WORKPLACE INNOVATION AND NEW PRODUCT DEVELOPMENT IN VIETNAMESE MANUFACTURING SMALL AND MEDIUM-SIZED ENTERPRISES

A thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

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Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Signed: ____________________

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List of Abbreviations

AVE	average variance explained
BCHEAN	Business College Human Ethics Advisory Network
CFA	confirmatory factor analysis
CFI	comparative fit index
CMIN/DF	normed chi-square
CR	composite reliability
DCV	dynamic capabilities view
EFA	exploratory factor analysis
FDI	foreign direct investment
FFE	fuzzy front end
GDP	Gross Domestic Product
GOF	Goodness-of-fit
HASMEA	Hanoi Small and Medium-sized Enterprises Association
HPWS	high-performance work system
HRM	human resource management
IFI	incremental fit index
IPIC	incremental product innovation capability
ML	maximum likelihood
MI	modifications indices
NPD	new product development
PDMA	Product Development and Management Association
PLS	partial least squares
RBV	resource-based view
R&D	research and development
RMSEA	root mean square error of approximation
RPIC	radical product innovation capability
RQ	research question

SD	standard deviation
SEM	structural equation modelling
SMEs	small and medium-sized enterprises
SRMR	standardised root mean square residual
TIC	technological innovation capabilities
VCCI	Vietnam Chamber of Commerce and Industry
WI	workplace innovation
WIS	Workplace Innovation Scale

Definition of Key Terms

Workplace innovation: a psychological construct that is contextual and a process of idea generation created by an individual or team within the workplace and is fostered through an innovative climate (McMurray and Dorai, 2003, p. 8).

New product development capability: the firm's capacity of developing and adapting new products able to satisfy market needs (Adler and Shenhar, 1990).

New product development process: a disciplined and defined set of tasks and steps that describe the normal means by which a company repetitively converts embryonic ideas into salable products or services (Kahn, 2012, p. 458).

New product development strategic planning: the process of establishing the vision, mission, values, long-term direction, goals and strategies of developing a new product in the future (developed by this researcher).

New product development resource allocation: the process of distributing required resources to complete the development of a new product (developed by this researcher).

New product development performance: the degree to which a new product and/or service has achieved its market share, sales, rates of asset return, rates of investment return and profit objectives (Atuahene-Gima and Ko, 2001, p. 58).

New product development success: a product that meets its goals and performance expectations (Kahn, 2012, p. 471).

Abstract

Workplace innovation (WI) and new product development (NPD) is essential for organisations to ensure their market positioning. Vietnam is at the starting point of innovation. The purpose of this thesis is to gain a better understanding of senior management practices in NPD projects in the Vietnamese manufacturing industry and the status of the NPD process, strategic planning, resource allocation and success measure in Vietnamese manufacturing small and medium-sized enterprises (SMEs); identify NPD success factors in Vietnamese manufacturing SMEs at the project level; investigate the relationship between WI, NPD capability, strategic planning and performance in Vietnamese manufacturing SMEs at the project level; and determine the moderating effect of two groups (manager and employee) on the relationship between WI, NPD capability and NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs. A total of 795 questionnaires were sent to manufacturing SMEs in Hanoi, with a response rate of 42.77% yielding 340 usable responses. Using IBM SPSS AMOS (v.25) software (hereafter AMOS) to test the research model of the relationship between WI, NPD capability, NPD strategic planning and NPD performance, the findings confirmed the simultaneous relationship between WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs at the project level. This thesis makes a significant contribution to the field of WI and NPD research from both theoretical and practical perspectives. Theoretically, this thesis contributes to the existing literature in the field of WI and NPD in organisations by 1) integrating the framework of contingency theory, the dynamic capability view and resource-based view theory in the study of the relationship between WI, NPD capability, NPD strategic planning and NPD performance; 2) developing a validated conceptual framework for examining the relationship between WI, NPD capability,

NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs; 3) observing a difference of perspective on the relationship between employee and managers, with the thesis findings confirming for the first time the simultaneous relationship between WI, NPD capability, NPD strategic planning and NPD performance, thereby expanding the contingency theory (Miller and Friesen, 1983) to a new environment–capability–strategic planning–performance paradigm; and 4) recognition of moderating effect of manager and employee on WI and NPD capability. Practically, the findings enhance current understanding of senior management practices in NPD projects and NPD success factors within Vietnamese manufacturing SMEs and discuss for the first time NPD process, strategic planning, resource allocation and success measures in Vietnamese manufacturing SMEs. These results are hugely beneficial, for manufacturing SMEs in Vietnam in particular and for other industries and countries in general, in assisting successful NPD.

Chapter 1: Introduction

One of the most active and important contributors to innovation in Vietnam is the manufacturing industry. It is well known that innovation has played a significant role in economic growth (Porter, 1990). In terms of profitability, sales growth, exports and employment growth, it is obvious that innovative firms have better performance than non-innovative firms (Evanschitzky, 2012). Therefore, innovation is crucial to the survival and prosperity of the Vietnamese manufacturing sector.

The manufacturing sector plays a crucial role in the Vietnam economy. In 2017, the growth rate of Vietnam's Gross Domestic Product (GDP) reached 6.81%, the highest in the last six years. The contribution from the manufacturing sector was 12.9% higher than in the previous year (General Statistics Office of Vietnam, 2018). The manufacturing sector is consistently increasing its contribution to GDP. This trend shows that the business environment in Vietnam is markedly improving and the manufacturing sector has attracted many foreign investors. According to the Ministry of Planning and Investment (2017), in 2017 the manufacturing sector attracted the highest portion of foreign direct investment (FDI), 44.2% or USD 15.87 billion. As of mid-2018, USD 186.1 billion of FDI has made into the manufacturing sector, representing 58.4% of the total FDI in Vietnam. Innovation is crucial to renewing the Vietnamese manufacturing sector.

There has been extensive research on innovation management, particularly workplace innovation (WI) and new product development (NPD). WI literature is mature and has attracted the most interest from policymakers and public policy researchers from Northern Europe. At the national level, it was considered a main driver of economic growth (Dhondt et al., 2014). In business, it has been studied in the fields of organisational and human resource management (HRM). From a psychological behaviour perspective, WI is determined as an examination of the level of innovation in the organisation such as organisational innovation, innovation climate, individual innovation and team innovation (McMurray and Dorai, 2003). NPD literature mainly focuses on NPD activities, performance and success factors (Cooper, 2014; Calantone et al., 2003; Cooper and Kleinschmidt, 1993b). According to the literature, there are several key factors that affect the success of NPD at the project (Cooper and Kleinschmidt, 2000) and company level (Cooper and Kleinschmidt, 2007). However, these two main streams of innovation studies have so far been conducted in parallel, with little empirical research integrating them. Further, there has been no research investigating the relationship between WI and NPD in Vietnamese manufacturing small and medium-sized enterprises (SMEs).

1.1 Research Objectives

The aim of this thesis is to:

- gain a better understanding of senior management practices in NPD projects in the Vietnamese manufacturing industry
- identify NPD success factors in Vietnamese manufacturing SMEs at the project level
- investigate the relationship between WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs at the project level.
- investigate the moderating effect of two groups (manager and employee) on this relationship

By considering these four aspects, this thesis will enrich our knowledge on the role of innovative behaviours of both staff and leaders in enhancing the success of NPD projects and provide valuable insights for both scholars and practitioners. The next section will address the research questions (RQs) employed.

1.2 Research Questions

The following RQs guide this thesis:

RQ1: What are the NPD processes, strategic planning, resource allocation and success measures in Vietnamese manufacturing SMEs?

RQ2: What are the NPD success factors in Vietnamese manufacturing SMEs?

RQ3: What is the relationship between WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs?

RQ4: To what extent does the specified model representing the impact of WI, NPD capability and NPD strategic planning on NPD performance fit the data gathered from Vietnamese manufacturing SMEs?

RQ5: To what extent do two groups (manager and employee) moderate the specified model representing the effect of WI, NPD capability and NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs?

The next section covers the thesis mode overview and structure of this thesis.

1.3 Thesis Mode Overview

The thesis utilises a quantitative approach to examine the senior management practices in NPD projects, identify NPD success factors and investigate the relationship between WI, NPD capability, NPD strategic planning and NPD performance in the context of Vietnamese manufacturing SMEs at the project level. The quantitative analysis primarily aims to answer the RQs (see Section 1.2) and examine the hypotheses (see Section 3.3) by utilising a questionnaire survey targeting leaders and non-leaders of SMEs in Vietnam. Existing and empirically-developed survey instruments will be used for all constructs—WI, NPD capability, NPD process, NPD strategic planning, NPD resource allocation, NPD success and NPD performance.

1.3.1 Conceptual Model Development

The background knowledge and theoretical framework are built based on the critical review of the literature on WI, NPD capability, NPD strategic planning and NPD performance. A conceptual model will be developed to address the RQs based on the understanding obtained from the literature review. A set of hypotheses will be developed from the review of previous empirical studies' outcomes reasonably connected to the model's constructs. The conceptual model will consist of four constructs connected to three main hypothesised associations.

1.3.2 Quantitative Analysis

A quantitative approach is utilised to tackle the RQs and evaluate the formulated hypotheses. The data for the quantitative analysis is obtained from 323 respondents in both management and non-management positions in SMEs in Vietnam.

Firstly, descriptive statistics will be employed to ensure that the resultant data is consistent with multivariate analysis and can be used as one data set. Then, various analysis techniques such as frequency analysis, descriptive analysis, Cronbach's alpha, t-test and confirmatory factor analysis (CFA) will be carried out for all model constructs to specify scale reliability and reveal suitable factor structures, which confirm the validity of the model constructs. Once model constructs are established, the statistically significant associations between the model constructs will be revealed and examined by utilising structural equation modelling (SEM).

1.4 Thesis Structure

An overview of this thesis is provided to assist and guide the reader in following how the thesis has been created and planned before in-depth review and explanation of the research chapters are provided.

Chapter 1 details the background of the thesis, research objectives and questions (Sections 1.1 and 1.2), thesis mode overview (Section 1.3), thesis structure (Section 1.4) and contribution and significance of the findings (Section 1.5).

Chapter 2 presents a review of the literature to provide background information on the conceptualisation and measurement of WI, NPD capability, NPD process, NPD resource allocation, NPD strategic planning, NPD success and NPD performance. This chapter also identifies NPD success factors.

Chapter 3 presents a theoretical framework and a literature review of the relationships between WI, NPD capability, NPD strategic planning and NPD performance which forms the conceptual framework and the hypotheses of the testing model. The study's hypotheses are formulated in this chapter.

Chapter 4 describes the research methodology, outlining the research paradigm, methodology and method utilised in the empirical research to justify the purposes of the thesis, answer the RQs and test the hypotheses. This chapter also explains the primary context, sampling, data collection technique and analysis method for the quantitative method approach.

Chapter 5 presents the analysis results of senior management in NPD projects in Vietnamese manufacturing SMEs. This chapter examines four activities of seniors in NPD projects—NPD success measure, organising NPD process, NPD resource allocation and NPD strategic planning.

Chapter 6 presents the analysis results of the success factors of NPD in Vietnamese manufacturing SMEs, examining the success factors from both staff and leaders' perspective.

Chapter 7 presents the analysis results of the NPD performance model in Vietnamese manufacturing SMEs. This chapter presents results of CFA analysis and SEM to confirm the conceptual model, answer the RQ and test the hypotheses.

Chapter 8 engages in an extensive discussion of the core findings, presenting the results of the analysis and answering the RQs.

Chapter 9 concludes the thesis by summarising its findings and discussing its overall evaluations and implications. Limitations of the thesis and future research avenues are also discussed.

1.5 Contribution and Significance of Research

1.5.1 Significance

This thesis studies WI and NPD in Vietnamese manufacturing SMEs. This study is significant for several reasons:

- This thesis is the first study on the relationship between WI, NPD capability, NPD strategic planning and NPD performance simultaneously, particularly in manufacturing SMEs in Vietnam. Despite extensive empirical studies that consider WI and NPD, to date no study has hypothesised about or tested these relationships. In this thesis, these relationships are tested through five main hypotheses and 35 sub-hypotheses. Twenty-five of these were successfully tested and 21 were supported, indicating a relatively strong relationship between WI, NPD capability, NPD strategic planning and NPD performance.
- The conceptual model—which reveals for the first time the relationship between WI and NPD capability, NPD capability and NPD strategic planning, and NPD strategic planning and NPD performance, and the moderating effect—will be constructed based on theories and quantitative data. Hypotheses derived from RQs will be formulated and tested.
- This thesis is the first study to discuss NPD processes, NPD strategic planning, NPD resource allocation and NPD success measures in Vietnamese manufacturing SMEs. The results indicate that Vietnamese

manufacturing SMEs have implemented relatively well in these area, with high mean scores of >4.00, >3.90, 3.95 and 3.98 for NPD success, NPD process, NPD strategic planning and NPD resource allocation respectively.

- This thesis is the first study to identify the success factors of NPD in Vietnamese manufacturing SMEs, which include innovation climate, research and development (R&D) capability, organisation capability, strategic planning capability, technical resources, building the business case and plan, development, product launch and percentage of sales by new product. All of these factors have a p level of >0.05.
- This thesis examines the effect managers and employees in Vietnamese manufacturing SMEs have on WI and NPD capability. No moderating effects of these groups on the relationship between NPD capability and NPD strategic planning and NPD strategic planning and NPD performance have been found in Vietnamese manufacturing SMEs, which is also significant contribution to the literature in general and to strategic planners in the Vietnamese Government in particular.

1.5.2 Contribution

This thesis has theoretical and practical contribution. Theoretically, this quantitative thesis brings together for the first time four constructs from within two aspects of management research, WI and NPD, and investigates their relationship. Thus, this thesis makes a contribution through the development of a model integrating WI and NPD. The relationship between WI, NPD capability, NPD strategic planning and NPD performance are explored, thereby expanding contingency theory (Miller and Friesen, 1983). Managers and employees are found to have significant moderating effects on WI, NPD capability, NPD strategic planning and NPD performance ($p<0.1$) in Vietnamese manufacturing SMEs. Investigation of the effect of managers and employees on WI and NPD capability also adds to existing knowledge.

Practically, the thesis enhances current understanding of senior management in NPD projects and NPD success factors in Vietnamese manufacturing SMEs at the project level. It will also assist business managers in improving NPD and assist policymakers and organisations to formulate policies supporting WI.

1.6 Summary

This chapter outlines the research background in which this PhD thesis is situated. This chapter addresses how the thesis has focused on examining the senior management in NPD projects, identifying the NPD success factors and investigating the relationship between WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs at the project level. This chapter also introduces the content of this thesis.

Chapter 2: Literature Review

This chapter reviews the literature on WI, NPD capability, NPD organisation/NPD process design, NPD strategic planning, NPD resource allocation, NPD success factors and NPD performance. This review identifies gaps in the literature which informed the RQs (Section 1.2) and hypotheses (Chapter 3) of this thesis.

2.1 Introduction

The focus of the literature review is on literature addressing WI, NPD capability, NPD organisation/NPD process design, NPD strategic planning, NPD resource allocation, NPD success factors and NPD performance. The review was conducted on national and international publications across multiple disciplines, using various databases such as EBSCO, Emerald, Elsevier, Google Scholar, Informit, ISI, ProQuest and Wiley Online Library. WI, NPD capability, NPD organisation/NPD process design, NPD strategic planning, NPD resource allocation, NPD success factors, NPD performance, manufacturing SMEs (international) and manufacturing SMEs (Vietnamese) were the key search terms used. Papers were chosen from journals listed as A*, A and B in the Australian Business Deans Council Journal Quality List. The reason for this was the intention of the researcher to define WI, NPD capability, NPD organisation/NPD process design, NPD strategic planning, NPD resource allocation, NPD success factors and NPD performance and identify empirical research linking these concepts. However, there are few studies that configure the concurrent relationship between these concepts and their impact on NPD performance.

2.2 Vietnamese Manufacturing Small and Medium-Sized Enterprises

While this study was conducted in Vietnam, most of the literature reviewed conducted research in developed countries. Thus, it is necessary to examine the implications of conducting research in Vietnam. It is well known that innovation has played a vital role in promoting economic growth (Porter, 1990). Existing literature has indicated that innovative SMEs show better performance than non-innovative SMEs in terms of profitability, sales growth, employment growth and exports (Evanschitzky, 2012). Further, a recent trend in studying innovation has focused on a specific industry because different industry sectors exhibit different patterns of innovation. Cross-sectoral studies may reduce the effect of differences between industries on their new product performance and may lead to attenuated and possible misleading conclusions. This thesis is concerned with new product management practices in the Vietnamese manufacturing industry. It investigates several aspects of new product management identified as important in Western literature in the context of the Vietnamese manufacturing industry.

Such a thesis is affirmed for three reasons. First, the Vietnamese manufacturing sector plays a significant role to the national economy. In 2017, the growth rate of Vietnam's GDP was the highest in the last six years with the biggest contributor to general growth being the industrial and construction sector. Contribution from the manufacturing sector was 12.9% higher than in 2016 (General Statistics Office of Vietnam, 2018) and the sector is consistently increasing their contribution to GDP. In 2017, there were 127,000 new registered enterprises established with a total registered capital of VND 1.29 million trillion—a 15.2% increase in the number of registered enterprises and a 45.4% increase in registered capital compared to 2016. The average registered capital of enterprises in 2017 reached VND 10.2 billion, a 26.2% increase since 2016 (General Statistics Office of Vietnam, 2018). Also in 2017, the number of enterprises returned to operation was 26,448, a 0.9% decrease since 2016. The total number of returned and new registered enterprises was 153,300 enterprises. The manufacturing sector has attracted significant FDI, accounting for 44.2% of FDI in Vietnam in 2017 (or USD 15.87 billion) (Ministry of Planning and Investment, 2017) and 58.4% by mid-2018 (or USD 186.1 billion). Innovation is crucial to developing the Vietnamese manufacturing sector.

Secondly, with the uniqueness of Vietnam's transitional economy, moving from a centrally-controlled economy to a more market-oriented economy, an understanding of NPD practice could assist government and industry to formulate innovation policy and strategies during this period of economic reform.

Research on innovation in Vietnamese manufacturing SMEs has attracted much attention. Tuan and Yoshi (2009), in an analysis of 337 Vietnamese manufacturing SMEs, confirmed that a strategy of new product introduction was positively and significantly associated with the growth of the firm. Le (2011a), in an analysis of 5,204 Vietnamese domestic non-state manufacturing SMEs, found that government assistance in credit at start-up, credit during operation and premises/land at start-up had a limited impact on the efficiency performance of Vietnamese manufacturing SMEs. In another analysis, Le (2011b) found that new product innovation had a limited positive impact on firm performance. Similarly, Tuan et al. (2016), in an analysis of 118 companies in mechanics, electronics, motorbike and automobile industries, found that process, organisation and marketing innovation had a significantly positive impact on innovative performance, however, product innovation activities had a limited impact on the innovative performance. Luu and Inaba (2013), in an analysis of more than 2,500 private manufacturing SMEs in Vietnam, confirmed that international engagements, export, import of equipment and machinery and supports from foreign donors (e.g., NGOs) were positive significant determinants of firm innovation. Dung et al. (2017), in an analysis of 865 private, domestic manufacturing SMEs in Vietnam, found that the formality of the employment contract significantly and positively influenced some aspects of the firm's innovation (i.e., product improvement and process innovation). Nam et al. (2017), in an analysis of 360 Vietnamese firms, found awareness of innovation, innovation strategy and policy, organisation for innovation, HRM for innovation and building capabilities as determinants of innovation. Calza et al. (2018), in an analysis of 3,065 Vietnamese manufacturing SMEs, confirmed that that the possession of an internationally recognised standard certificate lead to significant productivity premium and that the effect of certification on productivity was particularly strong for firms with technological innovation.

