analysis of Response Rates in Web- or Internet-based Surveys. *Educational and Psychological Measurement*, *60*(6), 821-836.

Cooper, D. R., & Schindler, P. S. (2008). *Business Research Methods* (10^{th} ed.). New York: McGraw-Hill/Irwin.

Cooper, R. G. (2005). Attention: Results are Down! Your NPD Portfolio may be Harmful to your Business's Health. *PMDA Visions, XXIX*(2), 3-13.

Cooper, R. G., & Edgett, S. J. (2001). Portfolio Management for New Products: Picking the Winners. *Product Development Institute, Ancaster, Ontario, Canada*.

Costello, A. B., & Osborne, J. W. (2005). Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most from Your Analysis. *Practical Assessment Research & Evaluation*, *10*(7), 1-9.

Craig, A., & Hart, S. (1992). Where to Now in New Product Development Research? *European Journal of Marketing, 26*(11), 2-49.

Crossan, M. M., & Berdrow, I. (2003). Organisational Learning and Strategic Renewal. *Strategic Management Journal, 24*(11), 1087-1105.

Crossan, M. M., Lane, H. W., & White, R. E. (1999). An Organisational Learning Framework: From Intuition to Institution. *The Academy of Management Review, 24*(3), 522-537.

Danneels, E. (2002). The Dynamics of Product Innovation and Firm Competences. *Strategic Management Journal, 23*(12), 1095-1121.

Danneels, E. (2008). Organisational Antecedents of Second-order Competences. *Strategic Management Journal, 9*(5), 519-543.

Dawes, J. (2008). Do Data Characteristics Change According to the Number of Scale Points Used? *International Journal of Market Research, 50*(1), 62-77.

Dawson, R. (2011). How Significant is a Boxplot Outlier. *Journal of Statistics Education*, *19*(2), 1-12.

De Clercq, D., Thongpapanl, N. T., & Dimov, D. (2013). Shedding New Light on the Relationship between Contextual Ambidexterity and Firm Performance: An Investigation of Internal Contingencies. *Technovation, 33*(4), 119-132.

DeCoster, J. (1998). *Overview of Factor Analysis*, Retrieved Nov 24, 2012, from http://www.stat-help.com/notes.html

Deeds, D. L., DeCarolis, D., & Coombs, J. (2000). Dynamic capabilities and New Product Development in High Technology Ventures: An Empirical Analysis of New Biotechnology Firms. *Journal of Business Venturing, 15*, 211-229.

Deloitte, T. T. L. (2012). *2013 Global Manufacturing Competitiveness Index*, Retrieved July 21, 2013, from http://www.deloitte.com/assets/Dcom-Global/Local%20Assets/Documents/Manufacturing/dttl_2013%20Global%20Manufacturing%20Competitiveness%20Index_11_15_12.pdf

Derichs, C. (2007). Malaysia in 2006: An Old Tiger Roars. *Asian Survey, 47*(1), 148-154.

Devadason, E. S., & Meng, C. W. (2009). Globalization of the Malaysian Manufacturing Sector: An Agenda for Social Protection Enhancement. *International Journal of Economics & Finance*, *1*(1).

Dewar, R. D., & Dutton, J. E. (1986). The Adoption of Radical and Incremental Innovations: An Empirical Analysis. *Management Science, 32*(11), 1422-1433.

Dhanani, S., O'Shaughnessy, N., & Louw, E. (1997). Marketing Practices of UK High Technology Firms. *Logistics Information Management, 10*(4), 160–166.

DiStefano, G., Peteraf, M., & Verona, G. (2010). Dynamic Capabilities Deconstructed: A Bibliographic Investigation into the Origins, Development, and Future Directions of the Research Domain. *Industrial and Corporate Change, 19*(4), 1187-1204.

Dodgson, M. (1993). Organisational Learning: A Review of Some Literatures. *Organisation Studies*, *14*(3), 375-394.

Droge, C., Calantone, R., & Harmancioglu, N. (2008). New Product Success: Is it Really Controllable by Managers in Highly Turbulent Environments? *Journal of Product Innovation Management, 25*, 272-286.

Durisin, B., Calabretta, G., & Parmeggiani, V. (2010). The Intellectual Structure of Product Innovation Research: A Bibliometric Study of the Journal of Product Innovation Management, 1984-2004. *Journal of Product Innovation Management, 27*, 437-451.

Dutta, S. (2009). Editor, *Previous Editions, Global Innovation Index Report 2008-2009*, INSEAD, Retrieved October 25, 2011, from http://www. globalinnovationindex.org/gii/main/previous/2008-09/FullReport_08-09.pdf

Dutta, S. (2010). Editor, *Previous Editions, Global Innovation Index Report 2009-2010*, INSEAD, Retrieved October 25, 2011, from http://www. globalinnovationindex.org/gii/main/previous/2009-10/FullReport_09-10.pdf

Dutta, S. (2011). Editor, *The Global Innovation Index 2011: Accelerating Growth and Development*, INSEAD, Retrieved October 31, 2011, from http: //www.globalinnovationindex.org/gii/GII%20COMPLETE_PRINTWEB.pdf

Dutta, S. (2012). Editor, *The Global Innovation Index 2012: Stronger Innovation Linkages for Global Growth*, INSEAD and WIPO 2012, Retrieved July 21, 2013, from http://www.wipo.int/export/sites/www/freepublications/en/ economics/gii/gii_2012.pdf

Dutta, S., & Lanvin, B. (2013). Editors, *The Global Innovation Index 2013: The Local Dynamics of Innovation*, Cornell University, INSEAD, and WIPO 2013, Retrieved July 21, 2013, from http://www. globalinnovationindex.org/ content.aspx?page=gii-full-report-2013#pdfopener

Ebrahim, N. A., Ahmed, S., & Taha, Z. (2010). Critical Factors for New Product Developments in SMEs Virtual Team. *African Journal of Business Management, 4*(11), 2247-2257.

Edwards, P., Roberts, I., Clarke, M., DiGuiseppi, C., Pratap, S., Wentz, R., & Kwan, I. (2002). Increasing Response Rates to Postal Questionnaires: Systematic Review. *BMJ*, *324*(7347), 1183.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic Capabilities: What are They? *Strategic Management Journal*, *21*, 1105-1121.

Eisenhardt, K. M., Furr, N. R., & Bingham, C. B. (2010). Microfoundations of Performance: Balancing Efficiency and Flexibility in Dynamic Environments. *Organisation Science, 21*(6), 1263-1273.

Eppinger, S. D., & Chitkara, A. R. (2006). The New Practice of Global Product Development. *MIT Sloan Management Review, 47*(4), 21-30.

Ernst & Young. (2011). *Winning in a Polycentric World: Globalization and the Changing World of Business*: Ernst & Young.

Ernst & Young. (2012). *The World is Bumpy: Globalization and New Strategies for Growth*: Ernst & Young.

Ernst, H. (2002). Success Factors of New Product Development: A Review of the Empirical Literature. *International Journal of Management Reviews, 4*(1), 1-40.

Fife-Schaw, C. (2006). Principles of Statistical Inference Tests. In G. M. Breakwell, S. Hammond, C. Fife-Schaw & J. A. Smith (Eds.), *Research Methods in Psychology* (3rd ed., pp. 388-413). London: SAGE Publications Ltd.

Fiol, C. M., & Lyles, M. A. (1985). Organisational Learning. *The Academy of Management Review, 10*(4), 803-813.

Fischer, T., Gebauer, H., Gregory, M., Ren, G., & Fleisch, E. (2010). Exploitation or Exploration in Service Business Development? Insights from a Dynamic Capabilities Perspective. *Journal of Service Management, 21*(5), 591-624.

Fiset, J., & Dostaler, I. (2013). Combining Old and New Tricks: Ambidexterity in Aerospace Design and Integration Teams. *Team Performance Management, 19*(7/8), 2-2.

Floyd, S. W., & Lane, P. J. (2000). Strategizing throughout the Organisation: Managing Role Conflict in Strategic Renewal. *The Academy of Management Review*, *25*(1), 154-177.