2.3 WI Concept and Dimensions

2.3.1 Conceptualisation

The concept of WI is becoming more and more popular nowadays in both natural and social sciences. To innovate means ‘to introduce something new or to make changes in something established’ while workplace could be understood as ‘a place where people work’ (Oxford English Dictionary Online, 2004). Research in the natural science discipline often treats ‘workplace’ as referring to the ‘place’ or the space of work with its unit varying from country, organisation, department, office, desk to online. Research on WI has attracted the interest of researchers from the fields of environment, architecture, design, materials, ergonomics and information technology (Prus et al., 2017). Researchers from the social science discipline, however, in treating the ‘workplace’ often focus at people and their work. Social science is an academic discipline concerned with society and the relationships among individuals within a society (Collins and Makowsky, 1998). That is, social innovation is concerned with new introduction or change in society and how individuals relate with others in a society. WI, from a social perspective, is related to new introduction or change in workplace (i.e., in the forms of working time, work organisation, work practices, skills, etc.) and the way people communicate and interact with each other within a workplace. In social science, researchers from the fields of culture, sociology, psychology, economics, public policy, business and management have paid much attention to the topic of WI

(Prus et al., 2017; Hughes et al., 2018). As each field of research has its own identity, researchers from different fields have developed different definitions of WI. This section reviews WI definitions developed in the social science discipline.

The concept of WI started to emerge in the early 1990s, however, there was no agreed meaning (Ichniowski et al., 1996). Over the last 20 years, WI literature has matured. Presently, WI attracts the most interest from policymakers and public policy researchers from Northern Europe. At the national level, it is considered a main driver of economic growth (Dhondt et al., 2014) and a priority in the reinforced European Union Industrial Policy Communication (Kesselring et al., 2014). Different countries recognise the important role of WI in their policy agenda (Alasoini, 2009). The European Commission (2016, p. 19) defines WI as

> many things such as a change in business structure, human resources management, relationships with clients and suppliers, or in the work environment itself. It improves motivation and working conditions for employees, which leads to increased labour productivity, innovation capability, market resilience and overall business competitiveness. All enterprises, no matter their size, can benefit from workplace innovation. Workplace innovation improves performance and working lives and encourages creativity of employees through positive organisational changes; combines leadership with hands-on, practical knowledge of frontline employees; and engages all stakeholders in the process of change.

Oeij (2015, p. 48) defines WI as ‘a developed and implemented practice or combination of practices that structurally (division of labour) and/or culturally (empowerment) enable employees to participate in organisational change and renewal to improve quality of working life and organisational performance’. Totterdill et al. (2012, p. 241) defines WI as

> the process through which ‘win-win’ approaches to work organisation are formulated—good for the sustainable competitiveness of the enterprise and good for the well-being of employees. Workplace innovation is also an inherently social process involving knowledge sharing and dialogue between stakeholders.

The Dortmund Brussels Position Paper on Workplace Innovation (2012, p. 1) considers WI to be

> a social process which shapes work organisation and working life, combining their human, organisational and technological dimensions. The participatory process simultaneously results in improved organisational performance and enhanced quality of working life.

Eeckelaert et al. (2012, p. 4) defines WI as

> strategy induced and participatory adopted changes in an organization’s practice of managing, organizing and deploying human and non-human resources that lead to simultaneously improved organizational performance and improved quality of working life.

Totterdill et al. (2002) gives the definition of

> a clear focus on those factors in the work environment which determine the extent to which employees can develop and use their competencies and creative potential to the fullest extent, thereby enhancing the company’s capacity for innovation and competitiveness while enhancing quality of working life.

These definitions highlight the view that recognises WI as a process and a win-win approach which fosters the improvement of the company’s performance, the wellbeing of employees and the quality of working life.

There is a growing body of literature that investigates the different factors of WI. Oeij et al. (2018, pp. 54-55) states that

> WI is about two things: the process of innovation and the subject of innovation. The process of WI is to engage and involve employees when the organisation develops or implements renewal and change. This 'bottom up' approach means that employees have a say in the process. The subject of innovation is not so much the new product, service, business model or technology, but the renewal and improvement of 'soft' and 'intangible' issues. For example work organisation (good job design, self-managing team work), human resource management (measures that engage employees), labour and employment relations (that enhance employee commitment) and supportive technologies (not 'steering and controlling' technologies).

In the Netherlands Employers Work Survey of 2010, WI was generally seen as 'the strategy to implement interventions in the field of organising and organisational behaviour and is seen as a capability of the organisation itself' (Oeij et al., 2012b, p. 5). Beblavý et al. (2012, p. 2) define WI as 'an integration of skills of employers and employee, technology innovation and human resources. These three factors are interdependent and always exist in an organization that leads to productivity innovation'. Similarly, Pot (2011, p. 404) proposes WI as 'the implementation of new and combined interventions in the fields of work organisation, human resource management (HRM) and supportive technologies'. He considers WI to be complementary to technological innovation. According to Totterdill (2010, p. 3), WI is characterised by 'collaboratively adopted changes in a company's work, organisational and human resource management practices that lead to improved operative/human performance and that also support other types of innovation'. Similarly, Dhondt (2004, p. 62) defines WI as 'the effort from workers and management to solve problems in the workplace environment. The core elements of WI are technology, knowledge development and receiving the client perspective in the company'. Lowe (2001, p. 51) defines WI as

> a 'bundle' of practices in the following areas of human resource management and work organization: Functional flexibility (use of job enrichment, job enlargement, multi-skilling/ job rotation, self-directed work teams); Flexible schedules; Training; Formal participation programs; and Information sharing.

These studies provide important insights into the main factors of WI from a public policy perspective. These definitions describe WI as an outcome in the form of participatory workplace practices. Such participatory practices grounded in innovation in HRM, work organisation and the deployment of technology. Thus, in defining WI it is important to recognise it from both the process and outcome perspectives.

In business and management, at the organisational level much of the current literature on WI pays particular attention to HRM and organisational management. While innovation studies traditionally have given little attention to the role of workers and work organisation, the 2000s have seen a growing interest in the organisational dimension. The phenomenon of WI is subject to different interpretations within the different strands of literature. There is a family of related terms or concepts, all attempting to capture the changing nature of work and the workplace. These include terms such as social innovation in the workplace, organisational innovation, employee-driven innovation, work organisation innovation, innovative, new or flexible workplace organisation, workplace reorganisation, workplace development, innovative workplace, high performance, high commitment, high involvement, alternative work practices/work systems/workplace practices, high-performance HRM, innovative work design, sustainable work and working smarter (Beblavý et al., 2012; Bauer, 2004). The most commonly used terms are high-performance work system (HPWS) and WI. While each of these concepts is distinct from the others, all represent alternative ways of organising work that emphasise flexibility of work organisation, empowerment and the autonomy of employees, with a focus on performance and outcomes. The core feature of these concepts is the idea of moving from a hierarchical type of organisation to flatter, more flexible, democratic structures where teams and individual workers can contribute new ideas and practices, share their voice and knowledge through open and welcoming dialogue to the creation of new models of collaboration and new social relationships, and improve the organisation they work for.

At the worker level, in HRM literature, HPWS theory focuses on the internal side of organising. HPWS argues that a specific set of HRM practices allows employees to exercise decision-making, leading to innovation, flexibility, skill sharing and improvement which will lead to highly competitive performance. WI could be presented based on 'high road' or 'low road' outcomes. These are categorised depending on the type of outcomes from the innovative work systems. Low road systems may lead to low road outcomes such as productivity increases and cost reductions. High road systems may contribute to high road outcomes such as a continuously developing workforce, new product introduction, new innovations and gains in market share. The high road company is employee centred and has an organisational model based on participation, empowered teamwork and investing in worker skills, with improved job quality, whereas the low road company has high levels of control of employees and standardisation of tasks with a focus on operation-based production flow. An innovative work system that broadly compares to low road innovation is Lean Manufacturing, while HPWS could be considered high road WI and best applied in the service sector and areas that require creativity. Regarding WI, Kim and Bae (2005, p. 1277) list 'three core components' of 'competence enhancement through human resource development and multi-skilling, commitment maximization through providing motivation and incentives and extensive employee participation and communication'.

From a psychological perspective, Karanika-Murray and Oeij (2017, p. 19) define WI as ‘renewal through deploying human talents and organizational design, aiming at both better performance and better jobs’. McMurray and Dorai (2003, p. 8) defined WI as ‘a psychological construct that is contextual and is a process of idea generation created by an individual, or a team within the workplace and is fostered through an innovative climate’. These definitions highlight the role of innovative human behaviour in a workplace. The McMurray and Dorai (2003) definition was used in this thesis as it covered all levels in the organisation.

2.3.2 WI and its Dimensions

The various definitions of WI already suggest that as a broad concept it is difficult to measure on a single scale. Empirical studies and initiatives to measure or monitor WI explicitly recognise the multidimensional nature of WI by distinguishing different dimensions. Table 2.1 provides popular WI measurements found in the literature.

Table 2.1

Measurements of WI Identified in the Literature

Study	Methods	Reliability score	Measurement	Types
Balkin et al. (2001)	Quantitative	Not reported	10 different types of workplace innovations counted by its presence in a labour contract: Team Innovation, Organization Restructure, Work Schedule Innovation, Skill Mix Change, Bargaining Process Innovation, Empowerment Innovation, Individual Pay Innovation, Team Pay Innovation, Organisation Pay Innovation, and Benefits Pay Innovation.	Outcome
McMurray and Dorai (2003)	Quantitative	0.90 0.89 0.77 0.76	24-item Workplace Innovation Scale comprising four dimensions: - Organisational innovation (five items) - Innovation climate (six items) - Individual innovation (eight items) - Team innovation (five items).	Process
Wolfgramm (2011)	Quantitative	Not reported	16-item comprising three dimensions: - Employee innovation (seven items) - Team innovation (five items) - Organisational innovation (four items).	Process

Study	Methods	Reliability score	Measurement	Types
Beblavý et al. (2012)	Quantitative; Case study	Not reported	Quantitative flexibility or employment practices: - Flexi-time - Teleworking - Alternative payment schemes Qualitative/functional flexibility or work organisation practices: - Flat hierarchies - Employee empowerment and autonomy - Task rotation and multi-skilling - Team work and team autonomy.	Outcome
Oeij et al. (2012a)	Quantitative	0.78 Yes/No questions 0.69 0.60	16-item Workplace Innovation Index by four subscales: - Autonomy (four items) - Self-directed teamwork (two items) - Internal flexibility (five items) - Innovation (five items).	Process
de Kok et al. (2014)	Quantitative	0.64 R = 0.41, $p<0.001$ 0.73 R = 0.51, $p<0.001$	Four different factors of workplace innovation: - Strategic orientation (three items) - Smart organising (two items) - Flexible work (five items) - Product-market improvement (five items).	Process
Totterdill and Exton (2014)	Quantitative	Not reported	Workplace innovation Index based on the Fifth Element model: - Work organisation (four items) - Structures and systems (four items) - Learning and reflection (four items) - Workplace partnership (five items).	Process
Oeij et al. (2015)	Qualitative Case study	Not reported	Seven measures constructed: Decision latitude of the organization, Organization model, Innovative behaviour of employees, Autonomy and participation, Participation in organisational model, Bottom-up and people-driven initiative, and Participatory implementation.	Outcome
Wipulanusat et al. (2017)	Quantitative	0.83 0.82	Two factors of workplace innovation: - Individual creativity (three items) - Team innovation (three items).	Process

A review of the literature showed that public policy researchers developed different WI measurement. Based on data from the 5th European Working Conditions Survey, Beblavý et al. (2012) elaborates a WI measurement which includes both quantitative measures (employment practices) and qualitative measures (work organisation practices). Quantitative measures were flexi-time, teleworking and alternative payment schemes; and qualitative measures were flat hierarchies, employee empowerment and autonomy, task rotation and multi-skilling and teamwork and team autonomy. Totterdill and Exton (2014) suggest four elements of WI, work organisation, structure and systems, reflection and innovation and workplace partnership. Work organisation might contain job autonomy, self-managed teams, integration of technology and flexible working; structure and systems contained reducing organisational walls and ceilings, supporting employee initiative, fairness and equality and trust; reflection and innovation contained high involvement innovation, continuous improvement, shared knowledge and experience and learning and development; and workplace partnership contained dialogue, representative participation, openness and communication, involvement in change and integrating tacit and strategic knowledge. Oeij et al. (2015) constructed seven measures for WI divided into three categories—contextual factors, features of WI and adoption and implementation. Contextual factors included decision latitude of the organisation and organisation model; features of WI included innovative behaviour of employees and autonomy and participation; and adoption and implementation included participation in organisational model, bottom-up and people-driven initiative and participatory implementation.

Oeij et al. (2012a), in an analysis of 2,250 Dutch profit and non-profit organisations, developed the measurement of a WI Index by four subscales—self-directed teamwork, autonomy, innovation and internal flexibility. The first, autonomy, was operationalised with four items and were measured on five-point Likert scale (Cronbach's $\alpha = 0.78$). The second dimension, self-directed teamwork, involved two yes/no questions. The third dimension, internal flexibility, consisted of five items and was measured on five-point Likert scale (Cronbach's $\alpha = 0.69$). The fourth dimension was innovation, measured by a subscale of five items. Two of these were measured on five-point Likert scale and the three other items were yes/no questions (Cronbach's

$\alpha = 0.60$). In an analysis of 1,125 Dutch profit and non-profit organisations, de Kok et al. (2014) developed the measurement of WI with four factors—flexible work, strategic orientation, product-market improvement and smart organising. These four factors reflected two dimensions including strategic orientation and product-market improvement which focused on external conditions and developments, and smart organising and flexible work focused on internal organisational issues. All items were measured on five-point Likert scale. Strategic orientation consisted of three items (Cronbach's $\alpha = 0.64$). The second factor, smart organising, consisted of two items ($R = .41$, $p<.001$). Flexible work was measured by a factor of five items (Cronbach's $\alpha = 0.73$), and the fourth factor, product-market improvement, consisted of two items ($R = .51$, $p<.001$). These studies provide important insights into WI measurements developed in the area of public policy. WI was measured in both quantitative and qualitative research, as a multidimensional construct which could be measured by countable indicators (Beblavý et al., 2012), formative dimensions (Oeij et al., 2015) or reflective scales (Oeij et al., 2015; de Kok et al., 2014). Most studies elaborated WI measurement from established data at the national level (de Kok et al., 2014; Oeij et al., 2012a; Moussa et al., 2018) or European level (Beblavý et al., 2012).

In business management and psychology, researchers have developed different measurements of WI at the organisational level. Balkin et al. (2001), in an analysis of 112 unionised Canadian organisations with data collected by the Bureau of Labor Information, divided WI into 10 types—team innovation, organisation restructure, work schedule innovation, skill mix change, bargaining process innovation, empowerment innovation, individual pay innovation, team pay innovation, organisation pay innovation and benefits pay innovation. Balkin et al. (2001) then measured WI by counting its presence in a labour contracts. In another study, McMurray and Dorai (2003) developed a 24-item Workplace Innovation Scale (WIS) which comprised four dimensions—

innovation climate, organisational innovation, team innovation and individual innovation. WIS was measured on five-point Likert scale. WIS was designed to identify and measure the behavioural aspects of innovation practices by individuals in their workplace. The first dimension, organisational innovation, was operationalised with five items (Cronbach's α = .90). The second dimension, innovation climate, consisted of six items (Cronbach's α = .89). The third dimension was individual innovation, measured by a subscale of eight items (Cronbach's α = .77). The fourth dimension, team innovation, involved five items (Cronbach's α = .76). In the same vein, Wolfgramm (2011) suggested a 16-item WI scale comprising three dimensions—employee innovation, team innovation and organisational innovation. This scale was designed in the form of a checklist for managers with yes/no questions. The first dimension, employee innovation, consisted of seven items. The second dimension, team innovation, was operationalised with five items and the third dimension, organisational innovation, was measured by four items.

From a management and engineering perspective, Wipulanusat et al. (2017) extracted data from the 2014 Australian Public Service employee census conducted by the Australian Public Service Commission, comprising 3,125 engineering professionals in the Commonwealth of Australia's departments, and revealed a WI scale comprising two factors—individual creativity and team innovation. Items were measured by using a five-point Likert scale. The first dimension, individual creativity, was operationalised with three items (Cronbach's α = 0.83). The second dimension, team innovation, consisted of three items (Cronbach's α = 0.82).

A review of the literature claimed that, at the organisational level, WI was designed as a multidimensional construct measured by countable indicators (Balkin et al., 2001) or formative dimensions (McMurray and Dorai, 2003; Wolfgramm, 2011; Wipulanusat et al., 2017). Most of the research related to WI, from management and psychology perspectives, was quantitative. Some researchers developed WI measurement based on established data from the government (Balkin et al., 2001; Wipulanusat et al., 2017) while others developed WI measurement based on empirical studies and theories (McMurray and Dorai, 2003; Wolfgramm, 2011). Based on reliability score, WIS was chosen for this thesis as it had a 15-year history of high reliability scores across six countries including Vietnam and specifically SMEs.

2.4 NPD Capability

To maintain a consistent approach, this section starts with providing the NPD definition. Mortensen and Bloch (2005) introduced four different innovation types—product innovation, marketing innovation, process innovation and organisational innovation—in which process and product innovations are closely related to the concept of technological developments. Mortensen and Bloch (2005, p. 48) define product innovation as

> the introduction of a good or service that is new or significantly improved regarding its characteristics or intended uses, including significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.

These new introductions or changes may be targeted to a newly defined requirement of customer or a niche category in the market. According to Mortensen and Bloch (2005, p. 49), a process innovation is

> the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products.

Generally, product innovation, which focuses on the demand of the market, is considered to generate new ideas or creating something new. Process innovation, which focuses on a firm's internal operations, represents changes in the way firms produce their products or deliver their services. Both product innovation and process innovation require firms to have capabilities related to technology and market (Danneels, 2002).

A review of the literature reveals that product innovation can be defined as a process or as an outcome. It can be a concept generation, process of strategy, organisation, product and plan creation, technical design, R&D, evaluation, conceiving, creating, manufacturing, management, commercialisation and launching. The outcome of product innovation results in a variety of different innovation types, typically called radical innovation for new products and incremental innovation for improved products, product modifications, new brand, changes in design of established products or use of new materials or components in the manufacture of established products. It is important to elucidate that a product can be new to the company, market or the world (Urban, 1993; Crawford, 1991).

In the Product Development and Management Association (PDMA) Handbook of New Product Development, Kahn (2012, p. 3458) defines product innovation as 'the development of new and improved products and services', and NPD as 'the overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and commercialization of a new product'. In the literature, 'product innovation' and 'NPD' are often used interchangeably. However, in management and engineering research NPD is more popular. The following sections discuss the conceptualisation and measurement of NPD capability.

2.4.1 Conceptualisation

In NPD literature, there are a group of related terms to NPD capability—NPD dynamic capability, new product capability, product development capability and product innovation capability. According to the theory of dynamic capabilities, a firm's NPD capability is embedded in that firm's management practices, processes and routines (Peng et al., 2008). Song and Su (2015, p. 3) state 'a firm's NPD capability can be created through a bundle of management practices and technological routines'. Similarly, Schilke (2014, p. 185) defines NPD capability as 'organizational routines that purposefully reconfigure the organizational product portfolio'. O'Cass and Sok (2014, p. 4) define product innovation capability as 'bundles of interrelated routines used to undertake specified product innovation-related activities in areas such as developing new products and improving existing product quality'. Some define NPD capability from a knowledge-based perspective. Zhao and Chadwick (2014, p. 1869) define NPD capability as 'the collective cognitive ability of an NPD unit's employees to consistently and effectively coordinate their interactions and communications to combine specialized knowledge in order to create and introduce new products'. According to Menguc et al. (2014, p. 316), product innovation capability is 'the ability to pool, link, and transform several different types of resources and knowledge to create a solution that is different from existing ones'. Branzei and Vertinsky (2006) state product innovation capability as the ability to acquire and fully understand external knowledge; transform it into unique, novel competencies and ideas; and then harvest these ideas by first generating and then effectively commercialising new or improved products. NPD capability could be considered as the combination of the absorptive capacity of external knowledge, the coordination capacity of internal relationships and the collective mind (Ettlie and Reza, 1992). Innovation has important roles in NPD capabilities improvement, knowledge sharing and internal learning in manufacturing organisations (Akroush and Awwad, 2018).

NPD capability can be defined as a process or as an outcome. Vorhies et al. (2002, p. 372) defines product innovation capabilities as

> the processes by which strategic business units (SBUs) acquire market and technical knowledge from inside and outside the business unit, integrate this knowledge to create new insights, and combine these insights with complementary resources that are deployed with the goal of creating meaningful new value offerings.

From an outcome perspective, Qureshi and Kratzer (2011, p. 52) define product development capability as ‘the ability to design products that can meet customer needs, outperform competitors and meet internal company goals and hurdles’. According to Huang and Chu (2010), product development capability was the capability of a firm to effectively develop new products and this comprised three dimensions—development quality, development features and development cost. Adler and Shenhar (1990) define product innovation capability as the capacity of the firm capability to develop and adapt new products able to satisfy market demands.

Several studies further distinguish between radical and incremental product innovation capability. Menguc and Auh (2010, p. 821) define radical product innovation capability (RPIC) as

> the ability to develop product innovations that are new to the world and which have a profound impact on customers’ usage experiences and learning (e.g., unlearning to learn) through the significant alteration of existing products (e.g., making old products obsolete). RPIC will lead to the creation of new technology and marketing S-curves (a curve that depicts the origin and evolution of radical product innovation by explaining how technologies and new product introductions advance along a series of consecutive curves).

They define incremental product innovation capability (IPIC) as ‘the ability to develop product innovations that exploit, leverage, reconfigure, and integrate existing technologies. Therefore, while RPIC is more exploratory, IPIC is more tuned to the exploitation of existing skills, knowledge, and assets' (Menguc and Auh, 2010, p. 821).

Following the theory of organisational capabilities which suggests that firms need to continuously renew themselves by exploiting existing competencies (exploitation) and generating new competencies (exploration) (Jansen et al., 2006), Song and Su (2015) divided NPD capability into two distinct and separate parts—NPD exploitation capability and NPD exploration capability. They defined NPD exploitation capability as 'a firm's competence in improving its NPD efficiency and effectiveness through the use of existing technologies', while NPD exploration capability could be defined as 'a firm's competence in exploring new technologies and markets and introducing new products' (Song and Su, 2015, p. 3). The definition of Adler and Shenhar (1990) was adopted in this thesis.

2.4.2 NPD Capability and its Dimensions

Measures for innovation capability have been proposed by several previous studies. While current innovation capability measures focus on industrial and technology innovations, service innovations have no proper measures (Tura et al., 2008). Carayannis and Provance (2008) show that current measures do not recognise that organisations have different sizes and operate in significantly different business areas.

From the literature, the current measures of innovation capability can be roughly divided into two groups, output measures and input measures (Albaladejo and Romijn, 2000). Input measures assess how resources are allocated to innovation activities and how these have been arranged. Tura et al. (2008) suggests that input measures comprise the funds used in R&D activities and education. Input measurement is considered problematic due to telling how much is devoted, rather than if anything has been accomplished. The disadvantage of input measures is usually to underestimate smaller innovation activities because smaller organisations do not have opportunities to invest in R&D. As a result, input measures do not reflect actual innovation capability (Albaladejo and Romijn, 2000). Therefore, when developing innovation capability, innovation outputs are expected (Lawson and Samson, 2001). In this situation, innovation outputs are the results of practice-based innovation activities. It is also expected that continuous successful results of innovation activities will make the organisation more innovative. Output measures assess the effects of innovation capability. It is difficult to express all kinds of innovations quantitatively, and in this case, output measures usually measure the results of successful innovations (Tura et al., 2008). Output measures mainly include the patents and licenses of organisation. Following an output perspective, Lyon and Ferrier (2002) measured product development capability by the total number of new products which a firm offers in a given year. However, the disadvantage of output measures is that they are only consistent with certain types of innovations and organisations. They are not suitable for small or service firms (Albaladejo and Romijn, 2000). One of the disadvantages is that output measures do not measure the economic value of all kinds of innovations (Tura et al., 2008). Intangible measures are undeveloped compared to financial measures which is not necessarily the most important measurement. Yliherva (2004) indicates that it is more important to notice the change in the measurement results. Albaladejo and Romijn (2000) limited innovation capability measurement to product innovations and included both inputs and outputs of innovation. They used three measures. The first is whether the organisation has had at least one product innovation in a three-year period, the second the number of patents and the third an index which shows the significance of the innovative outputs of the organisation in a period of three years. Recently, Laaksonen and Peltoniemi (2018) found that four types of operationalisations have been used—managers' evaluations; financial data; company's experience, actions and performance;

and managers' or employees' experience, actions and performance—to evaluate the dynamic capabilities.

Various researchers have developed their own measurement model to evaluating a firm's technological innovation capability. Capaldo et al. (2003) introduced an innovation capability evaluating method with four resource sets—human, entrepreneurial, those arising from external linkages and economic. Each set contained several measures to assess both the degree of technological innovation capability and market innovation capability. Tamer Cavusgil et al. (2003) measured innovation capability through four items—order of market entry, frequency of innovations, simultaneous entry in multiple markets and the ability to penetrate new markets to tap the various facets of innovation capability. Saunila and Ukko (2011) suggested an innovation capability measurement with seven factors—ideation and organising structures, participatory leadership culture, know-how development, work climate and wellbeing, external knowledge, individual activity and regeneration. Saunila et al. (2014) suggest another innovation capability measurement with eight factors—leadership practices, employees' skills and innovativeness, processes and tools for supporting culture, idea management, development of individual knowledge, employees' welfare, external sources for information and linkage to strategic goals.

Many studies have presented innovation capability as a synthesis of capabilities. From a process approach, Chiesa et al. (1996) propose a formative measurement model for technological innovation capability which included product development capability, process innovation capability, concept generation capability, leadership capability, technology acquisition capability, capability in effective use of system and tools and resources deployment capability. Burgelman et al. (1996), however, proposed a reflective measurement model for technological innovation capability which included capabilities of an organisation in understanding competitor innovative strategy and market, resources availability and allocation, structural and cultural affecting internal innovative activities, understanding technological developments relevant to firm and strategic management capability to cope with internal innovative activities.

From a functional approach, Yam et al. (2004) designed technological innovation capability as a multidimensional construct. Below is a brief description of the seven dimensions suggested by Yam et al. (2004). The capability of the firm to identify, assimilate and exploit knowledge from the environment was considered as learning capability. R&D capability refers to the capability of a firm to integrate R&D strategy, project portfolio management, project implementation and R&D expenditure. Resources allocation capability makes sure that the firm possesses enough resources such as capital, professionals and technology in the innovation process. Manufacturing capability to transform R&D results into products which meet market demands according to design requirement and can be manufactured on an industrial scale. Marketing capability refers to the capability of a firm of publicising and selling the products on the basis of understanding consumer demands, competition situation, cost and benefits and the acceptance of the innovation. Organising capability refers to is the capability of a firm in securing organisational mechanism and harmony, cultivating organisation culture and adopting good management practices. Strategic planning capability refers to the capability of a firm to identify internal weaknesses and strengths and external threats and opportunities, formulate plans in accordance with corporate vision and missions and acclimatise plans to implementation. The measurement model designed by Yam et al. (2004) was adopted in this thesis as it had high reliability scores.

2.5 NPD Process

2.5.1 Conceptualisation

NPD plays an important role in the survival of firms. Despise the creativeness of the NPD, the discipline still needs a systematic method to guide the processes that are required to get a new product into market. An effective NPD process, including the creation of new business opportunities, boost profitability for stakeholders and increases customer satisfaction through better products meeting specific needs—crucial for the growth of a company. There are two simultaneous activity paths in the NPD process. The first focuses on generating ideas, design of the product and detail engineering and the second deals with extensive market research and analysis.

A review of the literature revealed the NPD process can be defined as the process of generating and transforming new ideas of a product into commercial products as an integrated flow (Calantone et al., 1988; Gao and Bernard, 2018). Cooper (1994, p. 3) defines the NPD process as ‘a formal blueprint, roadmap, template, or thought process for driving a new product project from the idea stage to the market launch and beyond’. Koen et al. (2002, p. 455) defines NPD process as ‘a disciplined and defined set of tasks and steps that describe the normal means by which a company repetitively converts embryonic ideas into salable products or services’. Smulders et al. (2003) define the process as that which leads to the creation of product and process descriptions. In recent years, NPD process has been defined as the collective activities or system that a company uses to convert its ideas and technology into a flow of products that meet the demands of customers and the strategic goals of the organisation (Welo and Ringen, 2012). This thesis adopted the NPD process definition by Kahn (2012, p. 458), ‘a disciplined and defined set of tasks and steps that describe the normal means by which a company repetitively converts embryonic ideas into salable products or services’.

2.5.2 NPD Process and its Models

According to Koen et al. (2001), the NPD process has three main phases—‘fuzzy front end’ (FFE), NPD and ‘fuzzy back end’ or commercialisation. FFE NPD is fraught with tensions that fuel and inhibit innovation (Andriopoulos et al., 2018). Koen et al. (2001) states that FFE includes the unpredictable, chaotic and unstructured activities preceding a more formal NPD process. This stage is after an opportunity has been realised and before a formal product development process is regarded as ready. Herein, a concept may be generated, followed by the decision on its feasibility and whether it is worthy of further investment of resources. Practically, even though the FFE may not be a detailed or formal part of the product development process, it may end up consuming up to half of the total development time. This is the point where serious commitments regarding investment, time and the nature of the envisioned end product are decided. As a result, it shapes the direction of the whole product and project. Therefore, the importance of this phase cannot be overstated and should be included in the cycle time of the overall projected product development. In no specific order, Koen et al. (2001) proposes five elements of the FFE—Identification of Design Criteria, Concept Genesis, Prototype, Product Development and Idea Analysis. The front-end marketing phases have been well investigated with valuable models proposed. Studies such as Cooper and Kleinschmidt (1994) reveal that the quality of pre-development phases before proper product and project development starts greatly affects product success.

FFE is followed by a more formal process. The stage-gate is a step-by-step process where a concept is systematically formalised and managed, and is one of the most successful models used in NPD in the West. This concept was developed by NASA in the 1960s and then introduced for feasibility assessment of large-scale management and complex defence projects. The first version was called Phased Project Planning, which reported a basically sequential approach including four ordered phases—preliminary analysis (phase A), definition (phase B), design (phase C) and operation (phase D). In addition, checkpoint reviews were proposed to ensure that mistakes would not be carried forward into the next phase. While this approach was originally only utilised for large-scale, complex projects, its principles were scaled down and applied for NPD in a more general way. Later, it was adopted by Hewlett Packard, the United States (US) Army and the others, and presently it is broadly supported by the PDMA and employed in many organisations.

The Booz, Allen and Hamilton Model is an influential model published in 1982 that many companies still employ in the NPD process. There were seven steps in the model consisting of idea generation, development of NPD strategy, screening and evaluation, business analysis, development, testing and commercialisation. Many models have since been developed based on this model, but improvement has been marginal.

Another widely used model is the Stage-Gate Model developed and trademarked by the Canadian NewProd project lead Robert G. Cooper. In the 1980s, Cooper proposed the Stage-Gate Idea-to-launch process as a tool for managing NPD processes. This model was revised as the Third Generation Stage-Gate New Product Process (Cooper, 1996). It depicts a funnelling approach for managing the NPD process. The major difference between the old model and the new model is the stages and gates overlap in the latter model to improve efficiency and effectiveness. This model divides the NPD process into five phases with gates. Each gate in the NPD process serves as a go/no-go decision point for a project. Technological and market perspectives are integrated in this model. The advantage is the systemisation facilitating communication between top management and teams. Worth noting is that 88% of US businesses employ a stage-gate system to manage new products, from idea to launch in a APQC benchmarking study in 2010. Many benefits such as improved teamwork, shorter cycle time, improved success rates, earlier detection of failure and better launch have been reported by companies using this system. These findings indicate the significance of the stage-gate model in the area of NPD. These process models can be split into phases

(Ulrich, 2003; O’Connor, 1994). However, the sequential character and low flexibility are considered the main disadvantages of these models. The overlapping of process phases which can significantly shorten the lead time from idea to market launch supports the sharing of feedbacks among various project phases. Crawford and Rosenau (1994) propose a model with partial concurrency of project phases.

These sequential feedback models are standardised and explicit, thus having the advantage of clarity which makes clear the criteria against which a project idea will be judged. It is a streamlined and efficient way of carrying out new ideas and focuses on reducing uncertainty as ideas are developed. Cooper and Kleinschmidt (1986) 13-step process model recommends that the sequential feedback model can incorporate market factors throughout, even if it is functionally based. However, the sequential feedback model lacks interdisciplinarity and feedback over time because it is more likely to fall into the trap of functional sequential review. Therefore, this model contains some disadvantages such as potential decrease of creativity because of too much rigor and external review by managers early in the process; slowing of the process because of barriers from phase review, for example, gaining top management commitment and involvement, harmonisation with the product portfolio of the company and organisational culture (O'Connor, 1994); and gaining consensus on exit criteria by top management for each phase review. Phase review also suggests an emphasis on financial indicators, sequential development (which hampers communication with market) and initial scepticism resulting from a lack of training and education and bureaucratic perception of the process (Cooper and Kleinschmidt, 1993a). In some companies, phase review is almost non-existent, rules are not followed and the behaviour pattern is disseminated from managers down to team members (Valeri et al., 2003). Amabile (1998) warns that intrinsic reward via external evaluation and fear is undermined when applying time-consuming layers of evaluation to new ideas. As a result, projects based on emerging and radical technology that cannot demonstrate payback, a clear market segment and so on are likely to be discarded in favour of more certain projects. Thus, in practice the process tends to favour more incremental initiatives. The emphasis on commercialisation may override opportunities to make changes in the technical or market aspects of the project once a project is decided on and as investment increases. These disadvantage can be overcome in part by ensuring that the people judging the projects in the early stages recognise that the concepts should not be subject to the same rigor (e.g., by applying stringent criteria like discounted cash flow) as more fully developed projects, thus remaining open to less developed and higher risk projects with higher potential (Utterback and Bessant, 1996). Moreover, to develop and clarify the product and market, new information should still be allowed to flow into and update the process.

Over the last few years, the Lean Startup movement has quickly grown and challenged many of the inherent assumptions in the stage-gate model. In 2008, Eric Ries, using his personal experiences adapting lean management principles to high-tech start-up companies, proposed the first lean start-up methodology. Since then, this methodology has been extensively applied to many individuals, teams and companies looking to bring new services or products into the market. The Lean Startup methodology is employed for the development of businesses and products, aiming to shorten the cycle time of product development by adopting a combination of validated learning, iterative product releases and hypothesis-driven experimentation. The Lean Startup methodology holds central that if start-up companies devote their resources into iteratively building products or services to meet the demands of early customers they can minimise the market risks and sidestep the need for large amounts of initial project funding, failures and expensive product launches.

Recently, the Agile method, a series of rapidly executed sprints and scrums, was employed by many information technology developers. The Agile approach, a microplanning or project management tool, was designed to engage a development team, including the customer, in quickly getting to a working end product. In contrast to the typical stage-gate process which used five or six stages, the Agile method is mostly used during the development and testing stages of a new product project by the technical team doing the actual development work. The Agile method has received significant attention and does appear to have some remarkable benefits for software companies. Begel and Nagappan (2007) identify three primary benefits—quicker product releases, improved communication and coordination and faster responses to changing customer requirements or technical challenges. Offering such benefits, the Agile method was adopted by many software development companies.

Research has recently revealed that to develop physical products the elements of the Agile information technology product development method are now beginning to be integrated into the traditional gating processes by leading companies. The trend started in the information technology firms, where the Agile and stage-gate methods were found to supplement each other. Recently, Agile and stage-gate hybrid methods have been adopted in manufacturing firms. The use of the hybrid model has many benefits such as much better response to changing customer requirements, faster product releases and improved team communication and morale (Cooper, 2016).

Other frameworks, such as Venture Board (Armstrong et al., 2006) and Learning Plan (Rice et al., 2008), have iterative steps designed to be followed in a particular order to promote collaboration and creativity. Venture Board and Learning Plan models are aligned with integrative-iterative models. This approach to innovation is more organic compared to the sequential feedback approach, more 'developmental' as opposed to 'weeding out' and multifunctional throughout. Unlike explicit market and technical criteria, team projects are judged based on the basis of the experience and instinct of a venture team which contributes at the early stage of investment and focuses on discussion and collective interpretation when using the integrative-iterative approach (Armstrong et al., 2006; Song and Di Benedetto, 2008). Typically, the venture team consists of internal and external experts. While milestones are established early on to judge progress, this process focuses on building on and reframing ideas through constant discussion.

Rice et al. (2008) propose Learning Plan for long-term projects that are at the extreme pole of uncertainty, suitable for breakthrough projects in which the outcome is highly uncertain in market, technical, organisational and resource dimensions and projects with a lifetime of 10 years or more for which milestones are not easy to set. Learning Plan emphasises that the team needs to undertake an ongoing process of systematically examining the sources of uncertainty and test assumptions during the implementing time of a project. Project directions are also accordingly adjusted in reviewing what has been learned. Therefore, the company board should have people with experience in high-uncertainty projects along all dimensions.

The integrative-iterative approach typically allows for more ongoing input from the venture team and more repetition in project development. Moreover, while the venture board is multidisciplinary throughout, specific target markets are usually identified later in the development stage and financial measures are applied later. Thus, this approach is particularly appropriate to radical innovation in which markets are undeveloped or even unknown and technical development is nascent. The volition of the project leaders and members in successfully developing and implementing innovation is emphasised. The integrative-iterative model is most open to outsiders as external networks, which are often included on the company board.

However, the integrative-iterative model has some drawbacks. For example, it can be expensive and time consuming. No specific project direction is chosen and implemented as it can tend to get trapped in a cycle of repetition. At some point, the uncertainty in the project must be reduced for investment to continue. Because the process is adapted to the particular needs of a project, the criteria used are not explicit and people may not have a clear understanding of why some projects are being chosen over others. To tackle these disadvantages, the board can help guide the project team towards decision-making (as opposed to supporting an endless cycle of repetition) and can encourage the project team to identify and clarify market targets and technical approaches as these become obvious. In addition, people within the organisation need to be trained in how to access and contribute to the process of iteration.

The sequential feedback model places emphasis on value capture over creativity, while the integrative-iterative model emphasises creativity over value capture (Armstrong et al., 2006). While the openness of the sequential model to project redirection once selected is less and decreases over time, the openness of the integrative-iterative model to project redirection/reframing is emphasised throughout development.

Model choice depends on the strategic innovation objectives of an organisation. If an organisation aims to encourage both incremental innovation and more radical innovations that may be disruptive, Song and Di Benedetto (2008) recommend employing hybrid pathways. For incremental innovation, a sequential feedback model would be appropriate, and for radical innovation the integrative-iterative model would be suitable (Jain, 2010).

For this thesis, Cooper and Kleinschmidt's (1986) 13-step process model was used as it best fits the Vietnamese context. The model was widely and effectively used in industries to address NPD studies (Cooper, 2014; Huang et al., 2002; Cooper and

Kleinschmidt, 1993b; Cooper and Kleinschmidt, 1991; Cooper, 1990b). The activities from idea generation to commercialisation are covered in this process and a six-point scale, ranging from 'excellently done' to 'not taken at all', is employed to measure their quality of execution.

2.6 NPD Strategic Planning

2.6.1 Conceptualisation

The strategic planning process influences what products a company develops and the way it develops them. Kudla (1980, p. 5) defines strategic planning as

> the systematic process of determining the firm's goals and objectives for at least three years into the future and developing the strategies that will govern the acquisition and use of resources to achieve these objectives.

Cory (1989, p. 209) defines it as

> a process of developing and implementing a course of action or direction that an enterprise should take to achieve its objectives. The strategy is the course of action while plan is the detailed set of tasks to achieve the objectives.

Hax and Majluf (1996) define strategic planning as the process by which organisations determine and establish long-term directions and formulate and implement strategies to accomplish long-term objectives while taking into account relevant internal and external environmental variables. Martin (1998, p. 30) defines it as 'forecasting the future success of an organization by matching and aligning all its capabilities with its external opportunities'. Lisiński and Šaruckij (2006, p. 37) define strategic planning as 'the process of determining an organisation's long-term goals and then identifying the best approach for achieving those goals'. Komolavanij et al. (2009, p. 253) state

> product innovation strategic planning consists of three levels: the long-term plan, which covers 5 to 10 years; the medium-term plan, which extends to a period of three to five years, during which market trends in the near future are

studied; and the short-term plan, which consists of projected market and customer needs over a period of one year.