FMM (2011). *FMM Directory of Malaysian Industries 2011* (42nd ed.).

Frankfort-Nachmias, C., & Leon-Guerrero, A. (2009). *Social Statistics for a Diverse Society* (5th ed.). California: Pine Forge Press.

Gale, B. T. (1972). Market Share and Rate of Return. *The Review of Economics and Statistics*, *54*(4), 412-23.

Garcia, E. (2010). *A Tutorial on Correlation Coefficients*, Retrieved June 6, 2014, from http://web.simmons.edu/~benoit/lis642/a-tutorial-on-correlation-coefficients.pdf

Garcia, R., & Calantone, R. (2002). A Critical Look at Technological Innovation Typology and Innovativeness Terminology: A Literature Review. *The Journal of Product Innovation Management*, *19*, 110-132.

Gay, L. R., & Diehl, P. L. (1992). *Research Methods for Business and Management*. New York: Macmillan Publishing Company.

Gerasymenko, V., & Arthurs, J. D. (2010). Venture Capitalists' Exit Strategy: A Dynamic Capabilities and Resource Dependence Perspective. *Frontiers of Entrepreneurship Research*, *30*(3), 1.

Gibson, C. B., & Birkinshaw, J. (2004). The Antecedents, Consequences, and Mediating Role of Organisational Ambidexterity. *The Academy of Management Journal*, *47*(2), 209-226.

Ginsberg, A., & Venkatraman, N. (1985). Contingency Perspectives of Organisational Strategy: A Critical Review of the Empirical Research. *The Academy of Management Review, 10*(3), 421-434.

Gitlow, H.S., Oppenheim, A.J., Oppenhein, R. & Levine, D.M. (2005). Quality Management (3rd ed.). Boston: McGraw Hill International Edition.

Gliem, J. A., & Gliem, R. R. (2003). Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-type Scales. Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.

Gonzales, F. J. M., & Palacios, T. M. B. (2002). The Effect of New Product Development Techniques on New Product Success in Spanish Firms. *Industrial Marketing Management, 31*, 261-271.

Gorsuch, R. L. (1983). *Factor Analysis* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Grant, R. M. (2003). Strategic Planning in a Turbulent Environment: Evidence from the Oil Majors. *Strategic Management Journal*, *24*(6), 491-517.

Greve, H. R. (2007). Exploration and Exploitation in Product Innovation. *Industrial and Corporate Change*, 1-31.

Griffin, A. (1997). PDMA Research on New Product Development Practices: Updating Trends and Benchmarking Best Practices. *Journal of Product Innovation Management, 14,* 429-458.

Griffin, A. (2002). Product Development Cycle Time for Business-to-Business Products. *International Marketing Management, 31*, 291-304.

Grobler, A. (2007). A Dynamic View on Strategic Resources and Capabilities Applied to an Example from the Manufacturing Strategy Literature. *Journal of Manufacturing Technology Management, 18*(3), 250-266.

Groover, M. P. (2007). *Fundamentals of Modern Manufacturing* (3rd ed.). New York, USA: John Wiley & Sons.

Grubbs, F. E. (1969). Procedures for Detecting Outlying Observations in Samples. *Technometrics, 11*(1), 1-21.

Gupta, A. K., Smith, K. G., & Shalley, C. E. (2006). The Interplay between Exploration and Exploitation. *Academy of Management Journal, 49*(4), 693–706.

Guttel, W. H., & Konlechner, S. W. (2010). *Dynamic Capability: On the Interplay between Routinized and Ad-hoc Change.* Paper presented at the Fourth International Conference on Organisational Routines 'Organisational Routines between Change and Stability: Linking Empirical Research to Recent Theoretical Debates', Nice, France.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1992). *Multivariate Data Analysis with Readings* (3rd ed.). New York: Macmillan Publishing Company.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate Data Analysis with Readings* (4th ed.). New Jersey: Prentice-Hall.

Hamburg, M. (1983). *Statistical Analysis for Decision Making* (3rd ed.). New York: Harcourt Brace Jovanovich, Inc.

Hamburg, M. (1987). *Statistical Analysis for Decision Making* (4th ed.). Florida: Harcourt Brace Jovanovich, Inc.

Hammond, S. (2006). Using Psychometric Tests. In G. M. Breakwell, S. Hammond, C. Fife-Schaw & J. A. Smith (Eds.), *Research Methods in Psychology* (3rd ed., pp. 182-209). London: SAGE Publications Ltd.

Harmancioglu, N., McNally, R. C., Calantone, R. J., & Durmusoglu, S. S. (2007). Your New Product Development (NPD) is only as good as Your Process: An Exploratory Analysis of New NPD Process Design and Implementation. *R&D Management, 37*(5), 399-424.

Harreld, J.B., O'Reilly, C. A., & Tushman, M. L. (2007). Dynamic Capabilities at IBM: Driving Strategy into Action. *California Management Review, 49*(4), 21-43.

He, Z.-L., & Wong, P.-K. (2004). Exploration vs. Exploitation: An Empirical Test of the Ambidexterity Hypothesis. *Organisation Science, 15*(4), 481-494.

Helfat, C. E. (1997). Know-How and Asset Complementarity and Dynamic Capability Accumulation: The Case of R&D. *Strategic Management Journal, 18*(5), 339-360.

Helfat, C. E., & Peteraf, M. A. (2003). The Dynamic Resource-based View: Capability Lifecycles. *Strategic Management Journal, 24*, 997-1010.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M. A., Singh, H., Teece, D. J., & Winter, S. G. (2007). *Dynamic Capabilities: Understanding Strategic Change in Organisations*. USA: Blackwell Publishing.

Hezri, A. A., & Hasan, M. N. (2006). Towards Sustainable Development? The Evolution of Environmental Policy in Malaysia. *Natural Resources Forum*, *30*, 37-50.

Hinkle, D. E., Wiersma, W., & Jurs, S. G. (2003). *Applied Statistics for the Behavioural Sciences* (5th ed.). Boston: Houghton Mifflin Company.

Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2005). *Strategic Management: Competitiveness and Globalization (Concepts and Cases)* (6th ed.). Ohio: Thomson South-Western.

Ho, Y.-C., & Tsai, T.-H. (2006). The Impact of Dynamic Capabilities with Market Orientation and Resource-Based Approaches on NPD Project Performance. *Journal of American Academy of Business*, *8*(1), 215-229.

Hoang, H., & Rothaermel, F. T. (2010). Leveraging Internal and External Experience: Exploration, Exploitation, and R&D Project Performance. *Strategic Management Journal, 31*, 734-758.

Hodge, V. J., & Austin, J. (2004). A Survey of Outlier Detection Methodologies. *Artificial Intelligence Review*, *22*(2), 85-126.

Hohenegger, J., Bufardi, A., & Xirouchakis, P. (2007). A New Concept of Compatibility Structure in New Product Development. *J. Adv. Eng. Informatics, 21*(1), 101-116.

Holmqvist, M. (2004). Experiential Learning Processes of Exploitation and Exploration within and between Organisations: An Empirical Study of Product Development. *Organisation Science, 15*(1), 70-81.

Iacobucci, D., & Duhachek, A. (2003). Advancing Alpha: Measuring Reliability with Confidence. *Journal of Consumer Psychology*, *13*(4), 478-487.

Ianchovichina, E., Ivanic, M., & Martin, W. (2010). The Growth of China and India: Implications and Policy Reform Options for Malaysia. *Asian-Pacific Economic Literature*, 117-141.

IMD (2011). *The World Competitiveness Scoreboard 2011*, IMD World Competitiveness Yearbook, Retrieved November 1, 2011, from http://www.imd.org/research/publications/wcy/upload/scoreboard.pdf

IMD (May 13, 2005). Press Release, *Publication: IMD World Competitiveness Yearbook 2005*, Retrieved November 1, 2011, from http://www.imd.org/about/pressroom/pressreleases/upload/PR-WCY2005.pdf

Indu, P. V., Remadevi, S., Vidhukumar, K., Anilkumar, T. V., & Subha, N. (2011). Development and Validation of the Domestic Violence Questionnaire in Married Women aged 18-55 Years. *Indian Journal of Psychiatry*, *53*(3), 218-223.

Ireland, R. D., & Webb, J. W. (2007). Strategic Entrepreneurship: Creating Competitive Advantage through Streams of Innovation. *Business Horizons*, *50*(1), 49-5

Ishikawa, A., Fujimoto, S., & Tomoyose, M. (2010). The Difference of Growth Rate Distributions between Sales and Profits. In *Journal of Physics: Conference Series* (Vol. 221, No. 1, p. 012007). IOP Publishing.

Islam, M. Z., Doshi, J. A., Mahtab, H., & Ahmad, Z. A. (2009). Team Learning, Top Management Support and New Product Development Success. *International Journal of Managing Projects in Business, 2*(2), 238-260.

Ittner, C. D., & Larcker, D. F. (1998). Are Nonfinancial Measures Leading Indicators of Financial Performance? An Analysis of Customer Satisfaction. *Journal of Accounting Research, 36*, 1-35.

Ittner, C. D., Larcker, D. F., & Meyer, M. W. (2003). Subjectivity and the Weighting of Performance Measures: Evidence from a Balanced Scorecard. *The Accounting Review*, *78*(3), 725-758.

Ittner, C. D., Larcker, D. F., & Randall, T. (2003). Performance Implications of Strategic Performance Measurement in Financial Services Firms. *Accounting, Organisations and Society, 28*, 715-741.

Jabar, J., Soosay, C., & Santa, R. (2011). Organisational Learning as an Antecedent of Technology Transfer and New Product Development: A Study of Manufacturing Firms in Malaysia. *Journal of Manufacturing Technology Management, 22*(1), 25-45.

Jacobson, R., & Aaker, D. A. (1987). The Strategic Role of Product Quality. *Journal of Marketing, 51*, 31-44.

Jajri, I., & Ismail, R. (2007). Technical Efficiency, Technological Change and Total Factor Productivity Growth in Malaysian Manufacturing Sector. *ICFAI Journal of Industrial Economics, 4*(4).

Jamaliah, W., & Zain, N. M. (1999). Propensity of Product Innovation in Malaysian Manufacturing Companies. *AAM Journal, 4*(1), 17-33.

Jansen, J. J. P., Bosch, F. A. J. V. d., & Volberda, H. W. (2005). Exploratory Innovation, Exploitative Innovation, and Ambidexterity: The Impact of Environmental and Organisational Antecedents. *Schmalenbach Business Review, 57*, 351-363.

Jansen, J. J. P., Bosch, F. A. J. V. d., & Volberda, H. W. (2006). Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organisational Antecedents and Environmental. *Management Science*.

Jansen, J. J. P., Tempelaar, M. P., Bosch, F. A. J. V. d., & Volberda, H. W. (2009). Structural Differentiation and Ambidexterity: The Mediating Role of Integration Mechanisms. *Organisation Science*, 1-15.

Jaruzelski, B., & Mainardi, C. R. (2011). *The World's 10 Most Innovative Companies, and How They Do It*, Retrieved October 25, 2011, from http://www.forbes.com/2011/04/04/10-top-innovative-companies-apple-google-leadership-managing-how.html

Jaworski, B. J., & Kohli, A. K. (1993). Market Orientation: Antecedents and Consequences. *Journal of Marketing, 57*, 53-70.

Jiang, Y., Cukic, B., & Menzies, T. (2008). *Can Data Transformation Help in the Detection of Fault-prone Modules?* Paper presented at the DEFECTS'08, Seattle, Washington.

Jolliffe, I. T. (2002). *Principal Component Analysis*. Springer: London.

JPM (June 11, 2014). *Monthly Manufacturing Statistics Malaysia, April 2014*, Jabatan Perangkaan Malaysia (JPM), Retrieved June 11, 2014, from http://www.statistics.gov.my/portal/images/stories/files/LatestReleases/mms/2014/MMS_Apr14BI.pdf

Julian, C. C., & Ahmed, Z. U. (2009). Doing Business in Malaysia. *Thunderbird International Business Review*, *51*(1), 53-69.

Kalpakjian, S., & Schmid, S. (2006). *Manufacturing Engineering and Technology* (5th ed.). Singapore: Prentice Hall.

Kaplan, R. S. (2008). Conceptual Foundations of the Balanced Scorecard. *Handbooks of Management Accounting Research*, *3*, 1253-1269.

Kaplan, R. S., & Norton, D. P. (2004). *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*. Boston: Harvard Business School Press.

Katila, R., & Ahuja, G. (2002). Something Old, Something New: A Longitudinal Study of Search Behaviour and New Product Introduction. *The Academy of Management Journal*, *45*(6), 1183-1194.

Katkalo, V. S., Pitelis, C. N., & Teece, D. J. (2010). Introduction: On the Nature and Scope of Dynamic Capabilities. *Industrial and Corporate Change*, *19*(4), 1175-1186.

Kauppila, O. P. (2010). Creating Ambidexterity by Integrating and Balancing Structurally Separate Interorganisational Partnerships. *Strategic Organisation*, *8*(4), 283-312.

Kay, N. M. (2010). Dynamic Capabilities as Context: The Role of Decision, System and Structure. *Industrial and Corporate Change*, *19*(4), 1205-1223.

Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good Practice in the Conduct and Reporting of Survey Research. *International Journal for Quality in Health Care, 15*(3), 261-266.

Kihn, L. (2005). Comparing Performance Measurement approaches in Accounting Research. *Liiketaloudellinen Aikakauskirja*, *2*, 143.

Kim, B., & Kim, J. (2009). Structural Factors of NPD (New Product Development) Team for Manufacturability. *International Journal of Project Management, 27*, 690-702.

Kim, J.-Y., Wong, V., & Eng, T.-Y. (2005). Product Variety Strategy for Improving New Product Development Proficiencies. *Technovation, 25*, 1001-1015.

Kim, N., & Atuahene-Gima, K. (2010). Using Exploratory and Exploitative Market Learning for New Product Development. *Journal of Product Innovation Management, 27*, 519-536.

Kloot, L. (1997). Organisational Learning and Management Control Systems: Responding to Environmental Change. *Management Accounting Research*, *8*(1), 47-73.

Kohli, A. K., & Jaworski, B. J. (1990). Market Orientation: The Construct, Research Propositions, and Managerial Implications. *Journal of Marketing, 54*, 1-18.

Kowang, T. O., Rasli, A., & Long, C. S. (2014). New Product Development in Malaysia: Does Organisational Background Really Matter? *Jurnal Teknologi*, *68*(3).

Krasnikov, A., & Jayachandran, S. (2008). The Relative Impact of Marketing, Research-and-Development, and Operations Capabilities on Firm Performance. *Journal of Marketing, 72*, 1-11.

Krishnan, V., & Ulrich, K. T. (2001). Product Development Decisions: A Review of the Literature. *Management Science, 47*(1), 1-21.

Kroll, M., Wright, P., & Heiens, R. A. (1999). The Contribution of Product Quality to Competitive Advantage: Impacts on Systematic Variance and Unexplained Variance in Returns. *Strategic Management Journal, 20*(4), 375-384.

Kusunoki, K., Nonaka, I., & Nagata, A. (1998). Organisational Capabilities in Product Development of Japanese Firms: A Conceptual Framework and Empirical Findings. *Organisation Science, 9*(6), 699-718.

Kylaheiko, K., & Sandstrom, J. (2007). Strategic Options-based Framework for Management of Dynamic Capabilities in Manufacturing Firms. *Journal of Manufacturing Technology Management, 18*(8), 966-984.

Kyriakopoulos, K., & Moorman, C. (2004). Tradeoffs on Marketing Exploitation and Exploration Strategies: The Overlooked Role of Market Orientation. *International Journal of Research in Marketing, 21*, 219-240.