Kahn (2012, p. 471) defines strategic planning as ‘establishing the vision, mission, values, objectives, goals, and strategies of the organization’s future state’. In this thesis, NPD strategic planning is defined as the process of establishing the vision, mission, values, long-term direction, goals and strategies of developing a new product in the future.

2.6.2 NPD Strategic Planning and its Measurement

Business planning proves to be an important antecedent of the more development-related planning activities such as project planning and risk planning. The pursuit of strategic goals tends to be implicit, whereas we show the benefits of making them explicit for more successful market outcomes (Iamratanakul, 2018). For example, in service supply chain, Song et al. (2016) investigated the linkages between strategic interaction and relationship value with a variety of co-creating value strategies as conceptual mediators. They showed that strategic interaction leads to a positive effect on the relationship value without any regard to the size of the customer. However, a review of the literature showed that NPD strategic planning measurement had received little discussion.

NPD planning is important to a company because, when done properly, it can reduce resource expenditures, drive revenues and generate profitability. NPD is often a key objective and driver for product planning because it directly corresponds to the company’s bottom line. Just as important, a product reflects the company’s reputation, thus a company will be intent on launching only those products that enhance its image and reputation. Other objectives such as company awareness, customer satisfaction and market share attainment are also product planning objectives and underlie a company’s long-term viability and competitiveness. The nature of these objectives exemplifies the strategic implications that product planning poses for a company in pursuit of successful new products. NPD strategic planning will not guarantee success, but it does increase the likelihood of achieving success.

There are several approaches to measure and evaluate the effectiveness of the NPD strategic planning. Calantone et al. (2003), in analysing the effects of environmental turbulence on NPD strategic planning, developed the measurement of corporate strategic planning by the integration of internal and external environmental conditions in planning, a three-item scale tapping the use of long-term planning and the collaboration of department heads and top management in the development of strategic plans. Huang et al. (2002) examined the NPD process in Australian SMEs. They utilised a five-item scale to measure the degree to which a firm clearly established a long-term direction, shared intention and formal plan for NPD. This thesis uses Huang et al.'s (2002) five-item scale for evaluation of NPD strategic planning.

2.7 NPD Resource Allocation

2.7.1 Conceptualisation

Lasry et al. (2009, p. 2) defines resource allocation as 'the distribution of resources among programs, populations or regions that are competing for the same funds'. Filicetti (2009) defines resource allocation as planning of activities and the resources required by those activities, so that predetermined constraints of resource availability and/or project time are not exceeded. Aderanti and Oluwatobiloba (2016, p. 1) define resource allocation as 'the assignment of available resources to various uses'. According to Slotterback (2016), resource allocation is

> a plan for using available resources, for example human resources, especially in the near term, to achieve goals for the future. It is the process of allocating scarce resources among the various projects or business units.

Grimsley (2018) defines resource allocation as a process and strategy involving the decision of a company where scarce resources should be used in the production of goods or services. In this thesis, NPD resource allocation is defined as the process of distributing required resources to complete the development of a new product.

2.7.2 NPD Resource Allocation and its Measurement

Any company that engages in NPD faces the problem of allocating resources between innovation initiatives in a portfolio (Chao and Kavadias, 2007). Companies that make poor choices with respect to their NPD performance run the risk of losing their competitive advantage. For example, DuPont experienced trouble because the company diverted the majority of its estimated USD2 billion yearly R&D budget to improving established business lines (Barrett, 2003). Pilling (2000) revealed the decision to restructure its portfolio to include more incremental projects in his study about Drug maker AstraZeneca. Schoenberger (2003) reported that Kodak had been investing resources in revolutionary new technologies to catch up in the digital photography market despite the fact that the company was synonymous with photography for the better part of the twentieth century. These studies highlight that effective resource allocation and NPD portfolio management profoundly impact firm success. The NPD portfolio practically determines a firm's strategy for the medium- and long-term future and is the responsibility of senior managers (Roussel et al., 1991; Cooper et al., 1997). When managers make resource allocation and NPD innovation decisions, they take an implementation step that links innovation strategy with reality. This step contains a difficult choice—allocate resources to the development of fundamentally new technologies, products and markets that are naturally more risky investments or improve existing technologies, extend product lines and entrench existing market position without excessive risk. Of course, the problem is exacerbated by the fact that the former investments have the lure of potentially high payoffs while the latter often results in comparatively smaller payoffs (Tushman and O'Reilly III, 1996). From the dawn of operations research in the early 1950s to the emergence of managerial frameworks (such as the Boston Consulting Group matrix) in the 1970s to the present day, the problem of developing the 'right' new products has motivated academics and practitioners to propose a number of solutions. Several tools and theories have been developed by different constituencies, resulting in an interesting dichotomy—a collection of rigorous analytical efforts with minimal adoption and minimal practical impact (Loch et al., 2001, Shane and Ulrich, 2004) and a variety of managerial frameworks grounded in individual case studies with widespread impact but little theoretical foundation. In either case, managerial guidelines are limited to a generic notion of 'balance' among different value determinants due to the lack of understanding about fundamental problem drivers. Hence, senior, R&D and project managers are forced to make resource allocation decisions based primarily on intuition or heuristic rules. Recent data verify that the overall impact of NPD portfolio methods and research remains largely in doubt. A study conducted by the PDMA reveals that between 1994 and 2004 development cycle times significantly improved (Loch and Stylianos, 2008, p. 136). A portion of this effect is a due to overall improvement in the management of the product development process. However, the percentage of resources allocated to minor product changes and small improvements also increased significantly during the same period of time. Hence, there is evidence that firms are increasingly focused on incremental NPD efforts. However, high performing firms emphasise diverse portfolios that include 'cutting edge', 'new to the market' or 'new to the world' initiatives in addition to incremental efforts (Adams and Boike, 2004). Recently, Momeni and Martinsuo (2018) identified resource allocation challenges and practices in service units that perform both project and non-project activities in dynamic environments.

Even though the importance of recourse allocations have been demonstrated, a review of the literature showed that few studies measured NPD resource allocation (e.g., Cooper and Kleinschmidt (1988). In this thesis, NPD resource allocation was measured by eight items developed by Huang et al. (2001) that measured the adequacy of the new product project's marketing, financial and technical resources.

2.8 NPD Performance

2.8.1 Conceptualisation

Atuahene-Gima and Ko (2001, p. 58) define new product performance as 'the degree to which a new product and/or service has achieved its market share, sales, rates of asset return, rates of investment return, and profit objectives'. Similarly, Maunuksela (2003, p. 15) defines new product performance as 'an analysis of the new product's technical and economical results achieved since the product has been launched and introduced to markets'. Tharnpas and Sakun (2015, p. 109) define product innovation performance as

> the financial and non-financial performance of new or improved products or services (introduced by the company in the last three years) to create new markets or customers, or satisfy current markets or customers.

This thesis uses the definition proposed by Atuahene-Gima and Ko (2001).

2.8.2 NPD Performance and its Measurement

A performance measure can be defined as 'a metric used to quantify the efficiency and/or effectiveness of an action', while performance measurement is 'the process of quantifying the efficiency and effectiveness of action' (Neely et al., 1995, p. 81). A performance measurement system can be defined as the mechanism supporting the measurement process by which the required information is gathered, recorded and processed (Kerssens-van Drongelen, 1999). Traditional performance measures are those which focus on financial, aggregative types of performance measures. These include sales, gross profit, net profit, return on investment, earnings per share and earnings per employee. Determinants-based performance measures are those that provide indications of expected outcomes so that actions may be modified to achieve desired outcomes. Silvestro et al. (1992, p. 11) described these as the measures which attempt to quantify those factors which ‘determine competitive success’. They equate with key performance drivers which focus on the separate stages and are ‘important contributors to the outcomes of processes’ (Genoff and Green, 1998, p. 47). Key performance indicators are described by Walsh (1995, p. 18) as ‘those critical measures which ultimately determine profitability and shareholder value’. In the main, they are measures of outcome that generally provide insufficient information with which to select appropriate actions that lead to process improvement.

Performance measures that focus on the NPD process have also received attention, but the variety and complexity of new products and the associated paths of their development creates challenges for measurement and comparison. Both are essential if positive improvement actions are to be recognised and incorporated in subsequent NPD process. Recent efforts in measuring and improving NPD performance have concentrated on the behaviours of individuals and groups associated with developing new products. Bridging the gap between the operational and the behavioural approach to evaluating NPD performance is Caffyn’s work on the application of continuous improvement to the process of NPD (Caffyn, 1997, 1998; Caffyn and Bessant, 1996). Her approach to measuring performance improvement in the NPD process requires measurement of the level of maturity of key behaviours. The assumption is that higher levels of maturity of these behaviours equates to improved performance. Caffyn did qualify the sensitivity, or rather lack of sensitivity in her maturity model, observing that ‘when a firm is at a more advanced level of [continuous improvement] maturity. It may be harder to state with confidence the improvement made by [continuous improvement] to improved performance' (Caffyn, 1998, p. 69). The value of the Caffyn model lies not only in its effort to establish a causal relationship between a set of generic behaviours and 62 the performance of the NPD process but in its attempt to create a measurement scale for those behaviours. Another procedure in measuring NPD performance is the technical innovation audit (Chiesa et al., 1996). This too goes beyond the study of best practice and innovation performance and explores the processes used to develop and exploit innovations. 'Their auditing methodology goes beyond performance measurement by highlighting the problems and needs, and providing information that can be used in developing action plans for improving performance' (Chiesa et al., 1996, p. 105).

Hopkins (1981) measured NPD performance by using five indexes—finance evaluation, rate for new product accounted for in the gross sales amount, objectives evaluation, percentage of successful NPD and overall subjective satisfaction scores for NPD. NPD activities for enterprise performance and strategy were proposed by Calantone et al. (1995). To measure the performance, they used the ratio of investment and the investment growth rate, ratio of sales, sales growth rate, market share and growth rate as indexes. Sicotte and Langley (2000) argued that cross-department horizontal communication and information exchanges could significantly decrease the uncertainty in NPD and improve NPD performance. This research adopted three indexes to measure NPD performance—new product sales and profits, new product life cycle and time for new product to reach market.

To measure product innovation performance, many researchers aim to evaluate innovation performance by employing a measurement scale (Liu and Atuahene-Gima, 2018). Product development performance is generally measured by three dimensions—development time, cost and quality (Krishnan and Ulrich, 2001). Langerak, Hultink and Robben (2004) used analysis that mixed these performance dimensions together to measure new product performance in finance, customer acceptance, market and timing. However, Atuahene-Gima (1995) warned that using mixed measurements of new product performance may conceal the complexity of the market or other strategic orientation performance problems. Another measurement scale was given by Alegre et al. (2006), which aims to evaluate innovation performance. The authors conceived that the performance of the product innovation is constructed with two different dimensions, efficiency and efficacy. While innovation efficiency reflects the effort carried out to achieve that degree of success, innovation efficacy reflects the degree of success of an innovation. Zhu and Nakata (2007) claim that various dimensions of performance may reflect the varied output of companies.

It is important to note that single items or multidimensional approach is the most common method employed to measure new product performance (Ledwith and O'Dwyer, 2009). The literature also suggests that the predecessors of new product performance produce different performance impacts on the market and finance (Ali, 2000). In this thesis, NPD performance is measured by a single item that measures the market size of the new product.

2.9 NPD Success

2.9.1 Conceptualisation

According to Cooper (1990a, p. 27), Cooper (2018),

> new product success was defined in a number of ways including: A simple success/failure measure: whether the product's profits met or exceeded the company's financial criterion for success; The product's profitability level; The new product's market share after Year 3; The degree to which the product met company profit and sales objectives.

Calantone et al. (1994, p. 143) defines new product success as 'a cumulative index of both the degree of financial success of the entire new product program and the degree of financial success of a particular product introduced'. Maunuksela (2003) suggests 'New product success is defined as an outcome measure for a product development project. New product development projects may be either successful or failed, to the extent that a firm achieves the goals being allocated for each particular project'. This thesis uses Kahn's (2012, p. 471) definition of NPD success, 'a product that meets its goals and performance expectations'. NPD success is different from NPD performance in that it compares the achieved performance of a new product with its goals, objectives or expectations.

2.9.2 NPD Success and its Measurement

A review of the literature revealed that NPD success could be measured at different levels by using multiple criteria. The majority of NPD success measures were developed at the project level.

Cooper and Kleinschmidt (1987) empirically identified three aspects of new product performance—financial performance, market impact and opportunity window. These dimensions are factors at the project level that illustrate the financial performance of a new product, the extent to which a new product presents new opportunities and the impact of a product in the marketplace. Hauschildt (1991) suggested that success could be effectively measured from both technical and economic perspectives and that multiple criteria were needed if a correct evaluation was to be made. Dwyer and Mellor (1991) studied the relationship between NPD performance and the implementation integrity for NPD activities from 96 manufacturers. In their study, to assess if NPD was successful, four subjective measurement indexes—assessment of the overall success or failure, profit level, sales goal and opportunities that could be brought by the new product in the future—were employed. Hart (1993) insisted that both financial and non-financial success measures can be employed as direct and indirect measures. She identified three project-level success dimensions—beating the competition to market, beating the competition technologically and providing a technological breakthrough. Song and Parry (1997) employed four indexes—overall profit, new product sales compared with competitors, profit rate for new product compared with competitors and new product success compared with the expected profit—to measure the comparative success level for a manufacturer's new product. Kahn (2012) proposed measuring NPD success with four dimensions, including three dimensions at the project level—financial, customer-based and product technical performance—and a fourth dimension at the organisational level which measures new product contribution to overall company success. Recently, Guimaraes et al. (2018) claimed that important determinants of NPD success fall into five main areas of strategic leadership, competitive intelligence, management of technology, specific characteristics of the company's innovation process and the company's absorptive capacity to use available knowledge to produce and commercialise new products.

This thesis uses a scale developed by Huang et al. (2004) to measure NPD success, using 16 core PDMA measures suggested by Griffin and Page (1993). Respondents were asked to select their most recent new product and to indicate whether they had measured the success of that project. If so, they were asked about the success measures used to make such an assessment and how well they thought the new product had performed in terms of the 16 core measures, using a five-point scale that ranged from 'well below average' to 'well above average'.

2.10 NPD Success Factors

It is obvious that to ensure their survival, firms must constantly develop new products (goods and services) that are successful in the market. Cooper (1990a) showed that only one out of four NPD projects is successful. Because of the increasing number of NPDs and the high failure rate of product innovation, identifying success factors for new product innovation is crucial. Over the past few decades, the search for new product success factors has been extensively researched. Numerous studies have been conducted to identify the best NPD practices and/or the factors which contribute to the success of NPD (Kahn et al., 2006; Ernst, 2002; Griffin, 1997). Table 2.2 summarises NPD success factors identified in the literature.

Table 2.2

NPD Success Factors Identified in the Literature

Study	Study design	Dependent variable	Identified success factors
Cooper and Kleinschmidt (1987)	Study on 203 successful and failed launched new products	New product success	- Protocol - Product advantage - Proficiency of pre-development activities
Johne and Snelson (1988)	Review of factors associated with the new products success	Product innovation success (program success)	- Style - Staff - Systems - Skills - Strategy - Structure - Shared value
Montoya-Weiss and Calantone (1994)	Review and meta-analysis of 47 studies concerning the determinants of NPD	New product performance	Strategic factors: - Product advantage - Technological synergy - Marketing synergy Development process factors: - Protocol - Top management support/skill - Proficiency of technological activities - Proficiency of marketing activities - Proficiency of pre-development activities
Cooper and Kleinschmidt (1995a)	Study on 135 SMEs, their practices and performances regarding the companies' new product programs	NPD success (company level)	- A high-quality new product process - A clear and well-communicated new product strategy - Strategic focus and synergy - Entrepreneurial climate for product innovation - Central role of senior management
Balachandra and Friar (1997)	Examination of 19 studies discussing the success of failure of R&D projects and new product introductions (absolute, cumulative number of factors cited)	Successful product innovation	R&D projects: - High-level management support - Probability of technical success - Market existence - Availability of raw materials - Need to lower cost - Timing - Commitment of project staff NPD: - Competitive environment - Technology strategy tied to business strategy - Emphasise marketing

Study	Study design	Dependent variable	Identified success factors
			- Marketing and technology are strengths Evenly cited by both types of studies: - Create, make, market interphase - R&D process is well planned - Training and experience of own people
Cooper and Kleinschmidt (2000)	Study of 110 new products launched by five Australian SMEs	NPD success (project level)	- Project advantage - Influence on firm R&D - Marketing activities - Influence on market R&D - Homework activities - Project team organisation - Perceived risk at start - Technical activities - Marketing synergy
Henard and Szymanski (2001)	Review of 41 studies that reported one or more antecedents to new product success (meta-analysis)	New product performance	- Marketing task proficiency - Technological proficiency - Market potential - Product meeting customer needs - Pre-development task proficiency - Launch proficiency - Product advantage - Dedicated human resources - Dedicated R&D resources - Order of entry - Product technological sophistication
Ernst (2002)	Literature review of the success factors of NPD	NPD success	- NPD process - Organisation - Role and commitment of senior management - Cultural aspects of NPD and strategy have not been adequately researched.
Van der Panne et al. (2003)	Review of 43 studies investigating factors behind the success or failure of innovative projects	Innovative success	- Firm's culture that is dedicated to innovation and explicitly recognises the collective nature of innovation efforts. - Firm's previous experience with innovation projects - Multidisciplinary character of the R&D team; in particular a balance between technological and marketing skills, and the presence of a product champion - Clearly articulated innovation strategy and a management style suited to that - Compatibility of the project with the firm's core competencies - Innovation's product quality and price relative to those of established products - Good timing of market introduction
Pattikawa et al. (2006)	Meta-analysis of 47 studies	New product project performance	22 variables reveal significant relations with new product project performance (e.g., top management support, organizational culture/climate and company resources) 12 variables show a sizeable influence: - Technical proficiency - Management skill - Marketing proficiency

Study	Study design	Dependent variable	Identified success factors
			- Product advantage - Financial/business analysis - Market orientation - Degree of interaction - R&D—marketing interface - General product development proficiency - Technology synergy - Project manager competency - Launch activities
Cooper and Kleinschmidt (2007)	Study of 161 businesses	New product performance (business unit level)	- A high-quality new product success - A defined new product strategy for the business unit - Adequate resources—people and money—for new products - R&D spending on new products (as percent of the business's sales)
Evanschitzky (2012)	- Updated Henard and Szymanski's (2001) meta-analysis - Review and meta-analysis of 233 empirical studies on new product success from 1999 to 2011	New product success	31 variables of product, strategy, process, marketplace and organisational characteristics have weaker and decreasing effect sizes, while two variables, cross-functional communication and competitive response intensity, have stronger effect size over time. Also the moderating effects of culture.

Below is an overview of relevant works investigating the success factors of NPD. Research is conducted differently at the company and project levels. Cooper and Kleinschmidt have decisively shaped the knowledge of critical factors that affect new product success. Since 1979, Cooper and Kleinschmidt have published more than 20 works investigating NPD success at the firm and project level. At the project level, their works were built on by Myers and Marquis (1969) and the Scientific Activity Predictor from Patterns with Heuristic Origins (SAPPHO) project conducted by a group of researchers at the University of Sussex in Brighton. SAPPHO compared 29 successful and 29 unsuccessful innovations and identified 27 characteristics of the innovation process that differentiated between success and failure. Cooper and Kleinschmidt (1987), in a study of 203 new product projects (123 success and 80 failures) in 125 Canadian companies, identified product characteristics, market characteristics, purchase characteristics, synergy and protocol as success factors of NPD. Later, in a study of 110 new product projects (67 commercial success and 43 failures) launched by 55

Australian industrial product companies, Cooper and Kleinschmidt (2000) found homework activities, product advantage, perceived risk at start, technical activities, project team organisation, marketing activities, influence on firm R&D, influence on market R&D and marketing synergy as success factors of NPD.

Cooper and Kleinschmidt's research has garnered international interest in the success factors of NPD and was built on by many studies. As a result of the increasing number of conceptual and empirical studies on NPD success factors, scholars have summarised the most important results in literature reviews and meta-analysis.