Lam, A. (2004). Organisational Innovation (pp. 1-44). London.

Langerak, F., & Hultink, E. J. (2006). The Impact of Product Innovativeness on the Link between Development Speed and New Product Profitability. *Journal of Product Innovation Management, 23*, 203-214.

Latham, B. (2007). *Sampling: What is it?* Quantitative Research Methods. Retrieved July 3, 2014, from http://webpages.acs.ttu.edu/rlatham/Coursework/5377(Quant))/Sampling_Methodology_Paper.pdf

Latib, M. R. A. (2011). *Critical Success Factors in New Product Development: A Survey in Malaysian Manufacturing Industry* (Masters thesis, Universiti Utara Malaysia).

Lawson, B., & Samson, D. (2001). Developing Innovation Capability in Organisations: A Dynamic Capabilities Approach. *International Journal of Innovation Management*, *5*(3), 377-400.

Lazim, H. M. (2011). *Total Productive Maintenance (TPM) Practices and Manufacturing Performance: The Moderating Effect of Types of Production Processes* (Doctoral dissertation, Universiti Sains Malaysia).

Lee, C.-Y., Wu, H.-L., & Liu, C.-Y. (2012). Contextual Determinants of Ambidextrous Learning: Evidence from Industrial Firms in Four Industrialized Countries. *IEEE Transactions on Engineering Management*, 1-12.

Leonard-Barton, D. (1992). Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development. *Strategic Management Journal*, *13*, 111-125.

Levin, D. Z. (2000). Organisational Learning and the Transfer of Knowledge: An Investigation of Quality Improvement. *Organisation Science*, *11*(6), 630-647.

Levinthal, D. A., & March, J. G. (1993). The Myopia of Learning. *Strategic Management Journal*, *14*, 5-112.

Levinthal, D., & March, J. G. (1981). A Model of Adaptive Organisational Search. *Journal of Economic Behaviour and Organisation, 2*, 307-333.

Levitt, B., & March, J. G. (1988). Organisational Learning. *Annual Review of Sociology*, *14*, 319-340.

Li, C. R., Lin, C. J., & Chu, C. P. (2008). The Nature of Market Orientation and the Ambidexterity of Innovations. *Management Decision*, *46*(7), 1002-1026.

Li, C.-R., Chu, C.-P., & Lin, C.-J. (2010). The Contingent Value of Exploratory and Exploitative Learning for New Product Development Performance. *Industrial Marketing Management*, *39*, 1186-1197.

Li, Y., Vanhaverbeke, W., & Schoemakers, W. (2008). Exploration and Exploitation in Innovation: Reframing the Interpretation. *Creativity and Innovation Management*, *17*(2), 107-126.

Liao, J. J., Kickul, J. R., & Ma, H. (2009). Organisational Dynamic Capability and Innovation: An Empirical Examination of Internet Firms. *Journal of Small Business Management, 47*(3), 263-286.

Liao, S.-h., Fei, W.-C., & Liu, C.-T. (2008). Relationships between Knowledge Inertia, Organisational Learning and Organisational Innovation. *Technovation, 28*, 183-195.

Lichtenthaler, U. (2009). Absorptive Capacity, Environmental Turbulence, and the Complementarity of Organisational Learning Processes. *Academy of Management Journal, 52*(4), 822-846.

Lin, K.-H., & Peng, Y.-P. (2012). *The Influence of Organisational Capabilities on Organisational Tensions: An Ambidexterity Perspective.* Paper presented at the Academy of International Business Southeast Asia Regional Conference, Xiamen, China.

Litwin, M. S. (1995). *How to Measure Survey Reliability and Validity: Learning Objectives*. California: SAGE Publications, Inc.

Liu, W. (2006). Knowledge Exploitation, Knowledge Exploration, and Competency Trap. *Knowledge and Process Management, 13*(3), 144-161.

Loasby, B. J. (2010). Capabilities and Strategy: Problems and Prospects. *Industrial and Corporate Change, 19*(4), 1301-1316.

Loderer, C., & Waelchli, U. (2009). *Firm Age and Performance*, Retrieved November 13, 2011, from http://papers.ssrn.com/sol3/papers.cfm?abstract_id =1342248

Lukas, B. A., & Menon, A. (2004). New Product Quality: Intended and Unintended Consequences of New Product Development Speed. *Journal of Business Research, 57*, 1258-1264.

Luzon, M. D. M., & Pasola, J. V. (2011). Ambidexterity and Total Quality Management: Towards a Research Agenda. *Management Decision, 49*(6), 927-947.

MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On The Practice of Dichotomization of Quantitative Variables. *Psychological Methods, 7*(1), 19.

March, J. G. (1991). Exploration and Exploitation in Organisational Learning. *Organisation Science, 2*(1), 71-87.

Marsh, S. J., & Stock, G. N. (2003). Building Dynamic Capabilities in New Product Development through Intertemporal Integration. *The Journal of Product Innovation Management, 20*, 136–148.

Marsh, S. J., & Stock, G. N. (2006). Creating Dynamic Capability: The Role of Intertemporal Integration, Knowledge Retention, and Interpretation. *The Journal of Product Innovation Management, 23*(5), 422-436.

Martin, C. C. (2013). *Critical Success Factors for New Product Development in Hard Disc Drive Manufacturer in Malaysia*, Retrieved June 4, 2014, from http://razakschool.utm.my/wp-content/uploads/2014/03/CRITICAL-SUCCESS-FACTORS-FOR-NEW-PRODUCT-DEVELOPMENT-IN-HARD-DISC-DRIVE-MANUFACTURER-IN-MALAYSIA.pdf.

Mason, R. B. (2007). The External Environment's Effect on Management and Strategy: A Complexity Theory Approach. *Management Decision*, *45*(1), 10-28.

MASTIC (2011). *National Survey of Innovation 2002-2004*, Official Portal, Malaysian Science and Technology Information Centre (MASTIC), Retrieved October 25, 2011, from http://www.mastic.gov.my/servlets/sfs?s= TUx0VYoYVHasTvr0A&t=/contentManager/onStory&i=1108620651187&b=1108620651187&l=0&e=UTF-8&StoryID=1188464282562&ParentID= 1116297677695

Mat, A., & Razak, R. C. (2011). The Influence of Organisational Learning Capability on Success of Technological Innovation (Product) Implementation with

Moderating Effect of Knowledge Complexity. *Int. J. Bus. Soc. Sci, 2(17)*, 217-225.

Mat, N., & Jantan, M. (2009). Trust and Coordination in Cross-Functional New Product Development (NPD) Teams and the Effects on New Product Development Performance: The Malaysian Perspective. *International Journal of Management and Innovation*, *1*(2), 72-89.

Matsunaga, M. (2010). How to Factor-Analyse Your Data Right: Do's, Don'ts, and How-To's. *International Journal of Psychological Research, 3*(1), 97-110.

McGuire, J. B., Sundgren, A., & Schneeweis, T. (1988). Corporate Social Responsibility and Firm Financial Performance. *The Academy of Management Journal*, *31*(4), 854-872.

McNally, R. C., Cavusgil, E., & Calantone, R. J. (2010). Product Innovativeness Dimensions and Their Relationships with Product Advantage, Product Financial Performance, and Project Protocol. *Journal of Product Innovation Management, 27*, 991-1006.

Menguc, B., & Auh, S. (2006). Creating a Firm-level Dynamic Capability through Capitalizing on Market Orientation and Innovativeness. *Journal of the Academy of Marketing Science*, *34*(1), 63-73.

Menon, A., Chowdhury, J., & Lukas, B. A. (2002). Antecedents and Outcomes of New Product Development Speed: An Interdisciplinary Conceptual Framework. *Industrial Marketing Management, 31*, 317-328.

MIDA (2011). *Industries in Malaysia*, Official Website, Malaysian Investment Development Authority (MIDA), Retrieved October 25, 2011, from http://www.mida.gov.my/env3/index.php?page=industries-in-malaysia

Miller, D. (1987). The Structural and Environmental Correlates of Business Strategy. *Strategic Management Journal*, *8*(1), 55-76.

Millson, M. R., & Wilemon, D. (2008). Impact of New Product Development (NPD) Proficiency and NPD Entry Strategies on Product Quality and Risk. 491-509.

MITI (2011). *Investment in the Manufacturing and Services Sectors*, Ministry of International Trade and Industry (MITI), Retrieved October 25, 2011, from http://www.miti.gov.my/cms/documentstorage/com.tms.cms.document.Document_766a7ef5-c0a81573-2d952d95-a21d79d8/Chap%204.pdf

MITI (n.d.). *Manufacturing*, Ministry of International Trade and Industry (MITI), Retrieved June 11, 2014, from http://www.miti.gov.my/cms/content.jsp?id=com.tms.cms.section.Section_44b61991-c0a8156f-628f628f-841b8080

MITI (September 16, 2009). *Third Industrial Master Plan (IMP3)*, Ministry of International Trade and Industry (MITI), Retrieved November 1, 2011, from http://www.miti.gov.my/cms/content.jsp?id=com.tms.cms.section.Section_8ab58e8f-7f000010-72f772f7-dbf00272&rootid=com.tms.cms.section.Section_8ab4ec2a-7f000010-72f772f7-d6f41129

Mohamed, C. (2011). The Impact of Knowledge-based Economy on the Development of the Innovation in Services: Case of Algerian Banks and Insurance Companies. *IBIMA Business Review*, 1-9.

Mohammadjafari, M., Dawal, S. Z. M., Ahmed, S., & Zayandehroodi, H. (2011). Toward a Theoretical Concept of E-Collaboration through Project Management in SMEs for Reducing Time and Cost in New Product: A Review. *Journal of Applied Science, 11*(1), 174-182.

Mokhtar, S. S. M., & Yusof, R. Z. (2010). The Influence of Top Management Commitment, Process Quality Management and Quality Design on New Product Performance: A Case of Malaysian Manufacturers. *Total Quality Management, 21*(3), 291-300.

Molina-Castillo, F.-J., Jimenez-Jimenez, D., & Munuera-Aleman, J.-L. (2011). Product Competence Exploitation and Exploration Strategies: The Impact on New Product Performance through Quality and Innovativeness. *Industrial Marketing Management*.

Mom, T. J. M., Bosch, F. A. J. V. D., & Volberda, H. W. (2007). Investigating Managers' Exploration and Exploitation Activities: The Influence of Top-Down, Bottom-Up, and Horizontal Knowledge Inflows. *Journal of Management Studies*, *44*(6), 910-931.

Mom, T. J. M., Bosch, F. A. J. V. D., & Volberda, H. W. (2009). Understanding Variation in Managers' Ambidexterity: Investigating Direct and Interaction Effects of Formal Structural and Personal Coordination Mechanisms. *Organisation Science, 20*(4), 812-828.

Moorman, C. (1995). Organisational Market Information Processes: Cultural Antecedents and New Product Outcomes. *Journal of Marketing Research, 32*(3), 318-335.

MOSTI (2011). *National Innovation Model*, Majlis Inovasi Negara, Official Portal, Ministry of Science, Technology and Innovation (MOSTI), Retrieved October 25, 2011, from http://www.mosti.gov.my/mosti/images/pdf/innovation%20model%20jtpin.pdf

MOSTI (August 17, 2011). *Innofund*, Official Portal, Ministry of Science, Technology and Innovation (MOSTI), Retrieved October 25, 2011, from http://www.mosti.gov.my/mosti/index.php?option=com_content&task=view&id=1324&Itemid=510

MOSTI (August 8, 2011). *Technofund*, Official Portal, Ministry of Science, Technology and Innovation (MOSTI), Retrieved October 25, 2011, from http://www.mosti.gov.my/mosti/index.php?option=com_content&task=view&id=1325&Itemid=511

Nachar, N. (2008). The Mann-Whitney U: A Test for Assessing Whether Two Independent Samples Come from the Same Distribution. *Tutorials in Quantitative Methods for Psychology*, *4*(1), 13-20.

Nardi, P. M. (2003). *Doing Survey Research: A Guide to Quantitative Methods*. Boston: Pearson Education, Inc.

Neely, A. (2002). *Business Performance Measurement: Theory and Practice*. Cambridge: Cambridge University Press.

Nelson, R. R., & Winter, S. G. (1982). *An Evolutionary Theory of Economic Change*. Cambridge: Harvard University Press.

Ngui, K. S., Songan, P., & Hong, K. S. (2008). Organisational Learning Capability of Malaysia SMEs: Examining the Effects of Entrepreneurial Orientation and

Human-Capital Development Practices. *Journal of Information & Knowledge Management, 7*(4), 219-230.

Nicholas, T. (2012). *Technology, Innovation and Economic Growth in Britain since 1870* (No. 13-032). Harvard Business School Working Paper.

Nobeoka, K., & Cusumano, M. A. (1997). Multiproject Strategy and Sales Growth: The Benefits of Rapid Design Transfer in New Product Development. *Strategic Management Journal, 18*(3), 169-186.

Noymer, A. (2008). Alpha, Significance Level of Test. In P. Lavrakas (Editor), *Encyclopaedia of Survey Research Methods*. Thousand Oaks, CA: SAGE Publications.

Nugroho, G. (n.d.). An Overview of ASEAN States' RTA Strategy, Retrieved June 11, 2014, from http://www.kikou.waseda.ac.jp/wojuss/achievements/report/pdf/report_1/i2-3.pdf

Nunnally, J. C. (1978). *Psychometric Theory* (2nd ed.). New York: McGraw-Hill.

O'Connor, G. C. (2008). Major Innovation as a Dynamic Capability: A Systems Approach. *The Journal of Product Innovation Management, 25,* 313-330.

O'Reilly, C. A., & Tushman, M. L. (2004). The Ambidextrous Organisation. *Harvard Business Review*.

O'Reilly, C. A., & Tushman, M. L. (2008). Ambidexterity as a Dynamic Capability: Resolving the Innovator's Dilemma. *Research in Organisational Behaviour, 28,* 185-206.

O'Reilly, C. A., & Tushman, M. L. (2013). Organisational Ambidexterity: Past, Present, and Future. *The Academy of Management Perspectives (in press),* 1-30.

Omar, N., Sulaiman, S., Hui, W.S., Rahman, I. K. A., & Hamood, H. H. (2015). Target Costing Implementation and Organisational Capabilities: An Empirical Evidence of Selected Asian Countries. *Journal of Economics, Business and Management, 3*(2), 201-206.

Onwuegbuzie, A. J., & Johnson, R. B. (2006). The Validity Issue in Mixed Research. *Research in the Schools*, *13*(1), 48-63.

Osterlind, S. J. (2010). *Modern Measurement: Theory, Principles, and Applications of Mental Appraisal* (2nd ed.). Boston: Pearson Education, Inc.

Owens, J. D. (2007). Why do Some UK SMEs Still Find the Implementation of a New Product Development Process Problematical? An Exploratory Investigation. *Management Decision*, *45*(2), 235-251.

Ozer, M., & Cebeci, U. (2010). The Role of Globalization in New Product Development. *IEEE Transactions on Engineering Management, 57*(2), 168-180.

Page, A. L. (1993). Assessing New Product Development Practices and Performance: Establishing Crucial Norms. *Journal of Product Innovation Management, 10*, 273-290.

Page, A. L., & Schirr, G. R. (2008). Growth and Development of a Body of Knowledge: 16 Years of New Product Development Research, 1989-2004. *Journal of Product Innovation Management, 25,* 233-248.

Pallant, J. (2007). *SPSS Survival Manual* (3rd ed.). England: McGraw-Hill Education.

Park, H. S., Dailey, R., & Lemus, D. (2002). The use of Exploratory Factor Analysis and Principal Components Analysis in Communication Research. *Human Communication Research*, *28*(4), 562-577.