Johne and Snelson (1988) reviewed works from the *Journal of Product Innovation Management* which related to factors associated with new products' success at the project level. Their findings showed that product innovation success was based on skills, strategy, structure, shared value, style, staff and systems. Similarly, Balachandra and Friar (1997) investigated 19 studies which discussed success and failure of R&D projects and new product introductions. For R&D projects, common success factors were probability of technical success, availability of raw materials, high-level management support, market existence, need to lower cost, timing and commitment of project staff. For NPD projects, success was determined by emphasising marketing, marketing and technology strengths, competitive environment and technology strategy tied to business. In both R&D and NPD projects, Balachandra and Friar (1997) identified well-scheduled R&D process (to create and make), market interphase and training and experience of people as success factors. Ernst (2002) thoroughly reviewed the literature with a focus on the works of Cooper and Kleinschmidt. In this review, the most important findings of empirical studies that analyse the success factors of NPD at the project level were summarised. Five broad categories were used to structure his review including organisation, NPD process, the role and commitment of senior management, culture and strategy. Although three categories of NPD process, organisation and the role and commitment of senior management were identified as important measures of NPD success, two other categories (culture and strategy) were not fully studied. Forty-three studies of the factors behind the success or failure of innovative projects were investigated by Van der Panne et al. (2003). Success factors were classified under four major headings—project-related, firm-related, market-related and product-related. Based on a qualitative overview of studies, they obtained a more comprehensive number of factors behind success and failure by conducting a rank correlation analysis. From this qualitative review, the nine most comprehensive studies were identified and the most prevalent success factors identified—firm culture, previous experience with innovation projects, clearly articulated innovation strategy and a management style suited to that, compatibility of the project with the firm's core competencies, product quality and price relative to those of established products, multidisciplinary character of the R&D team and the timing of market introduction. Pattikawa et al. (2006) conducted a meta-analysis of 47 studies. The results indicated that 22 out of 34 investigated factors had a significant relationship with new product project performance (e.g., company resources, top management support and organisational culture/climate), however, only 12 factors had a sizeable relationship—the degree of organisational interaction, R&D and marketing interface, project manager competency, general product development proficiency, product advantage, management skill, financial/business analysis, technical proficiency, marketing proficiency, market orientation, launch activities and technology synergy.

Although the majority of analytical studies focused on the project level, there was another stream of study that determined NPD success factors at the company level. In an analysis of 135 Canadian SMEs, Cooper and Kleinschmidt (1995a, p. 374) found that new product success depends mainly on

> a high-quality new product process; a clear, well-communicated new product strategy for the company; adequate resources for new products; senior management commitment to new products; an entrepreneurial climate for product innovation; senior management accountability; strategic focus and synergy (i.e., new products close to the firm's existing markets and leveraging existing technologies); high-quality development teams; and cross-functional teams.

In another study of 161 companies in various industries in Germany, US, Denmark and Canada, Cooper and Kleinschmidt (2007) identified four key factors of NPD success—the company’s new product strategy, a high-quality new product process, R&D spending levels and resource availability. According to Cooper and Kleinschmidt (2007), NPD success at the company level might differentiate from success at the project level.

The literature on critical success factors for NPD is mature, as evidenced by the large number of works studied for ways to synthesise and generalise the accumulated evidence on key factors for determination of NPD success. Montoya-Weiss and Calantone (1994) conducted the first review and meta-analysis investigating the determinants of new product performance. They examined 47 studies in their review and grouped success factors into four main categories—development process, strategy, market environment and organisation. In their meta-analysis, they used various tools of analysis such as a correlation effect size test, a combined hypothesis test and a qualitative summary count of factors. Eighteen success factors at the company or project level were identified, whereas most of the reviewed studies (78.7 %) were project based. Frequently occurring factors in the reviewed studies are product advantage, marketing synergy, top management support/skill, technological synergy, the proficiency of technological activities, protocol, the proficiency of marketing activities and the proficiency of pre-development activities. However, these results may be biased as the effect sizes were not corrected for artefacts and a moderator analysis was not provided. Conducting these procedures might improve or at least change the results of a meta-analysis.

To overcome these limitations, Henard and Szymanski (2001) examined 41 studies in their meta-analysis which corrected for artefacts following by performing a moderator analysis. The study classified 24 predictors of new product performance in four categories—firm strategy characteristics, firm process characteristics, product characteristics and marketplace characteristics. Market potential, product advantage, pre-development task proficiencies, meeting customer needs and dedicated human and R&D resources were identified as the most important factors of new product performance. Their use of a broad conception of new product performance, including both firm- and project-level performance measures, may have led to the bias of the results. The results bias was caused by mixing firm- and project-level performance measures into a single factor in the meta-analysis—differences in the predictor–performance relationship could not be indicated.

Evanschitzky (2012) updated Henard and Szymanski's (2001) meta-analysis and conducted a review and meta-analysis of 233 empirical studies on new product success from 1999 through 2011. They identified 31 variables of product, strategy, process, marketplace and organisational characteristics had weaker and decreasing effect sizes, while two variables—cross-functional communication and competitive response intensity—had stronger effect size over time. They also found the moderating effects of culture. Changes in the effect sizes of NPD success factors might have developed from a rapid changes in research approaches or from changing economic environment. The results, however, might be biased as they included firm- and project-level studies.

Recently, Abu et al. (2018) identified the critical success factors (nine) and obstacles (12) to NPD implementation among SMEs.

2.11 Gaps in the Literature

Based on the above literature review of WI, NPD capability, NPD process, NPD strategic planning, NPD resource allocation, NPD performance, NPD success, NPD success factors and innovation in Vietnamese manufacturing SMEs, the following important gaps are identified.

Firstly, there is no research on NPD process, strategic planning, resource allocation and success at the project level in the context of Vietnamese manufacturing SMEs. Secondly, there is no research about NPD success factors at the project level in the context of Vietnamese manufacturing SMEs. Thus, this thesis aims to fill this gap by examining the NPD management activities of Vietnamese manufacturing SMEs' senior managers, manifesting in the NPD process, strategic planning, resource allocation and success measure, and by investigating the NPD success factors in Vietnamese manufacturing SMEs. These are covered by RQ1 and RQ2 (see Section 1.2).

2.12 Summary

The aim of this chapter was to review and analyse the literature related to this thesis and identify gaps in previous research. The literature was reviewed in relation to the main concepts—WI, NPD capability, NPD process, NPD strategic planning, NPD resource allocation, NPD performance, NPD success and NPD success factors.

The review undertaken in this chapter has revealed sizeable gaps in the literature. Empirical research of WI and NPD has largely been confined to North America and Northern Europe. The current state of NPD process, strategic planning, resource allocation and success measures in Vietnamese manufacturing SMEs has not been investigated. No empirical research has been conducted to investigate NPD success factors in the context of Vietnamese manufacturing SMEs.

In synthesising the relevant literatures, it was demonstrated that the NPD process, strategic planning, resource allocation, success measure and success factors should be examined in Vietnamese manufacturing SMEs. The next chapter reviews the theoretical framework and relationships between WI, NPD capability and NPD strategic planning that impacts on NPD performance in Vietnamese manufacturing SMEs.

Chapter 3: Research Framework and Hypotheses Development

The chapter provides an overview of the national and international literature addressing the relationships between WI, NPD capability, NPD strategic planning and NPD performance. This overview identifies the gaps in the literature and informs the hypothesis that form the foundation of this thesis.

There are main two sections in this chapter. The first (Section 3.1) critically overviews the theories uncovering the relationship between WI, NPD capability, NPD strategic planning and NPD performance. The second (Section 3.2) identifies the relationships between WI, NPD capability, NPD strategic planning and NPD performance in the literature and presents the five main hypotheses and 35 sub-hypotheses.

3.1 Theoretical Framework

This thesis adopts the theories of knowledge creation, dynamic capabilities view (DCV) and resource-based view (RBV) in conjunction with contingency theory to highlight the importance of WI, NPD capability, NPD strategic planning and NPD performance.

3.1.1 Theory of Knowledge Creation

Knowledge was defined by the ancient Greeks as justified true belief, which suggests that knowledge is something absolute, objective and context free. However, Takeuchi (2013) defined knowledge as a human, dynamic and social process of justifying personal belief towards the truth. The most important feature of knowledge, in comparison with physical resources and information, is that it is derived from human interaction. Individuals interact with each other to exceed their boundaries and realise their vision of the future. As a result, they change themselves, others, the environment and the organisation.

Nonaka and Takeuchi (1995, p. 3) introduced a theory to explain the phenomenon of organisational knowledge creation, defined as ‘the capability of a company as a whole to create new knowledge, disseminate it throughout the organization, and embody it in products, services and systems’. They defined knowledge as ‘justified true belief’ (p. 21) to reflect the context in which knowledge exists. Nonaka and Takeuchi claimed that knowledge is initially created by individuals and then becomes organisational knowledge through a process reported by the theory. They stated that organisational knowledge creation has two dimensions, epistemological and ontological. On the epistemological side, the authors recognised two types of knowledge, tacit and explicit. Explicit knowledge can be written down and relatively easily transferred from one person to the next. More specifically, explicit knowledge is knowledge that can be codified, articulated and is easy to be communicated through words and numbers. It can be spread widely in the form of hard data, formulae and principles. Examples of explicit knowledge are an ISO-based quality management process, a lecture by an expert on the quality requirements of the market or a guide book on safe food preparation. In organisations, explicit knowledge exists in the form of company policies, systems, guidelines and procedures. Tacit knowledge is more difficult to express clearly because it often arises out of experience. Tacit knowledge is difficult to express in forms of languages such as words and numbers. It is often intrinsic and unclear. Tacit knowledge is difficult to formalise and communicate because it is highly context specific and has a personal quality (Nonaka et al., 1994). Subjective insights, intuition and hunches are examples of tacit knowledge. For some people, tacit knowledge is known but it is difficult for them to explain and clarify to others.

The ontological dimension moves from the individual at one end of the range to group, team, organisation and beyond. ‘A spiral emerges when the interaction between tacit and explicit knowledge is elevated dynamically from a lower ontological level to higher levels' (Nonaka and Takeuchi, 1995, p. 57). This pattern is created by conversion of four modes of knowledge which is converted from one knowledge type to another. The modes of knowledge conversion consist of combination (from explicit to explicit knowledge), internalisation (from explicit to tacit knowledge), socialisation (from tacit to tacit knowledge) and externalisation (from tacit to explicit knowledge). While each of the four modes can independently create knowledge, the organisational knowledge creation process can only take place when all four modes are organisationally managed and dynamically interacted. The process constitutes a 'knowledge spiral' which is highly repetitious and starts at the individual level, moves up to the collective (group) level and then to the organisational level mainly through informal networks of relations within the organisation, resulting in a 'spiralling effect' of knowledge accumulation and growth.

The creation of new knowledge would enable the organisation to engage in creative activities that can bring about innovation. Nonaka and Takeuchi (1995) note that continuous innovation is derived from knowledge creation. Nonaka (2007, p. 2) writes

> The knowledge-creating company is much about ideals as it is about ideas. And that fact fuels innovation. The essence of innovation is to re-create the world according to a particular vision or ideal. To create new knowledge means quite literally to re-create the company and everyone in it in a nonstop process of personal and organizational self-renewal.

This indicates that innovation is a natural outcome of knowledge creation. Andreeva and Kianto (2011) pointed out that from among all knowledge management processes, knowledge creation is the most important for innovation in organisations.

Nonaka and Takeuchi (1995) state that individual knowledge is ‘amplified’ into and throughout the organisation through these four modes and under five conditions that enable and promote organisational knowledge creation—autonomy, intention, redundancy, fluctuation and creative chaos and requisite variety. The five phases of the organisational knowledge creation process are sharing tacit knowledge, creating concepts, justifying concepts, building an archetype and cross-levelling knowledge. In development of this theory, Nonaka and Takeuchi (1995) reviewed numerous works, including Anderson (1983) and Singley and Anderson (1989) studies on declarative (explicit) and procedural (tacit) knowledge from cognitive psychology, Brown (1991) study on communities of practice, Johnson-Laird (1983) work on shared mental models, Polyani’s (1966) work on tacit and codified (explicit) knowledge and Donnellon, Gray and Bougon’s (1986) work on metaphors.

The theory of knowledge creation used in this thesis originates from Nonaka et al. (1994) and was advanced by Nonaka and Takeuchi (1995, 2007) and Nonaka and Toyama (2003). This is one of the most well known theories of knowledge and knowledge creation and perhaps the most widely accepted and employed.

3.1.2 Resource-Based View

RBV originated in the field of economics and has been translated to other scientific disciplines including organisational and management science. RBV was mainly developed between 1984 and the mid-1990s after the first initial work by Wernerfelt (1984) attempted to formalise RBV (Kraaijenbrink et al., 2010; Newbert, 2007). Since then, many articles have been put forward on RBV (e.g., Priem and Butler, 2001; Barney, 1991; Hamel and Prahalad, 1990; Dierickx and Cool, 1989) contributing to its conceptual development. The use of RBV, however, was only widespread after the publication of a groundbreaking article by Hamel and Prahalad (1990) followed by the important work of Barney (1991). According to Barney’s (1991) work and later works, the resources of a firm consist of the capabilities, assets, firm attributes, organisational processes, knowledge information and others. In another aspect, firm resources can be defined as either physical, human or organisational. Resources can be tangible or intangible (Mathews, 2003; Spanos and Lioukas, 2001; Gupta and Roos, 2001; Haanes and Fjeldstad, 2000; Hoskisson et al., 1999). According to a firm's ideas on how to adopt them, the same resources can be put to use in different ways. In this sense, firms are really repositories of knowledge based on a close relationship between the knowledge that people in the organisation retain and the services obtained from the resources. The RBV of the firm approach recognises the strategic importance of social and behavioural interactions in the conceivability of the choice and implementation of the strategies of the organisation (Barney and Zajac, 1994; Barney, 1986).

Since Barney's (1991) paper, several scholars approached the firm and its strategy from a resource-based perspective. In term of a strategic perspective of the RBV of the firm, the organisation is a collection of capabilities and unique competencies affecting its evolution and options for strategic growth (Barney, 1991; Dierickx and Cool, 1989; Winter and Teece, 1987). The resources, which are the basis of this theory, define the differences in performance between firms. The resources are the basis of an organisation's strategy and are employed to fulfil it. According to Hoopes et al. (2003), the differences in performance within an industry are explained by using this theory. The RBV of the firm states that differences in performance happen when organisations possess valuable resources that others do not have, enabling them to achieve a rent in its quasi-monopolist form (Wernerfelt, 1984). This thesis builds on the RBV of Barney (1991).

3.1.3 Dynamic Capabilities View

In the early 1990s, the RBV was criticised as being static and neglecting the influence of high market dynamism because of the fast-changing business environment (e.g., Priem and Butler, 2001; Eisenhardt and Martin, 2000). Recently, resource-based literature has highlighted that firms cannot retain their competitive advantage regardless of the uniqueness of the resources and capabilities they possess (Hewitt-Dundas, 2006). Other researchers have proposed that the average duration for which firms can maintain competitive advantage has reduced over time. This suggests that to obtain long-term competitive advantage in fast-changing environments is a hard task for companies (Barreto, 2010). In the RBV, resources and capabilities are hard to change in the short term and difficult to retain their value for long period because they are heterogeneous and 'sticky' (Galunic and Eisenhardt, 2001). Such distinctive and non-substitutable capabilities and resources are actually highly specialised. This led to the rapid decrease of the value of resources and capabilities in situations where there is no demand for the output of the firms due to rapid changes in the markets. As a result, emphasising resource advantages alone is not enough to provide sustainable competitive advantage in the new competitive environment (Leonard and Barton, 1992).

To obtain the good performance, organisations should instantly react to their rapidly changing environment. DCV uses inclusion of dynamic external factors in addressing the integration and reconfiguration of both internal and external competencies to extend the RBV. A question of how firms can sustain competitive advantage in dynamic business environments is answered by a research framework provided by DCV. Teece, Pisano and Shuen (1997, p .2) referred to dynamic capability as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments'. Capabilities are not readily available in the market that it needs to be built from the firms (Teece et al., 1997). To face the challenges from the changing business environment, firms need to reconfigure the variety of capabilities they possess (Weerawardena and Mavondo, 2011). DCV is more about economical strategic management which emphasises the strategic and external aspects of organising.

This thesis builds on the DCV by (Teece et al., 1997), in contrast to the resources/competences (i.e., the RBV of the firm) which map well into the operational capabilities of a firm. The DCV maps well into the high-level activities of a firm (such as strategy making).

3.1.4 Contingency Theory

Contingency theory posits that organisational effectiveness is achieved by matching organisational characteristics to contingencies. ‘Contingency’ is defined as ‘any variable that moderates the effect of an organizational characteristic on organizational performance’ (Donaldson, 2001, p. 7). A number of potential contingencies have been identified in the literature (e.g., technology, innovation, environmental change, size and diversification). Donaldson (2001) argued that size, environment and technology are the underlying contingencies in the contingency literature. While size is relatively straightforward, the ways researchers operationalised the environment and technology contingencies have been a source of contention (Pennings, 1975). Donaldson (2001) suggested that many contingencies, excluding size, can be divided into two aspects of organisational tasks, task uncertainty and task interdependence. Along with size, task uncertainty and task interdependence make up the underlying contingencies of the contingency literature.

Strategy literature has a rich history that demonstrates the direct effect of environment on a firm’s strategic initiatives (Venkatraman and Camillus, 1984; Hofer, 1975) and its implications for firm performance (Miller and Friesen, 1983). Organisations must modify their structures to cope with the additional information processing requirements invoked by more dynamic, hostile or complex environments (or they must somehow avoid or control these environments) (Miller and Friesen, 1983). It seems, however, that organisations must also revise their strategy-making processes to cope with more challenging environments. Thus, not only must managers focus attention on achieving a ‘match’ or congruence between environment and structure and between strategy and structure. A third link, between strategy making and environment, must also be carefully managed. Increased environmental dynamism seems to occasion the need for more analysis and innovation, growing environmental hostility seems to require additional analysis and firms facing more heterogeneity benefit from innovation.

The contingency perspective has attracted research attention in many disciplines. Contingency theory’s basic premise lies in the assumption that firm performance is determined by the fit between environment and strategy. Therefore, to achieve good performance, the strategies of firms need to be manipulated in each particular internal and external circumstance that they face (Miller and Friesen, 1986). This thesis uses the contingency theory of Miller and Friesen (1983). The environment–strategy–performance paradigm of this theory states that when strategy fits environment, firms will maximise performance.

3.2 Hypotheses and Conceptual Framework

Based on the theoretical framework, by integrating contingency theory (Miller and Friesen, 1983) with DCV (Teece et al., 1997), this thesis sought to extend the environment–strategy–performance paradigm to a new environment–capability–strategy–performance paradigm by examining the relationships between WI (as environment), NPD capability, NPD strategic planning and NPD performance. This thesis model aims to extend the contingency theory, a three-paradigm system, to a four-paradigm system in the context of Vietnamese manufacturing SMEs. It suggested there is a co-evolution, co-alignment of environment, capability, strategy and performance, manifested through the field of NPD, and that the fit between WI, NPD capability and

NPD strategic planning will determine NPD performance. The relationships between WI and NPD capability, NPD capability and NPD strategy, and between NPD strategy and NPD performance have been extensively investigated in the literature. These relationships are discussed in detail in this section.

3.2.1 WI and NPD Capability Relationship

The capability view assesses the extent to which the company's competencies, culture and conditions support the conversion of innovation resources (including WI) into opportunities for business renewal. The inputs of this capability view are the preconditions for WI (i.e., the extent to which a company's skills, marketing, culture and values are adapted to innovation). Outputs include the development of new skills and knowledge domains that spawn innovation and the number of strategic options.

On the premise that the firm's resources, including WI, and capabilities provide performance differentials, the RBV has attracted considerable research attention. Analyses of theoretical developments within the literature show that RBV has largely been conceptualised and discussed within two streams of research. One adopts the position that the firm's heterogeneous resources that are valuable, rare, inimitable and non-substitutable drive performance differentials (Barney, 1991; Crook et al., 2008). The other stream adopts the position that resources only have potential value (Ketchen et al., 2007) and it is the firm's capabilities to deploy its resources that drive performance differentials (Eisenhardt and Martin, 2000).