Patterson, M. L. (1998). From Experience: Linking Product Innovation to Business Growth. *Journal of Product Innovation Management*, *15*(5), 390-402.

Paul, R. K. (2006). *Multicollinearity: Causes, Effects and Remedies*, Retrieved June 8, 2014, from http://www.iasri.res.in/seminar/AS-299/ebooks%5C2005-2006%5CMsc%5Ctrim2%5C3.%20Multicollinearity%20Causes,Effects%2and%20Remedies-Ranjit.pdf

Pavlou, P. A., & Sawy, O. A. E. (2011). Understanding the Elusive Black Box of Dynamic Capabilities. *Decision Sciences, 42*(1), 239-273.

Pearl, J. (2009). Causal Inference in Statistics: An Overview. *Statistics Surveys*, *3*, 96-146.

PEMANDU (2011). *Overview of the National Key Economic Areas*, Economic Transformation Programme, Performance Management and Development Unit (PEMANDU), Retrieved October 25, 2011, from http://etp.pemandu.gov.my/Overview_of_NKEAs_-@-Overview_of_NKEAs.aspx

Pfaffenberger, R. C., & Patterson, J. H. (1981). *Statistical Methods: For Business and Economics* (Revised ed.). Illinois: Richard D. Irwin, Inc.

Ping, L. P., & Yean, T. S. (2007). Malaysia Ten Years after the Asian Financial Crisis. *Asian Survey, 47*(6), 915-929.

Pison, G., Rousseeuw, P. J., Filzmoser, P., & Croux, C. (2003). Robust Factor Analysis. *Journal of Multivariate Analysis, 84*, 145–172.

Pitelis, C. N., & Teece, D. J. (2010). Cross-border Market Co-creation, Dynamic Capabilities and the Entrepreneurial Theory of the Multinational Enterprise. *Industrial and Corporate Change, 19*(4), 1247-1270.

Porter, M. E. (2008). The Five Competitive Forces That Shape Strategy. *Harvard Business Review*, 1-18.

Price, I. (2000). *Determining if Skewness and Kurtosis are Significantly Non-normal*, Retrieved November 18, 2012, from http://www.une.edu.au/WebStat/unit_materials/c4_descriptive_statistics/determine_skew_kurt.html

Priem, R. L., Rasheed, A. M., & Kotulic, A. G. (1995). Rationality in Strategic Decision Processes, Environmental Dynamism and Firm Performance. *Journal of Management*, *21*(5), 913-929.

Protogerou, A., Caloghirou, Y., & Lioukas, S. (2012). Dynamic Capabilities and Their Indirect Impact on Firm Performance. *Industrial and Corporate Change*, *21*(3), 615-647.

Rahaman, M. N. A., & Muhamad, M. R. (2004). The Winning New Product Strategy: Market or Technology Driven?. In *IEEE International Engineering Management Conference*.

Raisch, S., & Birkinshaw, J. (2008). Organisational Ambidexterity: Antecedents, Outcomes, and Moderators. *Journal of Management, 34*(3), 375-409.

Raisch, S., Birkinshaw, J., Probst, G., & Tushman, M. L. (2009). Organisational Ambidexterity: Balancing Exploitation and Exploration for Sustained Performance. *Organisation Science, 20*(4), 685-695.

Ramasamy, B., & Yeung, M. (2007). Malaysia - Trade Policy Review 2006. *The World Economy*, 1193-1208.

Ramaseshan, B., Caruana, A., & Pang, L. S. (2002). The Effect of Market Orientation on New Product Performance: a Study among Singaporean Firms. *Journal of Product & Brand Management*, *11*(6), 399-409.

Ramayah, T., Sulaiman, M., Jantan, M., & Ching, N. G. (2004). Organisational Learning, Proprietary Technology, and Manufacturing Performance: A Glimpse from the Malaysian Manufacturing Firms. *International Journal of Innovation and Incubation*, *1*(1), 63-90.

Rattray, J., & Jones, M. C. (2007). Essential Elements of Questionnaire Design and Development. *Journal of Clinical Nursing*, *16*(2), 234-243.

Rauniar, R., Doll, W., Rawski, G., & Hong, P. (2008). The Role of Heavyweight Product Manager in New Product Development. *International Journal of Operations & Production Management*, *28*(2), 130-154.

Razali, N. M., & Wah, Y. B. (2011). Power Comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors, and Anderson-Darling Tests. *Journal of Statistical Modelling and Analytics*, *2*(1), 21-33.

Richard, P. J., Devinney, T. M., Yip, G. S., & Johnson, G. (2009). Measuring Organisational Performance: Towards Methodological Best Practice. *Journal of Management*, *35*(3), 718-804.

Rijsdijk, S. A., Langerak, F., & Hultink, E. J. (2011). Understanding a Two-Sided Coin: Antecedents and Consequences of a Decomposed Product Advantage. *Journal of Product Innovation Management, 28*, 33-47.

RMK-10 (2010). Rancangan Malaysia ke-10. *Unit Perancang Ekonomi, Jabatan Perdana Menteri,* Retrieved May 28, 2014, from http://www.pmo.gov.my/dokumenattached/RMK/RMK10_Mds.pdf.

Robbins, P., & O'Gorman, C. (2014). *How having an innovation strategy and process can improve NPD outcomes for Irish SME's*, Retrieved June 5, 2014, from http://ispim.org/files/2014_dublin_proceedings/575622400_Paper.pdf

Rodan, S. (2005). Exploration and Exploitation Revisited: Extending March's Model of Mutual Learning. *Scandinavian Journal of Management*, *21*(4), 407-428.

Roper, S. (1999). Under-reporting of R&D in Small Firms: The Impact on International R&D Comparisons. *Small Business Economics*, *12*(2), 131-135.

Rosli, M. M. (2012). Competitive Strategy of Malaysian Small and Medium Enterprises: An Exploratory Investigation. *American International Journal of Contemporary Research*, *2*(1), 93-105.

Rosli, M. M., & Sidek, S. (2013). Innovation and Firm Performance: Evidence from Malaysian Small and Medium Enterprises. *Entrepreneurship Vision 2020: Innovation, Development Sustainability, and Economic Growth*, 794-809.

Rothaermel, F. T., & Alexandre, M. T. (2009). Ambidexterity in Technology Sourcing: The Moderating Role of Absorptive Capacity. *Organisation Science, 20*(4), 759–780.

Rothaermel, F. T., & Deeds, D. L. (2004). Exploration and Exploitation Alliances in Biotechnology: A System of New Product Development. *Strategic Management Journal, 25*, 201-221.

Royston, P. (1982). An Extension of Shapiro and Wilk's W Test for Normality to Large Samples. *Journal of the Royal Statistical Society. Series C (Applied Statistics), 31*(2), 115-124.

Royston, P. (1995). Remark AS R94: A Remark on Algorithm AS 181: The W-test for Normality. *Journal of the Royal Statistical Society. Series C (Applied Statistics), 44*(4), 547-551.

Rugman, A. M., & Verbeke, A. (2002). Edith Penrose's Contribution to the Resource-Based View of Strategic Management. *Strategic Management Journal*.

Saban, K., Lanasa, J., Lackman, C., & Peace, G. (2000). Organisational Learning: A Critical Component to New Product Development. *Journal of Product & Brand Management, 9*(2), 99-119.

Sabherwal, R., Hirschheim, R., & Goles, T. (2001). The Dynamics of Alignment: Insights from a Punctuated Equilibrium Model. *Organisation Science, 12*(2), 179-197.

Salant, P., & Dillmant, D. A. (1994). *How to Conduct Your Own Survey*. New York: John Wiley & Sons.

Salomo, S., Talke, K., & Strecker, N. (2008). Innovation Field Orientation and Its Effect on Innovativeness and Firm Performance. *Journal of Product Innovation Management, 25*, 560-576.

Schoonhoven, C. B. (1981). Problems with Contingency Theory: Testing Assumptions Hidden within the Language of Contingency “Theory”. *Administrative Science Quarterly, 26*(3), 349-377.

Schudy, C. A. J. (2010). *Contextual Ambidexterity in Organisations: Antecedents and Performance Consequences* (Doctoral dissertation, The University of St. Gallen, Bamberg).

Segerstrom, P. S. (1991). Innovation, Imitation, and Economic Growth. *Journal of Political Economy,* 807-827.

Sekaran, U. (2003). *Research Methods for Business: A Skill Building Approach* (4th ed.). New York: John Wiley & Sons.

Shamshurin, A. (2011). *Beyond Lean Manufacturing: The Productivity, Innovator's and Productivity Dilemmas Resolved* (Doctoral dissertation, RMIT University).

Sharma, S., Durand, R. M., & Gur-Arie, O. (1981). Identification and Analysis of Moderator Variables. *Journal of Marketing Research*, 291-300.

Sharpe, A., & Currie, I. (2008). *Competitive Intensity as Driver of Innovation and Productivity Growth: A Synthesis of the Literature* (No. 2008-03). Centre for the Study of Living Standards.

Shlens, J. (2005). A Tutorial on Principal Component Analysis. *Systems Neurobiology Laboratory, University of California at San Diego*, *82*.

Shrivastava, P. (1983). A Typology or Organisational Learning Systems. *Journal of Management Studies, 20*(1), 7-28.

Sian, F., Chuan, S., Kai, B., Chen, S., & Chen, B. (2010). Culture and Consumer Behaviour: Comparisons between Malays and Chinese in Malaysia. *International Journal of Innovation, Management and Technology*, *1*(2), 180-185.

Sijtsma, K. (2009). On the Use, the Misuse, and the Very Limited Usefulness of Cronbach's Alpha. *Psychometrika, 74*(1), 107-120.

Sim, J., & Arnell, P. (1993). Measurement Validity in Physical Therapy Research. *Physical Therapy, 73*(2), 102-110.

Simsek, Z., Heavey, C., Veiga, J. F., & Souder, D. (2009). A Typology for Aligning Organisational Ambidexterity's Conceptualizations, Antecedents, and Outcomes. *Journal of Management Studies, 46*(5), 864-894.

Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing Firm Resources in Dynamic Environments to Create Value: Looking Inside the Black Box. *Academy of Management Review, 32*(1), 273-292.

SMECorp (September 24, 2013). *SME Annual Report 2012/13: Embracing Changes*, National SME Development Council, Retrieved June 11, 2014, from http:// www.smecorp.gov.my/vn2/sites/default/files/chapter%202_2.pdf

Smith, G. F. (2000). Too Many Types of Quality Problems: Categorizing Your problems in Solution Relevant Ways. *Quality Progress*, 43-49.

Song, M., & Montoya-Weiss, M. M. (2001). The Effect of Perceived Technological Uncertainty on Japanese New Product Development. *The Academy of Management Journal*, *44*(1), 61-80.

Song, X. M, Montoya-Weiss, M. M., & Schmidt, J. B. (1997). Antecedents and Consequences of Cross-Functional Cooperation: A Comparison of R&D, Manufacturing, and Marketing Perspectives. *Journal of Product Innovation Management, 14*(1), 35-47.

Song, X. M., & Montoya-Weiss, M. M. (1998). Critical Development Activities for Really New versus Incremental Products. *Journal of Product Innovation Management, 15*, 124-135.

Sorensen, J. B., & Stuart, T. E. (2000). Aging, Obsolescence, and Organisational Innovation. *Administrative Science Quarterly*, *45*(1), 81-112.

Sounder, W. E., Sherman, J. D., & Davies-Cooper, R. (1998). Environmental Uncertainty, Organisational Integration, and New Product Development Effectiveness: A Test of Contingency Theory. *Journal of Product Innovation Management, 15*, 520-533.

Spanjol, J., Qualls, W. J., & Rosa, J. A. (2011). How Many and What Kind? The Role of Strategic Orientation in New Product Ideation. *Journal of Product Innovation Management, 28*(2), 236-250.

Stoop, I., Billiet, J., Koch, A., & Fitzgerald, R. (2010). *Improving Survey Response: Lessons Learned from the European Social Survey*. United Kingdom: John Wiley & Sons Ltd.

Sturgis, P. (2006). Surveys and Sampling. In G. M. Breakwell, S. Hammond, C. Fife-Schaw & J. A. Smith (Eds.), *Research Methods in Psychology* (3rd ed., pp. 104-121). London: SAGE Publications Ltd.

Suhr, D. D. (2006). *Exploratory or Confirmatory Factor Analysis?* Retrieved August 12, 2012, from http://www2.sas.com/proceedings/sugi31/200-31.pdf

Swink, M., Talluri, S., & Pandejpong, T. (2006). Faster, Better, Cheaper: A Study of NPD Project Efficiency and Performance Tradeoffs. *Journal of Operations Management, 24*, 542-562.

Tabachnick, B. G., & Fidell, l. S. (1989). *Using Multivariate Statistics* (2nd ed.). New York: Harper Collins Publishers, Inc.

Tabachnick, B. G., & Fidell, l. S. (2007). *Using Multivariate Statistics* (5th ed.). Boston: Pearson/Allyn & Bacon.

Tajudin, M. M., Musa, O., & Musa, N. C. (2012). Effects of Organisational Culture, Market Orientation, and Innovativeness toward New Product Performance amongst Malaysian SMEs. *International Journal of Innovation and Business Strategy, 1*, 24-48.

Takeuchi, H., & Nonaka, I. (1986). The New New Product Development Game. *Harvard Business Review*, 137-146.

Tan, C. L., & Nasurdin, A. M. (2010). Knowledge Management Effectiveness and Technological Innovation: An Empirical Study in the Malaysian Manufacturing Industry. *Journal of Mobile Technologies, Knowledge and Society*, 1-13.

Tan, J., Li, S., & Li, W. (2006). Building Core Competencies in a Turbulent Environment: An Exploratory Study of Firm Resources and Capabilities in Chinese Transitional Economy. *Managing Global Transitions, 4*(3), 197–214.

Taylor, A., & Helfat, C. E. (2009). Organisational Linkages for Surviving Technological Change: Complementary Assets, Middle Management, and Ambidexterity. *Organisation Science, 20*(4), 718–739.

Teddlie, C., & Yu, F. (2007). Mixed Methods Sampling: A Typology with Examples. *Journal of Mixed Methods Research, 1*(1), 77-100.

Teece, D. J. (1998). Capturing Value from Knowledge Assets: The New Economy, Markets for Know-How, and Intangible Assets. *California Management Review, 40*(3), 55-79.

Teece, D. J. (2007). Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance. *Strategic Management Journal*.

Teece, D. J. (2009). *Dynamic Capabilities and Strategic Management: Organising for Innovation and Growth*. New York: Oxford University Press.

Teece, D. J. (2010). Business Models, Business Strategy and Innovation. *Long Range Planning*, *43*(2), 172-194.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, *18*(7), 509-533.

Teece, D., & Pisano, G. (1994). *The Dynamic Capabilities of Firms: An Introduction* (Working Paper). Laxenburg: International Institute for Applied Systems Analysis.

Tempelaar, M. P. (2010). *Organising for Ambidexterity: Studies on the Pursuit of Exploration and Exploitation through Differentiation, Integration, Contextual* *and Individual Attributes* (No. EPS-2010-191-STR). Erasmus Research Institute of Management (ERIM).

Tether, B. S. (2003). *What is Innovation? Approaches to Distinguishing New Products and Processes from Existing Products and Processes*. Centre for Research on Innovation and Competition, University of Manchester.

Tinoco, J. K. (2009). Strategic Ambidexterity in Innovation: an Indispensable Capability in the Face of Change. In *Science and Innovation Policy, 2009 Atlanta Conference on Science and Innovation Policy* (pp. 1-8). IEEE.

Torun, H., & Cicekci, C. (2007). Innovation: Is the Engine for the Economic Growth? *The Faculty of Economics and Administrative Sciences, Ego University, Izmir*.