Chatterjee (2009), with evidence from the Chinese and Indian auto-component sectors, found trust and learning as moderators in achieving global supply chain competitiveness. In addition, Song et al. (2010) used survey data from 194 firms from mainland China and found that trust and learning both have a positive impact on innovation performance. Based on a sample of 115 Chinese firms, Song et al. (2008) confirmed the influence of knowledge sharing behaviour on innovation capability.

Zhaoquan (2011b), based on an analysis of knowledge sharing and NPD of a firm, concluded there is a relationship between knowledge sharing and NPD. An analysis of 251 Spanish high and medium-high manufacturing firms, Delgado-Verde, Martín de Castro and Emilio Navas-López (2011) confirmed that higher product innovation capability resulted from culture and CEO commitment towards innovation within the firm. Based on 244 samples from Chinese companies, Guo-quan (2008) ran statistical analysis and found that the measurement instrument for individual learning capability has acceptable reliability and validity, and that individual learning capability was significantly positively correlated with complex and dynamic business environment. The relationship between innovation resource–capability complementarity and innovation-based performance in Cambodia SMEs was also tested by (Sok and O'Cass, 2011). The researchers also confirmed that while innovation resource–capability complementarity drives innovation-based performance, their relationship will be enhanced via the firms' possession of superior learning capability. These findings show a significant effect of innovation resource–capability complementarity on innovation-based performance. Slater et al. (2014), studying product innovation capability, suggested that organisational culture, structure, innovation process and senior leadership lead to dynamic capabilities in terms of RPIC. In an analysis of 144 Spanish industrial firms, Camisón and Villar-López (2014) confirmed that the development of technological innovation capabilities was favoured by the organisational innovation and both organisational innovation and technological capabilities for products and processes can lead to superior performance of a firm. Farhang (2017), in an analysis of 157 Iranian manufacturing firms, showed observation of a positive relationship between organisational innovation and performance through product innovation capabilities. From these studies, the first hypothesis is developed:

H1: There is a relationship between WI and NPD capability in Vietnamese manufacturing SMEs.

3.2.2 NPD Capability and NPD Strategic Planning Relationship

The competitive advantage of a firm is a function of industry analysis, organisational governance and firm effects in the form of capability and strategies (Mahoney and Pandian, 1992). Firms can shape their strategies in response to the demands of competitive environments and, in the process, develop capabilities that suit the competitive environment. In the first place, both organisation and competition are clearly important in shaping strategy and performance. Secondly, the inconclusive nature of much of the existing research reflects the fact that organisational capabilities, competition, strategy and performance are fundamentally endogenous. In other words, reciprocal interactions at multiple levels of analysis between the market environment and firm capabilities shape business strategy and performance, while interactions between strategy and performance in turn shape both organisational capabilities and competitive environment. Specific resources should be related to tactical and strategic decisions and actions—that is, firms should select their strategies to generate rents based on resource capabilities.

Chew et al. (2008) reported there were positive relationships between capability and strategy, which suggests a need to align core capability and competitive strategy as a precondition for superior performance. Akter et al. (2016), in the findings from two Delphi studies and 152 online surveys of business analysts in the US, indicated the significant moderating impact of the analytics capability–business strategy alignment relationship. Andriopoulos et al. (2018), in an analysis of over 2,500 manufacturing SMEs in Vietnam, found that most use relatively low-level technologies. In an analysis of 215 Chinese companies from the electronics industry, Shan and Jolly (2013) found that the differences of technological innovation capabilities (TICs) have a positive effect on product innovation. Vickery et al. (2013), in an analysis of 214 US manufacturing firms from four industries (industrial and commercial machinery, fabricated metal products, transportation equipment and electronics), they confirmed NPD has a positive influence on NPD strategy.

Bates et al. (2001), in an effort to link strategy to capability by using an Australian approach to concept development and experimentation, mentioned that an NPD capability rooted in outsourcing may be transient whereas an in-house strategy means the firm can fully appropriate the value of the NPD capability despite initially higher investment costs. Control over the full NPD capability afforded through an in-house strategy might then enable superior long-term movement to an entirely new value chain position or an entirely new value chain for the firm. In effect, make-or-buy decisions such as in-house development can enable greater benefits over time beyond simply transaction cost benefits (Cánez et al., 2000). From the literature, it is clear there is a positive relationship between NPD capability and NPD strategy. This leads to the second hypothesis:

H2: There is a relationship between NPD capability and NPD strategic planning in Vietnamese manufacturing SMEs.

3.2.3 NPD Strategic Planning and NPD Performance Relationship

A firm's NPD strategy describes what the firm desires to achieve from its new products and provides strategic direction for its NPD activities (Brews and Hunt, 1999; Song and Montoya-Weiss, 1998) by planning the role and goals of, and by allocating adequate resources to, that function (Brown and Eisenhardt, 1995; Cooper and Kleinschmidt, 2007). As strategic planning involves defining new product goals, identifying target markets and examining the fit between the intended new products and a firm's strategy (Brown and Eisenhardt, 1995; Salomo, Weise and Gemünden, 2007), it enables the firm to align its NPD efforts with technological developments and market requirements. Moreover, establishing a clear relationship between NPD and business goals can lead to reduced role ambiguity within the organisation. Thus, NPD strategic planning can improve communication, increase integration (Moenaert et al., 1994) and reduce potential conflicts between NPD and marketing (Song and Thieme, 2006).

NPD performance is the operational effectiveness of a firm's NPD activities (i.e., quality, timeliness and customer responsiveness). A good level of strategy in the firm (Cooper, 1985) results in improved NPD performance (Gatignon and Xuereb, 1997; Voss and Voss, 2000). Such firms systematically monitor trends in existing technologies, identify emerging technologies and allocate resources to their NPD activities accordingly (Chiesa et al., 1996). Thus, technological strategy enables firms to rapidly integrate new technologies and create better solutions and/or applications to fulfil customer expectations of high-quality products in a timely manner (Zhou et al., 2005).

The relation between NPD strategy and NPD performance has been extensively studied. Kotabe (1990) reported that product innovation level has a direct relation to performance, that is, the higher the product innovation level the better performance. Davis (1988) studied three NPD cases (two failures, one success) with seven activities proposed by Booz, Allen and Hamilton. Both failures indicated that omitting the important product developing activities tests will lead to failure. While the successful case was mainly due to implementation of product development activities step by step. Cooper (1984) investigated 58 innovative industrial products from 30 different industrial companies and found that in seven NPD activities the successful cases had complete implementation activities. Hise et al. (1989) concluded in their studies that a company that performs its operations without a specific procedure or lacking a complete development schedule will decrease its success rate for NPD and entry to market. Zirger and Maidique (1990) conducted case studies using 23 variables and eight models to compare each success or failure characteristic among 148 electronic products. The results showed that a company with excellent R&D organisation would have higher success probability in NPD due to the completeness of the development activities. Wheelwright and Clark (1992) pointed out that if a company wanted to achieve integration of all upstream (i.e., design) and downstream (i.e., manufacturing) problems, all design activities must include three capabilities—possessing a keen perception in solving downstream problems, zero-error design and rapid problem-solving. These design capabilities rely deeply on the complete product development activities.

The importance of firms to have an unambiguously clear new product strategy backed by sufficiently detailed action plans has been widely acknowledged by NPD scholars. The relationship between strategic planning on NPD performance has been empirically examined in various contexts (Calantone et al., 2003; Cooper and Kleinschmidt, 1995b; Langerak et al., 2004; Rauniar et al., 2008; Salomo et al., 2007; Slater et al., 2006; Acur et al., 2012). Cooper and Kleinschmidt (1995) first investigated the relationship between strategic planning and NPD performance. Later, Calantone et al. (2003), in an analysis of 461 US firms, confirmed the positive relationship between corporate strategic planning and NPD performance. Slater et al. (2006) reported that strategic orientation moderates the relationship between different elements of the strategy formation capability and performance in US manufacturing and service businesses. Recently, Acur et al. (2012) further investigated this relationship and argued that strategic planning indirectly influences NPD performance through achieving better strategic alignment (based on data collected in Denmark, Finland, Norway and the Netherlands). Cooper and Kleinschmidt (1991) interviewed higher-level managers from five large companies (IBM, 3-M, GM, Northern Telecom, Emerson Electric) that had implemented NPD procedures. All agreed on the positive effect of implementing NPD procedures. The third hypothesis is based on the strong relationship between NPD strategy and NPD performance demonstrated by the above literatures:

H3: There is a relationship between NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs.

3.2.4 Hypotheses

The literature asserts there are positive relationships between WI and NPD capability, NPD capability and NPD strategic planning, and NPD strategic planning and NPD performance. Based on these relationships, this thesis's conceptual framework was constructed to identify the relationships among WI, NPD capability, NPD strategic planning and NPD performance simultaneously in the context of Vietnamese manufacturing SMEs. Based on the lack of a comparable study (i.e., one simultaneously investigating and integrating concepts such as WI, NPD capability, NPD strategic planning and NPD performance), a conceptual framework was created to answer RQ3. From RQ3, three hypotheses need to be addressed.

H1 was developed from the aforementioned studies of Song et al. (2008), Zhaoquan (2011b), Delgado-Verde et al. (2011), Slater et al. (2014) and Farhang (2017). Song et al. (2008) employed SEM to empirically investigate the influence of knowledge sharing behaviour on absorptive capacity and innovation capability, and the mediating effects of absorptive capacity in their study of 115 Chinese firms. Zhaoquan (2011b) discussed issues including the process of knowledge accumulating, renewing and sharing, the improvement of intellectual capital and technological innovation capability. Delgado-Verde et al. (2011) tested empirically the relationships between organisational knowledge assets and the innovation capability of the firm. Slater et al. (2014) highlighted how the components of a radical innovation capability function differently from those of incremental innovation capability and reviewed the relationship among them. Farhang (2017) identified positive relationship between organisational innovation and process innovation capabilities and between organisational innovation and performance through process innovation capabilities. The study also reported a positive relationship between product innovation and company performance and a positive relationship between organisational innovation and performance through product innovation capabilities.

H1 is divided into 28 sub-hypotheses:

H1a1: There is a relationship between learning capability and organisational innovation in Vietnamese manufacturing SMEs.

H1a2: There is a relationship between organisational innovation and R&D capability in Vietnamese manufacturing SMEs.

H1a3: There is a relationship between organisational innovation and resources allocation capability in Vietnamese manufacturing SMEs.

H1a4: There is a relationship between organisational innovation and manufacturing capability in Vietnamese manufacturing SMEs.

H1a5: There is a relationship between organisational innovation and marketing capability in Vietnamese manufacturing SMEs.

H1a6: There is a relationship between organisational innovation and organisation capability in Vietnamese manufacturing SMEs.

H1a7: There is a relationship between organisational innovation and strategic planning capability in Vietnamese manufacturing SMEs.

H1b1: There is a relationship between innovation climate and learning capability in Vietnamese manufacturing SMEs.

H1b2: There is a relationship between innovation climate and R&D capability in Vietnamese manufacturing SMEs.

H1b3: There is a relationship between innovation climate and resources allocation capability in Vietnamese manufacturing SMEs.

H1b4: There is a relationship between innovation climate and manufacturing capability in Vietnamese manufacturing SMEs.

H1b5: There is a relationship between innovation climate and marketing capability in Vietnamese manufacturing SMEs.

H1b6: There is a relationship between innovation climate and organisation capability in Vietnamese manufacturing SMEs.

H1b7: There is a relationship between innovation climate and strategic planning capability in Vietnamese manufacturing SMEs.

H1c1: There is a relationship between individual innovation and learning capability in Vietnamese manufacturing SMEs.

H1c2: There is a relationship between individual innovation and R&D capability in Vietnamese manufacturing SMEs.

H1c3: There is a relationship between individual innovation and resources allocation capability in Vietnamese manufacturing SMEs.

H1c4: There is a relationship between individual innovation and manufacturing capability in Vietnamese manufacturing SMEs.

H1c5: There is a relationship between individual innovation and marketing capability in Vietnamese manufacturing SMEs.

H1c6: There is a relationship between individual innovation and organisation capability in Vietnamese manufacturing SMEs.

H1c7: There is a relationship between individual innovation and strategic planning capability in Vietnamese manufacturing SMEs.

H1d1: There is a relationship between team innovation and learning capability in Vietnamese manufacturing SMEs.

H1d2: There is a relationship between team innovation and R&D capability in Vietnamese manufacturing SMEs.

H1d3: There is a relationship between team innovation and resources allocation capability in Vietnamese manufacturing SMEs.

H1d4: There is a relationship between team innovation and manufacturing capability in Vietnamese manufacturing SMEs.

H1d5: There is a relationship between team innovation and marketing capability in Vietnamese manufacturing SMEs.

H1d6: There is a relationship between team innovation and organisation capability in Vietnamese manufacturing SMEs.

H1d7: There is a relationship between team innovation and strategic planning capability in Vietnamese manufacturing SMEs.

H2 was developed from the aforementioned studies of Barczak (1995), Shan and Jolly (2013), Ng and Hamilton (2015) and Vickery et al. (2013). Barczak (1995) in particular found that a company's focus should be on ensuring the best possible fit between its chosen NPD strategy and its corporate goals and capabilities. Recently, Ng and Hamilton (2015) found that a product innovation strategy maximised performance, mediating innovation and human capital capabilities in their study of 110 firms from the information and communications technology industry in New Zealand. They also confirmed that financial and organisational capabilities had direct positive effects on performance irrespective of strategy. Shan and Jolly (2013), in their study of 215 Chinese companies in the electronic industry, also identified that different technological innovation capabilities had a positive impact on product innovation, beginning with the linkage capability, moving to the production capability and ending with the investment capability. They also showed that product innovation has a mediating effect on the relationship between different technological innovation capabilities and firm performance. Vickery et al. (2013) reported supply chain integration for NPD as a dynamic capability and explores its relationship with a product platform strategy, NPD performance and overall firm performance.

H2 is divided into seven sub-hypotheses:

H2a: There is a relationship between learning capability and NPD strategic planning in Vietnamese manufacturing SMEs.

H2b: There is a relationship between R&D capability and NPD strategic planning in Vietnamese manufacturing SMEs.

H2c: There is a relationship between resources allocation capability and NPD strategic planning in Vietnamese manufacturing SMEs.

H2d: There is a relationship between manufacturing capability and NPD strategic planning in Vietnamese manufacturing SMEs.

H2e: There is a relationship between marketing capability and NPD strategic planning in Vietnamese manufacturing SMEs.

H2f: There is a relationship between organisation capability and NPD strategic planning in Vietnamese manufacturing SMEs.

H2g: There is a relationship between strategic planning capability and NPD strategic planning in Vietnamese manufacturing SMEs.

H3 was developed from the pioneer work of Calantone et al. (2003) which addressed a baseline model with firm innovativeness, market orientation and top-management risk taking as antecedents to NPD speed and corporate strategic planning. These, in turn, are modelled as antecedents to NPD program performance and a relationship between NPD corporate strategic planning and NPD program performance were also confirmed. This hypothesis was also developed from Liu et al. (2005), which emphasised that 1) there is a positive effect on NPD performance for those companies that strongly implement knowledge management method, 2) different NPD strategies taken by companies lead to variations in performance, and 3) innovation is more effective than a copying strategy. High technology companies that use an effective knowledge management method to establish NPD strategies will succeed.

By addressing research question 4*: To what extent does the specified model representing the impact of WI, NPD capability, NPD strategic planning on NPD performance fit the data gathered from Vietnamese manufacturing SMEs?* fourth hypothesis is developed:

H4: The specified model representing the effect of WI, NPD capability, NPD strategic planning on NPD performance perfectly fits the data gathered from Vietnamese manufacturing SMEs.

This indicates that the specified model can be employed to demonstrate the effect of WI, NPD capability and NPD strategic planning on the NPD performance of manufacturing SMEs in Vietnam. This hypothesis also investigates the fit of the relationships between WI and NPD capability, NPD capability and NPD strategic planning, and NPD strategic planning and NPD performance in the model.

Another fifth hypothesis arises from RQ5 "*To what extent do two groups of managers and employee moderate the specified model representing the effect of WI, NPD capability, NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs?"*:

H5: There is a moderating effect between two groups (managers and employees) on the specified model representing the effect of WI, NPD capability and NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs.

H5 is developed from RBV theory and reveals the effect of human resources on the WI, NPD capability and NPD strategy of Vietnamese manufacturing SMEs.

3.2.5 Conceptual Framework

Based on the in-depth literature review and comprehensive analysis of the manufacturing SMEs in Vietnam, a conceptual framework which shows the relationship between concepts has been successfully developed (see Figure 3.1). Particularly, there is a strong relationship between WI and NPD capability (Chatterjee, 2009; Song et al., 2008; Zhaoquan, 2011b; Delgado-Verde et al., 2011; Camisón and Villar-López, 2014; Farhang, 2017), followed by a mutual interaction between NPD capability and NPD strategic planning (Shan and Jolly, 2013; Vickery et al., 2013). Finally, evidence from the literature review show that NPD strategic planning is closely related to NPD performance (Calatone et al., 2003). Moreover, managers and employees have a strong moderating effect on the WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs.

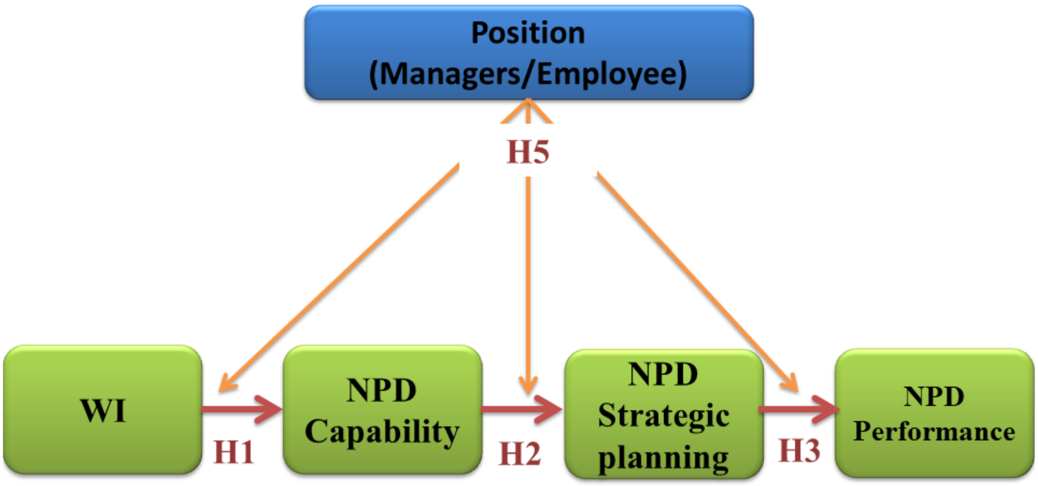

Figure 3.1. Conceptual Model. H = hypothesis, WI = workplace innovation, NPD = new product development.

References: **WI and NPD Capability Link** (Chatterjee (2009), Song et al. (2008), Zhaoquan (2011b), Delgado-Verde et al. (2011), Camison and Villar-Lopez (2014) and Farhang (2017)); **NPD Capability and NPD Strategic Planning Link** (Shan and Jolly (2013), Vickery et al. (2013)); **NPD Strategic Planning and NPD Performance relationship** (Calatone et al., 2003)

3.3 Summary

The chapter reviewed and analysed the literature to identify gaps in research, formulate hypotheses and develop the conceptual model. The literature was reviewed in relation to the concepts of WI, NPD capability, NPD strategic planning and NPD performance. To date, the relationship between WI, NPD capability, NPD strategic planning and NPD performance has not been investigated. Therefore, it is necessary to determine these relationships. Five RQs and Five hypotheses have been drawn from the literature review undertaken in Chapters 2 and 3. The literature has demonstrated there are relationships between WI, NPD capability, NPD strategic planning and NPD performance. The next chapter details the research methodology.

Chapter 4: Methodology

This chapter explains the research methodology used to test the hypotheses and answer the RQs. Sections 4.1–4.2 discuss the research paradigm and design. Sections 4.3 explains the instrument development. Sections 4.4–4.9 detail the sampling and data collecting process. Section 4.10 outlines the data analysis procedures used, such as factor analyses and structural modelling. Section 4.11 discusses the ethics of this thesis.