Tripsas, M. (1997). Unravelling the Process of Creative Destruction: Complementary Assets and Incumbent Survival in the Typesetter Industry. *Strategic Management Journal*, *18*, 119-142.

Tsang, E. W. K., & Williams, J. N. (2012). Generalization and Induction: Misconceptions, Clarifications, and a Classification of Induction. *MIS Quarterly*, *36*(x), 1/Forthcoming 2012.

Tuah, H., Nadaraja, D., & Jaafar, Z. (2009). *Benchmarking Malaysia's Innovation Capacity*, Retrieved April 24, 2013, from http://umconference.um.edu.my /upload/43-1/papers/213%20HamriTuah_DevendranNadaraja_ZakiahJaafar .pdf

Tushman, M. L., & O'Reilly, C. A. (1996). Ambidextrous Organisations: Managing Evolutionary and Revolutionary Change. *California Management Review*, *38*(4), 8-30.

Tushman, M., Smith, W., Wood, R., Westerman, G., & O'Reilly, C. (2002). *Innovation Streams and Ambidextrous Organisational Designs: On Building Dynamic Capabilities* (Social Science Research Network (SSRN) Working Paper).

Utterback, J. M. (1971). The Process of Technological within the Firm. *The Academy of Management Journal, 14*(1), 75-88.

Venkatraman, N., Lee, C.-H., & Iyer, B. (2007). *Strategic Ambidexterity and Sales Growth: A Longitudinal Test in the Software Sector*, Retrieved November 13, 2011, from http://www.softwareecosystems.com/SMJManuscript_revised.pdf

Verona, G. (1999). A Resource-Based View of Product Development. *The Academy of Management Review, 24*(1), 132-142.

Verworn, B., Herstatt, C., & Nagahira, A. (2008). The Fuzzy Front End of Japanese New Product Development Projects: Impact on Success and Differences between Incremental and Radical Projects. *R&D Management, 38*(1), 1-19.

Veryzer, R. W. (1998). Discontinuous Innovation and the New Product Development Process. *Journal of Product Innovation Management, 15*(4), 304-321.

Visser, M. d., Weerd-Nederhof, P. d., Faems, D., Song, M., Looy, B. v., & Visscher, K. (2010). Structural Ambidexterity in NPD Processes: A Firm-Level Assessment of the Impact of Differentiated Structures on Innovation Performance. *Technovation, 30*, 291-299.

Voss, G. B., & Voss, Z. G. (2013). Strategic Ambidexterity in Small and Medium-sized Enterprises: Implementing Exploration and Exploitation in Product and Market Domains. *Organization Science, 24*(5), 1459-1477.

Wang, C. L., & Ahmed, P. K. (2007). Dynamic Capabilities: A Review and Research Agenda. *International Journal of Management Reviews, 9*(1), 31-51.

Wang, K. J., Lee, Y. H., Wang, S., & Chu, C. P. (2009). Performance Evaluation of Resource Allocation Strategies for New Product Development under Different Workload Scenarios. *Journal of Modelling in Management*, *4*(2), 91-113.

Webb, B., & Schlemmer, F. (2008). *Information Technology and Competitive Advantage in Small Firms*. New York: Routledge.

Wei, X., & Xiaobin, F. (2009). *Research on the Relationship between Organisational Learning, Product Innovativeness and Product Quality.* Paper presented at the 2009 International Conference on Information management, Innovation Management and Industrial Engineering.

Weinstein, O., & Azoulay, N. (1999). *Firms' Capabilities and Organisational Learning: A Critical Survey of Some Literature,* Retrieved November 13, 2011, from http://www.lem.sssup.it/Dynacom/files/D10_0.pdf

Wernerfelt, B. (1984). A Resource-Based View of the Firm. *Strategic Management Journal, 5*, 171-180.

Wheelwright, S. C. & Clark, K. B. (1992). *Revolutionizing Product Development: Quantum Leaps in Speed, Efficiency, and Quality*. Simon and Schuster.

Wind, W., & Mahajan, V. (1997). Issues and Opportunities in New Product Development: An Introduction to the Special Issues. *Journal of Marketing Research, XXXIV*, 1-12.

Winter, S. G. (2003). Understanding Dynamic Capabilities. *Strategic Management Journal, 24*, 991-995.

Workman, J. P., Homburg, C., & Jensen, O. (2003). Intraorganisational Determinants of Key Account Management Effectiveness. *Journal of the Academy of Marketing Science*, *31*(1), 3-21.

WTO (2011). *International Trade Statistics 2011*, World Trade Organisation (WTO), Retrieved November 1, 2011, from http://www.wto.org/english/res_e/statis_e/its2011_e/its2011_e.pdf

Wu, L.-Y. (2006). Resources, Dynamic Capabilities and Performance in a Dynamic Environment: Perceptions in Taiwanese IT Enterprises. *Information & Management, 43*, 447-454.

Wu, L.-Y. (2010). Applicability of the Resource-Based and Dynamic-Capability Views under Environmental Volatility. *Journal of Business Research, 63*, 27-31.

Yahaya, S.-Y., & Abu-Bakar, N. (2007). New Product Development Management Issues and Decision-making Approaches. *Management Decision, 45*(7), 1123-1142.

Yahya, A. Z., Othman, M. S., Othman, A. S., Rahman, I. A., & Moen, J. A. (2011). Process Innovation: a Study of Malaysian Small Medium Enterprises (SMEs). *World J. Manage*, *3*(1), 146-156.

Yalcinkaya, G., Calantone, R. J., & Griffith, D. A. (2007). An Examination of Exploration and Exploitation Capabilities: Implications for Product Innovation and Market Performance. *Journal of International Marketing, 15*(4), 63-93.

Yuan, K. H., & Zhang, Z. (2012). Structural Equation Modeling Diagnostics using R Package semdiag and EQS. *Structural Equation Modeling: A Multidisciplinary Journal, 19*(4), 683-702.

Zaaimuddin, W. A. b. W., Gan, G. G. G., & Eze, U. C. (2009). *Knowledge Management Process and New Product Development Performance in a Malaysian Research and Development Organisation.* Paper presented at the 2009 IEEE IEEM.

Zack, M. H. (1999). Developing a Knowledge Strategy. *California Management Review, 41*(3).

Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and Dynamic Capabilities: A Review, Model and Research Agenda. *Journal of Management Studies, 43*(4), 917-955.

Zechmeister, E. B., & Posavac, E. J. (2003). *Data Analysis and Interpretation in the Behavioural Sciences*. California: Wadsworth/Thomson Learning.

Zeufack, A. G., Yoong, L. K., & Nadaraja, D. (2011). *Knowledge, Innovation and Long-run Growth*. Khazanah Research and Investment Strategy Macro Modeling Project, Retrieved June 5, 2014, from http://www.innovation.my/ pdf/innovating_formulation_of_nis/Knowledge%20Innovation%20Growth.pdf

Zhou, K. Z., & Li, C. B. (2010). How Strategic Orientations Influence the Building of Dynamic Capability in Emerging Economies. *Journal of Business Research, 63*, 224-231.

Zhou, K. Z., & Wu, F. (2010). Technological Capability, Strategic Flexibility, and Product Innovation. *Strategic Management Journal, 31*, 547-561.

Zhou, K. Z., Yim, C. K., & Tse, D. K. (2005). The Effects of Strategic Orientations on Technology- and Market-based Breakthrough Innovations. *Journal of Marketing*, *69*(2), 42-60.

Zirger, B. J., & Maidique, M. A. (1990). A Model of New Product Development: An Empirical Test. *Management Science, 36*(7), 867-883.

Zollo, M., & Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organisation Science, 13*(3), 339-351.

Zulkiffli, S. (2009). *A Literature Analysis on the Supply Chain Operational Capabilities in Malaysian Small and Medium Enterprises (SMEs)*, 3rd International Conference on Operations and Supply Chain Management (pp. 1-13). Malaysia: ISMSEM, Retrieved June 5, 2014, from http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1027&context=gsbpapers