4.1 Research Paradigm

A research paradigm includes ontological and epistemological assumptions and methodology. While ontological assumptions refer to the nature of reality, epistemological assumptions represent the recognition in association with the object being studied, which is considered real. Methodology is the process and means to understand something real.

In this thesis, three dominant paradigms in social research are considered, positivism, interpretivism and critical realism. This thesis was informed by positivist ontological and epistemological assumptions for the following reasons. Firstly, the purpose of this thesis is to develop a research framework with examinable hypotheses to test the influence of WI, NPD capability and NPD strategic planning on NPD performance, together with the moderating role of two groups in the context of manufacturing SMEs in Vietnam. Therefore, this thesis applies a deductive method of reasoning, a fundamental characteristic of the positivist paradigm, to validate the hypotheses. Secondly, SEMs survey is the tool used to obtain the constructs under investigation. In this thesis, a questionnaire was utilised to quantify the constructs and statistical techniques were used to assess the hypotheses concerning the research variables. SEM methods and tools were used to undertake confirmation of the reliability and validity of the model at measurement and structural levels. The function of the researcher is to clarify the outcomes of an analysis in consideration with prior assumptions, with minor interference to the collected data. These features of the thesis are in line with both the ontological and epistemological elements of the positivist paradigm. Thirdly, according to Creswell (2009), when the researcher and reality are not connected and the findings should be replicable without regard to who conducts the study, the positivist paradigm is applicable. To develop the survey instrument, a way of designing such as a paradigm was use and confirmation procedure was designed to establish measurement reliability and validity. Finally, the researcher had experience in and skills for quantitative methods, which align with the positivist paradigm.

The thesis seeks to validate the path model concerning the hypothetical-deductive method reported by Guba and Lincoln (2005). According to Creswell (2009), quantitative research is the preferred method for the validation as long as the aim of research is hypothesis testing using statistical procedures and generalising to a larger population from the sample based on numerical data.

The predominantly positivistic research approach in this thesis used a survey questionnaire to gather quantitative data. A questionnaire-based survey was the most suitable method to employ for gathering data to understand individuals' accounts of their behaviour and perceptions (Ticehurst and Veal, 2000). The survey method was chosen for the following reasons. Firstly, as shown in Chapter 2, it is commonly used in similar research studies, secondly, self-administered questionnaires can eliminate interviewer bias and, thirdly, it allowed this researcher to overcome time and cost constraints.

Building on previous research on WI, NPD capability and NPD success (Huang et al., 2004; McMurray et al., 2013; Yam et al., 2004), a quantitative approach was employed to tackle the RQs. A questionnaire was designed which contained measures of WI (McMurray and Dorai, 2003), NPD capability (Yam et al., 2004), NPD process

(Cooper, 1996), NPD strategic planning (Huang et al., 2002), NPD resources (Huang et al., 2001) and NPD success (Huang et al., 2004). A quantitative method helped to investigate variable factors that influence NPD performance.

4.2 Research Design

This thesis adopts a research design model developed by De Vaus (2002). The research design was based on the six ideal typical stage research process. According to De Vaus (2002, p. 16), the researchers use theory to guide the researchers' observations, moving from the general to the particular to test a theory. The first stage is to identify the theory to be tested. The second stage aims to achieve a set of conceptual propositions, that is, the nature of the relationship between two factors. The process of translating abstract concepts into something more explicit and observable is undertaken in the third stage. Operationalising a concept results in clear and measurable indicators is necessary so that the researchers have a clear idea of what data to collect. In stage four, data is collected. In stage five, data analysis is undertaken to evaluate whether the propositions are supportable and, therefore, quantify how much support there is for the theory. In stage six, an assessment of the results will usually reveal the theory is not fully supported, rather there still exists conflicting or confusing results. Consequently, the initial theory is adjusted based on the observations made and the modifications are tested rigorously.

The research framework utilised in this thesis is consistent with the framework of De Vaus (2002, p. 16). Figure 4.1 describes the activities that were employed to achieve the thesis goals. The research begun with extensive library research for identification of constructs (stage one). Subsequently, research gaps, RQs and theoretical approach were identified (stage two). Developing the pre-test questionnaire involved a pilot study to check its reliability and validity of the questionnaire and measures (stage three). Data collection, referred to main study, includes fieldwork and the implementation of the survey questionnaire (stage four). The obtained quantitative data were analysed using AMOS and other software (stage five). From this was extracted findings and conclusions suggesting recommendations for future research (stage six).

A cross-sectional study design was adopted, the advantages of which, as opposed to a longitudinal study, were that because it was only conducted once there was less disruption caused to the participating organisation and the process was less costly and time consuming (Hussey and Hussey, 1997).

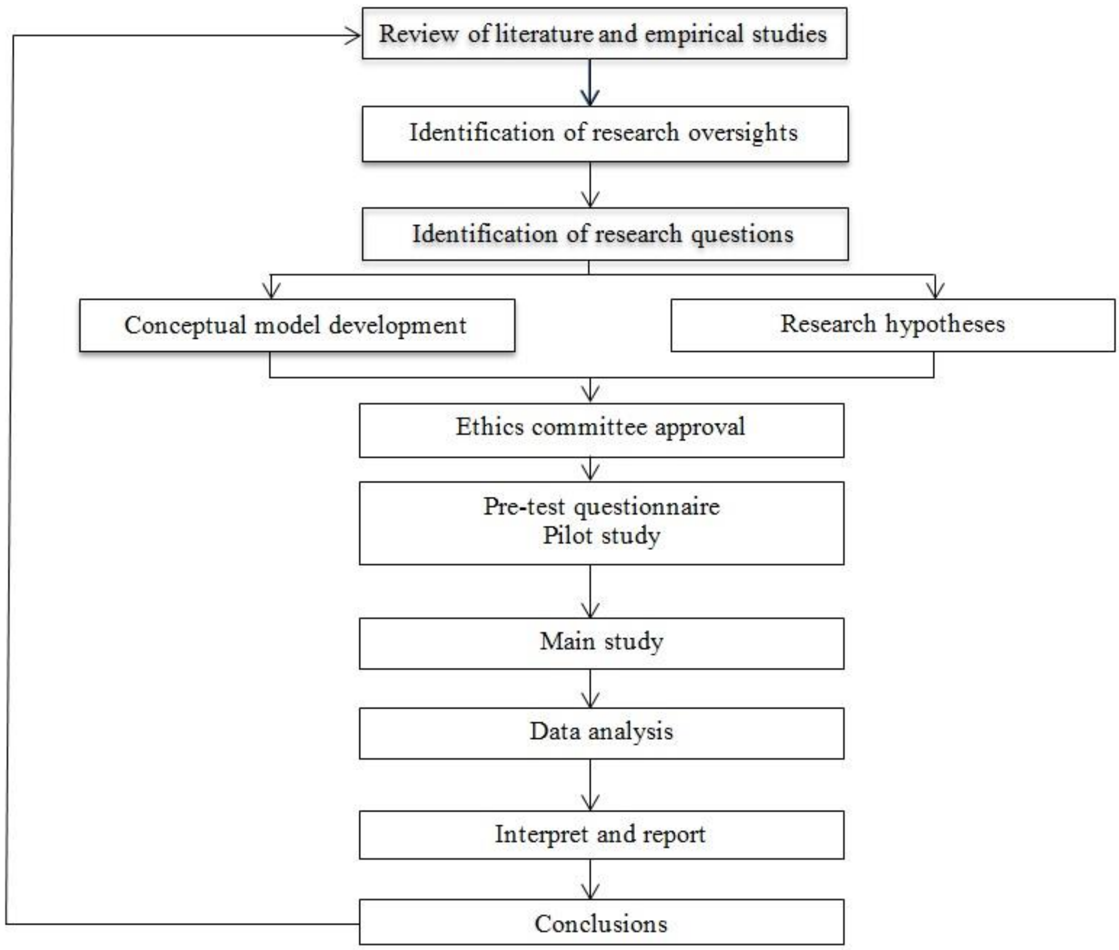

Figure 4.1. Research Design.

4.3 Quantitative Method

4.3.1 Research Context: Vietnamese Manufacturing SMEs

Quantitative data analysis allows the researcher to recognise and evaluate errors involved in quantifying the researcher's experience (Hussey and Hussey, 1997). The manufacturing industry in Vietnam is particularly labour intensive and, therefore, is conducive to quantitative research. As this thesis adopts a positivistic paradigm, a quantitative method was appropriate to collect data. Neuman (2013) notes quantitative approaches such as surveys and interviews need to have labour-oriented contexts in which responses help draw definite conclusions for the thesis. As WI, NPD strategic planning, NPD capability and NPD performance are employee-related constructs, the labour-intensive Vietnamese manufacturing industry was an ideal context for this research.

4.3.2 Data Collection Technique

Information about a new product project can be collected through a single informant or multiple informant methods. The single informant method is commonly employed in marketing research and is also widely used in study of NPD. A single informant method was used in this thesis. The advantages of this method are to reduce costs and time taken for collecting data (Mitchell, 1994). In addition, independence of response was another consideration in the research method. Since multiple projects were to be investigated in each firm, the multiple informant technique may have limited the number of projects or violate the assumption of independence of response. Also, the multiple informant technique may have increased the length of the data collection process and reduced the response rate.

4.4 Sample Design

4.4.1 Rationale for Sampling

In an empirical study that employs a positivistic method, selecting a sample is necessary (Hussey and Hussey, 1997). Considering the purpose of this thesis, a population is a body of people or any other collection of items (Hussey and Hussey, 1997). A sample is a fraction of subjects derived from a population. In an attempt to obtain data representative of the whole target population, sampling allows the researcher to investigate a relatively few number of subjects from the population. The use of sampling can generate detailed information and a high degree of accuracy because it deals with small number of units (Neuman, 2013; Hussey and Hussey, 1997; Sekaran and Bougie, 1992). In a single industry, choosing several organisations has the advantage to significantly minimise the diversity of the sample (Chryssochoidis and Wong, 2000). Homogenous sampling enables the researcher to minimise demographic biases in terms of respondent skills and experience. As samples are expected to be representative, they must be chosen in a systematic way.

4.4.2 Analysis Unit

Analysis unit is the way researchers distinguish and deal with independent elements, which refers to the 'whom' or 'what' under study (Babbie, 2013; Krippendorff, 2012). The unit of analysis chosen for this thesis is a new product project. This has long been used in studies of NPD. The advantages of this project-level analysis are that more detailed information could be obtained from key informants and relationships between variables can be easily identified. The major limitation of this method is that it may not provide generalised information on company's NPD programs.

4.4.3 Identifying the Population Sample

This thesis was designed to study SMEs as the flexibility of SMEs allows them to quickly adapt and improve in a changing environment. They also more easily accept and make the changes (Damanpour, 1996). The Vietnamese Government defines SMEs by Decree 56/2009/ND-CP; SMEs in the industrial sector are those entities whose annual average number of laborers does not exceed 300 persons, or whose total capital is less than VND 100 billion. The researcher contacted the Vice Head, who is also the General Secretary of the Hanoi Small and Medium-sized Enterprises Association (HASMEA). However, due to the association's regulation, the list of its members was not accessible. The researcher then made contact with the General Secretary, who is also the Head of the Enterprise Development Institute of the Vietnam Chamber of Commerce and Industry (VCCI), and received a reference letter from her. Discussions with HASMEA's officials and the General Secretary indicated that online surveys in Vietnam often resulted in low response rates.

According to the 2015 Vietnam Business Directory, the public database of the VCCI, there are 1,192 manufacturing enterprises in Hanoi. Given that the Vietnamese Government defines SMEs on the basis of workers and capital, two questions about the number of labourers and firm capital were added to the questionnaire to determine if a firm is an SME.

The Vietnamese Government issued the Vietnam Standard Industrial Classification 2007 by Decision 10/2007/QD-TTg on 23 January 2007. According to the Decision, the manufacturing sector is divided into 24 industries (see Appendix A). It was decided to restrict the population sample to nine industries in the manufacturing sector—pharmaceuticals; basic metals; chemicals and chemical products; rubber and plastics products; other non-metallic mineral products; electronic and optical products; electrical equipment; fabricated metal products, except machinery and equipment;

computer, machinery and equipment n.e.c. The manufacturing SMEs in these nine industries account for 46.1% of the total number of manufacturing SMEs in Hanoi (per the 2015 Vietnam Business Directory). This was considered a large enough sample.

As the unit of analysis was new product project, to reflect the most recent practice in NPD the duration of new product projects studied was confined to between 2013 and 2015. The economic and political environment in Vietnam during this period was stable, thus less abrupt change to NPD imposed by macro environmental factors seemed to have occurred. The sample for this thesis comprised 1,192 manufacturing SMEs located in Hanoi. The potential respondents were working in the NPD and marketing divisions as they were able to provide information about innovation in their SMEs.

4.4.4 Sampling Procedure

For 1,192 companies there were 772 email addresses. Using Qualtrics, an online version of the questionnaire was created. The researcher sent emails to NPD managers of these SMEs inviting them to participate in a research project, with an online link to the questionnaire and the reference letter from the General Secretary of VCCI. The Participant Information Sheet was also attached in the email. To maintain anonymity, the SMEs were not identified. Participants were also asked if they had any questions relating to the research and were reminded that their participation was entirely voluntary and they could withdraw from the process at any time.

Of 772 emails sent, six firms replied, 435 firms did not respond and 331 emails bounced. The researcher then used follow-up phone calls and subsequent email to remind participants, however, the response rate remained low.

4.4.5 Sample Size and Response Rate

Simple SEM models can be meaningfully tested even if sample size is quite small (Marsh and Hau, 1999; Hoyle and Kenny, 1999; Hoyle, 1999). However, usually a sample size of 100 to 150 is considered the minimum size for conducting SEM (Tinsley and Tinsley, 1987; Tabachnick and Fidell, 2007; Ding et al., 1995; Anderson and Gerbing, 1988). Some consider the minimum sample size for SEM to be larger, for example, at least 200 (Kline, 2015; Hoogland and Boomsma, 1998; Boomsma and Hoogland, 2001). Simulation studies show that with normally distributed indicator variables and no missing data, a reasonable sample size for a simple CFA model is about 150 (Muthén and Muthén, 2002). For multigroup modelling, rule of thumb is 100 cases per group (Kline, 2015). Jaccard and Wan (1996) recommend a minimum of 75 subjects per group (100 preferred).

To analyse the complex model specification, a minimal sample size of 146 is recommended for the characteristics of this thesis. This was calculated based on formulation: N = 50 + 8X (where X = number of factors) (Tabachnick and Fidell, 2007). Thus, efforts were exerted to collect more questionnaires, aiming to expand the sample to at least 146 (minimum) or 340 (optimum). As 316 SMEs provided inexact information and 81 SMEs had inconvenient addresses, the survey could only be distributed to 795 manufacturing SMEs. With 340 usable responses received, the response rate reached 42.77%.

4.4.6 Profile of Population Sample

Demographic data were tabulated using frequencies. More descriptive details of the sample are provided below.

4.4.6.1 Individual respondent demographics

The demographic profile of respondent individuals is shown in Table 4.1. The survey contained five demographic questions on age, education, position, background and years of working experience. The sample population included CEOs, managers and staff working in manufacturing SMEs in Hanoi.

Table 4.1

Sample Demographics (Individuals)

Position[a]	**N**	**%**
President or vice president	84	25.4
Manager	124	37.3
Employee	124	37.3
Age[b]	**N**	**%**
<25	36	10.6
25–30	122	36.1
31–40	132	39.1
41–50	33	9.7
51–60	12	3.6
>60	3	0.9
Education[c]	**N**	**%**
Secondary	27	8.1
Diploma	81	24.2
Undergraduate degree	209	62.4
Postgraduate degree	18	5.3
Background[d]	**N**	**%**
Engineering	69	20.6
Science	11	3.3
Business	157	46.9
Tradesperson	29	8.6
Other	69	20.6

Note. [a] N = 332, [b] N = 338, [c] N = 335, [d] N = 335.

Respondents were predominately younger, with 36.1% aged of 25–30 and 39.1% aged 31–40. More managers and employees (74.6%) than presidents and vice presidents (25.4%) responded. The sample showed a tendency to higher education, with

62.4% of respondents possessing an undergraduate degree. Average working experience was 7.37 years.

4.4.6.2 Firm respondent demographics

The demographic profile of respondent firms (all manufacturing SMEs in Hanoi) are shown in Table 4.2. The survey contained five demographic questions on industry, ownership, year established, turnover and number of employees.

Table 4.2

Sample Demographics (Firms)

Industry[a]	**N**	**%**
Chemicals	45	13.6
Pharmaceuticals	32	9.6
Rubber and plastics	15	4.5
Non-metallic products	37	11.2
Basic metals	22	6.6
Fabricated metal	16	4.8
Electronics	18	5.4
Electrics	29	8.7
Other machinery	118	35.6
Ownership[b]	**N**	**%**
Fully state-owned	6	1.8
Fully private-owned	282	82.9
Fully foreign-owned	12	3.5
Other	22	6.5
Established[c]	**N**	**%**
Before 1986	20	6.0
1986–1990	4	1.2

1991–2000	46	13.8
2001–2010	174	52.3
2011–2015	89	26.7

Note. [a] N = 332, [b] N = 322, [c] N = 333.

Slightly more SMEs from the chemical industry (50.3%) responded than those from the machinery industry (49.7%). The chemical industry includes chemicals, pharmaceuticals, rubber and plastics, non-metallic products, basic metals and fabricated metals, while the machinery industry includes electronics, electrics and other machinery. Firms were largely fully private-owned (82.9%), and most (94%) were established after economic reform in Vietnam in 1986. Average turnover for the 2014–2015 financial year was VND 48.46 billion, which indicates efficient business operation. Average number of employee was 62 full time and nine part-time.

4.4.6.3 New product project profiles

The profile of new product projects among respondent firms is shown in Table 4.3. The survey contained five questions about new product projects on launch time, level of newness, market and certified quality system.

Table 4.3

Respondent Firms' New Product Project Profiles

Launch time[a]	**N**	**%**
2013	106	31.6
2014	119	35.5
2015	103	30.8
Not yet marketed	7	2.1
Certified quality system[b]	**N**	**%**
ISO 9000	17	5.1
ISO 9001	124	37.4

ISO 9002	20	6.0
Other	25	7.5
None	146	44.0
Level of newness[c]	**N**	**%**
New to the world	8	2.4
Incremental modification	287	85.9
Radical modification	39	11.7
Market[d]	**N**	**%**
Industrial market	83	24.8
Consumer market	230	68.6
Other	22	6.6
Market[e]	**N**	**%**
Local market	18	5.4
National market	295	88.9
International market	19	5.7

Note. [a] N = 335, [b] N = 332, [c] N = 334, [d] N = 335, [e] N = 332.

Only 2.1% of new products were not yet marketed, while 97.9% were launched between 2013 and 2015. The majority of new products were developed for the consumer market (68.6%) and national market (88.9%). Only 56% of respondent firms had adopted certified quality systems, of which 67.2% developed products for the consumer market and 26.3% developed products for the industrial market.

4.5 Instrument Development and Documentation

Two documents and six scales were used for the research. The documents used were the survey invitation letter and plain language statement. The instruments used were the WIS (McMurray and Dorai, 2003), NPD capability scale (Yam et al., 2004), NPD strategic planning scale (Huang et al., 2002), NPD resource allocation scale (Huang et al., 2001), NPD process scale (Cooper, 1996) and NPD success scale (Huang et al., 2004).

The survey comprised four sections—survey invitation letter (see Appendices B and C), plain language statement (see Appendices D and E), questionnaires and demographic questions (see Appendices F and G).

4.5.1 Survey Invitation Letter

A survey invitation letter from the General Secretary of VCCI was circulated to managers. The letter explained that the research was supported by VCCI and that the research results would assist in improving innovation activities of enterprises and help policymakers support innovation activities. It was also explained that answers would be collected anonymously and kept in the strictest confidence, and the results of the research would only be analysed based on integrated data (see Appendices B and C).

4.5.2 Plain Language Statement

The plain language statement outlined the rationale and aims of the research, and provided information about the procedures and the level of participation required. The voluntary nature of participants was explained and respondents were informed they could withdraw from the study at any time. Confidentiality was again assured (see Appendices D and E).

4.5.3 Scales of the Instrument

The scale of an instrument is developed to measure variables that are not directly seen. Neuman (2013) identifies two purposes for using scales in social science research. Firstly, scales exhibit the fit between a single construct and a set of indicators and, secondly, scaling generates quantitative measures and can combine with the measures of other variables to test the hypotheses.

Several scales are used to measure beliefs and attitudes. According to Peterson (2000), there are three scales influential in measuring and scaling—Likert, Stapel and semantic differential. Likert scales (Likert, 1932) evaluate statements on a scale of agreement, which usually comprise five rating points that range from ‘strongly agree’ to ‘strongly disagree’, thought in some cases seven to 11 points can be employed (Bernstein and Nunnally, 1994). Stapel scales (Stapel (1969) consist of 10 unipolar rating categories, ranging from –5 to +5 with a single adjective in the centre. Semantic differential scales (Osgood et al., 1957) are a seven-category rating around bipolar adjectives.

The advantage of Likert scales is facile to design and generate, but the downside is that it is difficult to interpret the meaning of a single score. While, semantic differential scales has the advantage of easy creation and allowing comparison, it has the disadvantages in finding the appropriate adjectives and being ordinal but not interval with the data. Even though Staple scales are easier to design and manage than semantic differential scales, they may be harder to interpret because their extremes are in the form of numbers (William, 2003).

In this thesis, items were scaled using a five-point Likert ranging from ‘strongly disagree’ to ‘strongly agree’. A Likert scale was suitable for this thesis as it was simple to use and, further, it was found that when several items were combined it was feasible to have a comprehensive multiple indicator measurement.

4.5.3.1 WI scale

WIS, devised by McMurray and Dorai (2003), is a 24-item five-point Likert-type scale. The WIS measures four subscales:

1. F1 Organisational Innovation (items 1, 2, 3, 4 and 5)
2. F2 Innovation Climate (items 6, 7, 8, 9, 10 and 11)
3. F3 Individual Innovation (items 12, 13, 14, 15, 16, 17, 18 and 19)
4. F4 Team Innovation (items 20, 21, 22, 23 and 24)

The instrument has been used over the past 13 years across six countries and demonstrates a consistently high reliability score. Following McMurray and Dorai (2003), the coefficient alphas of organisational innovation, innovation climate, individual innovation and team innovation were .90, .89, .77 and .76 respectively. WIS was previously used in Vietnamese SMEs.

4.5.3.2 NPD capability scale

Based on comprehensive review of the previous TIC studies (Christensen, 1995; Chiesa et al., 1996; Yam et al., 2004), the thesis uses the scales developed by Yam et al. (2004). The scale is used to examine seven TICs—learning capability, resource allocation capability, R&D capability, organisational capability, marketing capability, manufacturing capability and strategic planning capability with coefficient alphas of .78, .82, .86, .82, .85, .85 and .92 respectively (Yam et al., 2011).

4.5.3.3 NPD resource allocation scale

Within the survey, eight items developed by Huang et al. (2001) identified the marketing, financial and technical resources of their organisation.

4.5.3.4 NPD strategic planning scale

The measures of NPD strategic planning were developed from Huang et al. (2002) and measured the degree to which the firm clearly established a long-term direction, had a shared intention and formal plan for NPD.

4.5.3.5 NPD process scale

The questions for NPD process were based on the 13 NPD stages proposed by Cooper and Kleinschmidt (1986) and further developed by Rochford and Rudelius (1997). Respondents were questioned to indicate which of these activities they had undertaken and, for those undertaken, how well these steps had been implemented, using a five-point scale ranging from ‘very poorly done’ to ‘excellently done’.

4.5.3.6 NPD success scale

It is always difficult to measure the success of a new product. Sixteen core aspects of new product success were suggested by using a task force set up by the PDMA (Griffin and Page, 1993). All of these aspects were included in the questionnaire of this thesis. Moreover, an additional measure asking respondents about their perceptions of the overall success of new products was also included and discussed. Respondents were asked about new product success through 17 measures, each using a five-point scale ranging from 'well below average' to 'well above average' to indicate the success of the product.

4.5.4 Survey Questionnaire

The survey questionnaire was designed based on the literature review and the conceptual model presented in Chapters 2 and 3. The survey was organised into seven sections for clarity—filter questions, questionnaire for NPD process, questionnaire for NPD strategy and resources, questionnaire for WI, questionnaire for NPD capability, questionnaire for NPD success and demographic questions (see Appendices F and G). The eight-page survey questionnaire, entitled 'Innovation in Vietnamese manufacturing SMEs', comprised 106 questions and a final section to collect demographic data. At the top of page one there was an introductory preamble asking for voluntary and anonymous participation. Instructions on how to answer questions were given before all scales.

The scales appeared thematically in the instrument so that innovation process was followed by innovation strategy and resources questions, WI questions, innovation capability questions, innovation performance questions and, lastly, demographics. The scales were scattered with other questions, as explained below.

The first section was designed to collect information about the organisation's size and new product project. There were three filter questions to determine if the organisation was an SME and if they had developed a new product since 2013. A question about the launch time of the new product project was also included.

The second section contained a filter question to determine if the organisation had an innovation process. This was followed by a 13-item innovation process scale anchored to a 5-point Likert scale (1 = excellently done to 5 = very poorly done), plus a 'Not taken at all' option. Four multiple choice questions asked respondents about the new product project with regard to level of newness of innovation, its market and certified quality system.

The third section contained a filter question, the five-item NPD strategic planning scale and the eight-item innovation resources scale.

The fourth section comprised the 24-item WIS (McMurray and Dorai, 2003) with four subscales—organisational innovation, innovation climate, individual innovation and team innovation. This was followed by a qualitative open-ended question asking respondents to provide one word that they would use to describe the culture of their organisation and department/division. The qualitative question was placed to give breaks between the scales in an effort to allow some relief to respondents from reading lists of questions.

The fifth section included the 24-item innovation capability scale (Yam et al., 2004) with seven subscales—learning capability, resource allocation capability, R&D capability, organisational capability, marketing capability, manufacturing capability and strategic planning capability. All of the three scales in the third, fourth and fifth sections were anchored to a five-point Likert scale (1 = strongly agree to 5 = strongly disagree).

The sixth section contained a filter question and the 17-item innovation performance scale. These 17 items were anchored to a five-point Likert scale (1 = well above average and 5 = well below average) plus a 'Measures used' option. Respondents were also asked questions on how they would like to rate the new product performance and the competition and market size for the new product. These three items were also anchored to a five-point Likert scale.

The seventh section of the questionnaire was the demographic section, which included 10 items capturing data relating to the respondents—age, education, position, background and years of working experience—and the organisations—industry, ownership, year established, turnover and number of employees. A statement of thanks was placed at the end of the questionnaire.

The original questionnaire was designed in English and translated into Vietnamese. A back-translation procedure was used to verify the accuracy of the Vietnamese version (Hui and Triandis, 1985). The questionnaire contained six parts and took an average of 20 minutes to complete. To maintain anonymity, all information was treated in strictest confidence and no individual or business was identified.

4.6 Pre-Test Study Procedure

Once a questionnaire is designed, each question and the whole questionnaire must be rigorously tested before final administration. The purpose of running an online pre-test study and pilot study before the main study was to obtain primary feedback about the survey itself and enhance the data integrity of the research. In online surveys, this step is particularly important because accessibility, flow and technical issues can be identified and corrected. Other common accuracy aspects such as spelling, wording, readability and answering length in a paper survey were also carefully checked.

For the pre-test purpose, a preliminary online questionnaire in Qualtrics online software was developed by the researcher. A paper-based version was also created. There were 15 participants in the pre-test study. The participants were chosen from postgraduate students and professionals. Instructions were provided to each participant by the researcher on a one-to-one basis before they answered the questionnaire, following the same link employed in the pilot and main studies. The researcher sat next to the participant while they filled out the survey, to detect confusion or problems in following the survey instructions. At the end of the survey, feedback was provided by the participants.

After the pre-test study, aspects that had not been considered were identified and modified to improve the quality of the questionnaire. The most relevant aspect that arose during the pre-test was wording and this was subsequently corrected. The participants reviewed the revised questionnaire and confirmed a significant improvement—less repetitive questions and clearer instructions. The survey was approved for employment in a pilot study after the second review.

4.7 Pilot Study

The purpose of the pilot study was to assess the feasibility of large-scale data collection and the reliability of the survey instrument. The survey distribution strategies were the same as the main study. Through the pilot procedure, the researcher can assess the proposed recruitment approach and reliability of the scales and identify potential problems with the analysis techniques, variability in the outcomes and logistics. Three stages of pilot testing questions are suggested (De Vaus (2002), Converse and Presser (1986)).

The first stage is the development of question. This stage aims to check whether the questions are grammatically correct and the range of responses adequate and able to assess the intention of participants. If adopting new questions, these have to be extensively tested and the use of previously used questions must be considered in the context of their previous study compared to the anticipated sample. For example, are questions used in one cultural context appropriate in another? Even though feedback from respondents is expected to achieve this, only a limited number of questions can be tested in this way because this is an intensive process. In this thesis, exploratory studies were conducted before the pilot test and, with the exception of previously researched and tested scales, only one new demographic question on firm ownership was added to the questionnaire for the pilot study. Further, the exploratory studies were conducted using culturally diverse samples. De Vaus (2002) recommends that individual items should be evaluated by six points:

1. responses should be varied
2. respondents should show they understand the intended meaning of the questions and comprehensible answers should be obtained
3. redundancy, that is, inter-item correlation should be higher than 0.8 if two questions ask the same aspect
4. to ensure all items in a scale belong in that scale, inter-item coefficiency should be more than 0.3 and Cronbach's alpha (i.e., reliability) should be >.7.
5. non-response can result in difficulties at the analysis stage because of serious reductions in sample size (this may occur for a several reasons such as too much effort to answer, intrusion or similarity to other questions)
6. acquiescent responses mean that a respondent agrees with seemingly contradictory questions.

All scales included in the pilot test questionnaire had been used in previous research and had been subjected to extensive testing indicating acceptable validity and reliability. All questions were checked to ensure no repetition.

The purpose of the second stage was to test the whole questionnaire. This stage takes into account comments from the respondents and their responses to the questions. For purpose of testing, respondents should not be told that the questionnaire is still under development, thus this stage is usually undeclared. De Vaus (2002) proposed that four points should be properly considered:

1. Flow, that is, do the questions fit together and is the flow smooth to follow between sections or is the transition appropriate?
2. Position of filler questions as the skip patterns must be reasonable.
3. Testing should result in estimation of the time needed to complete the questionnaire so that participants have realistic expectations of their time commitment to complete the survey.
4. Interest and attention of respondents should be considered and whether questions and/or sections need to be reordered so that interest is maintained and answers considered and reliable.

De Vaus (2002) also recommends that a pilot study should be conducted and should obtain responses from 75 to 100 respondents with similar aspects to the main study sample to achieve the relation between feedback and corrections.

In this thesis, a boxed instruction on how to complete the following section was use at the beginning of each section for purpose of separation. The questionnaire then provided a continuity of assistance and narrative, which assured flow and brief breaks between sections. In this thesis, a completion time of 20 minutes was estimated for the pilot test. Participants in the pilot study were required to provide feedback by making comments directly on the questionnaire or on a separate piece of paper.

In the final stage, the questionnaire was polished by revising or shortening questions, reordering the questions and paying attention to the general layout and presentation of the questionnaire to ensure clarity and feasibility. Both the purpose of the questionnaire and the context in which the questions are being asked must be clear and apparent to the respondents. This can be achieved by introducing an explanatory paragraph or covering letter and precise instructions about how to response to the questions (Hussey and Hussey, 1997). An explanatory note at the beginning of the questionnaire set out the aim of the survey and welcomed participants to recommend improvements to the layout of the survey. Instructions guiding respondents on how to answer questions (including an example) were placed at the start of each section. Alternate questions were shaded to improve readability where scales consisted of 10 to 24 questions.

An online version of the questionnaire was created using Qualtrics. Participants were sent a questionnaire link through emails and asked to complete the questionnaire. As responses were not received within a certain timeframe, the researcher used follow-up phone calls and subsequent mailing to remind participants. However, the response rate remained low so the researcher turned to using self-administered questionnaires.

The pilot study was conducted on a selected sample of SMEs in the same district, Thanh Xuan district, Hanoi. Based on the VCCI database, 92 SMEs were called before going to the firm. A reference letter from the General Secretary of VCCI, together with a paper-based questionnaire with the plain language statement was provided to each SME.

The results of the pilot study confirmed that the distribution strategy for the survey and the reliability of instrument itself were appropriate. The instrument or scales were found to be clear and without problems. The only significant concern from the pilot study was that communication information (such as telephone numbers and addresses) in the VCCI database were outdated.

The process of invitation and survey response then ran quickly with 43 usable responses. Importantly, the reliabilities (Cronbach's alpha) for each construct were calculated as above .7 (Hair et al., 2010), allowing the researcher to proceed to the main study using the designed questionnaire.

4.8 Main Study

Survey research was used within the positivist approach to collect quantitative data. The origin of survey research can be traced back to the ancient form of the census.

Survey research grew popular during the First and Second World Wars, and has gained further momentum since the 1970s (Hussey and Hussey, 1997; Neuman, 2013). The distinguishing feature of surveys is forms of data collection and methods of analysis, which are often linked to computers.

As this thesis drew a sample from a cross-section of manufacturing SMEs in Hanoi, it was appropriate to use the survey method. The survey method enabled the researcher to obtain a wide sample from a large population. The survey was distributed to 795 manufacturing SMEs and 340 usable responses were received (response rate of 42.77%).

4.9 Analysis Techniques

Many quantitative analysis techniques can be employed to analyse the data. These analysis techniques can be organised into four groups—association, description, inference and causation. Association techniques—including simple correlation, analysis of variance and covariance and simple, partial and multiple regressions—are employed to determine the degree of variation of two variables. Description techniques are used to report the distribution of a sample across a range of variables. They consisted of measures of frequency, central tendency and dispersion. Inference techniques are used to estimate a population from a sample and identify differences or relationships within a sample, which can be expected to occur other than by chance (significance tests) (Tabachnick and Fidell, 2007; Blaikie, 2009). To establish causation, factor analysis, path analysis, SEM and regression (simple, partial and multiple) are commonly used.

The four technique groups were used in this thesis at different stages of the analysis. However, causation analysis is the main technique required in this thesis due to testing RQs and hypotheses.

SEM has two sub-techniques. The first is variance-based SEM, also called partial least squares SEM (PLS). The second is covariance-based SEM, usually known as CB-SEM or simply SEM. PLS is a causal modelling technique which focuses on maximising the variance explanation of the dependent variable. SEM's focus is to estimate the statistical difference between the data with the structure of theoretical relationships (Hair et al., 2011). SEM, a confirmatory technique, is appropriate for theory testing. It can estimate error terms, provide global estimates of model fit, embrace multiple dependent variables and be applied to CFA and causal modelling. However, SEM has the disadvantages of requiring larger samples (no less than 60 observances) and potential restrictive assumptions. Therefore, this technique assumes normality, linearity and absence of multicollinearity (Tabachnick and Fidell, 2007).

Compared with SEM, PLS has the advantage of minimising the residual variances of the dependent variables, which presents less issues with model identification. PLS can work with smaller samples, can format constructs and directly incorporate reflective. However, drawbacks of PLS are that the issues with the measurement model have to be addressed before producing valid results and it is also limited in theory testing because it does not provide global estimates of model fit (Hair et al., 2011).

A philosophic selection criteria is used as the first criteria for the selection of SEM or PLS for the thesis. If the aim of the study is to test theory, SEM is recommended. If the purpose is theory development and prediction, PLS is recommended (Hair et al., 2011). Secondly, when selecting techniques, the limitations of each technique should be considered. This thesis focuses on theory testing, thus SEM was used. To minimise the drawbacks of SEM, the following measures were taken. Regarding the sample, the appropriate number of participants has to be calculated; the minimal number for this thesis is 210 and 340 useful responses were obtained. Non-normality concerns were addressed using bootstrapping sub-sampling to minimise the impact of the disadvantages (Byrne, 2016). Complementary analysis techniques including redundancy analysis and f-tests, and avoiding the interpretation of the indicators affected by multicollinearity as explained in Fornell and Larcker (1981), were used to tackle multicollinearity concerns in the extended model. Additionally, PLS was also used to run the analysis of the models to cross-validate the results.

In cases of not obtaining data normality, applying data transformations (Tabachnick and Fidell, 2007) or using a technique known as bootstrapping was use as options to solve this issue (Byrne, 2016). These options have the common advantage of avoiding overlooking the normality assumption and the possibility of producing invalid results. However, it might be more difficult to interpret the results, which is disadvantageous to data transformations (Tabachnick and Fidell, 2007). Additionally, the bootstrapping technique allows assessing the stability parameter estimates and reporting accurate results even with relatively small samples. The bootstrapping technique is automatic and easy to set. However, it also has some limitations such as it cannot be representative for a sample and produces more biased estimates than the maximum likelihood (ML) method for normally distributed data (Byrne, 2016).

4.10 Data Analysis Procedure

The analysis method consists of three main processes or phases. The first is preparing data for analysis, cleaning and formatting data. The second is the examination of the items and the factors. The third is confirming the reliability of the items and performed factor analyses, examining the hypothesised relations among constructs and contrasting aspects with empirical findings.

This thesis conducted exploratory factor analysis (EFA) using IBM SPSS Statistics v.25, followed by CFA using AMOS. Based on the results of EFA and CFA, the Stats Tools Package version update 13/12/2017 for Microsoft Excel and Parallel Analysis using O’Connor’s (2000) algorithm for AMOS was used to assess discriminant and convergent validity.

4.10.1 Data Preparation

Preparation of the data for analyses was the first step in the process. The data evaluation included handling missing data, unengaged responses, outliers and testing for the assumptions of multivariate analysis (normality, homoscedasticity, multicollinearity and linearity).

4.10.1.1 Data editing and coding

Data editing is an important preliminary step in deriving meaning from the data. The first step in data editing should be conducted in the field to detect the most outstanding omission and inaccuracy in the data. Data was screened and cleaned by checking for errors and correcting errors in the data file. This was implemented by checking each variable, which was out of range scores, checking the variable parameters and referring back to the hardcopy questionnaires to ensure that the accurate values were then used (Pallant, 2013).

The computer software package AMOS was used and data were coded prior to being typed into the database (Pallant, 2013). For the purpose of analysis, continuous variables were converted into categorical variables through the coding process, for example, the continuous variable of age was converted into a categorical variable by coding age intervals such as 2 = 25–30yrs, 3 = 31–40yrs. Similar procedures were carried out with the continuous variables of tenure of organisation, position and span of control. This was an appropriate procedure to carry out a comparative analysis between groups. The coding process was relatively simple, because most questions were closed and were scaled. All questionnaires were numbered.

4.10.1.2 Missing values

Missing values were discovered among the scales and demographic sections. Replacing missing values is desirable to maximise cases used in the statistical procedures. A number of options were used for replacing the missing values, including mean of nearby points, series mean, linear interpolation, median of nearby points and linear trend at point. However, since the phenomena under study were context specific, the responses from each participating organisation were separated and series means were used to calculate the missing values within scales, thus maintaining the integrity of the context. The data from all organisations were then brought together within one database to carry out the remaining statistical procedures. Missing values were not replaced as doing so would not alter the validity or reliability of the scales; analysis was conducted using the original data collected. Where appropriate, variables were coded as categorical variables for more convenient analysis.

4.10.1.3 Unengaged responses

Firstly, to identify responses with no variance, the standard deviation was evaluated on each respondent. A low resultant standard deviation may indicate the respondent answered each question with the same value, which suggests that they responded without reading the question (Gaskin, 2017). Seventeen responses had a standard deviation of less than .5 on their answers for the factor questions and were deleted. No discernible pattern was found by examination of the demographic characteristics of this excluded set. Ultimately, 323 responses were used for the purpose of analysis.

4.10.1.4 Outliers

Outliers are scores that have a significant difference between actual and predicted the observation values (Hair et al., 2010). It should be taken into account that because an ordinal Likert-type scale with five intervals was used to measure all of these variables, therefore, extreme value outliers have to be excluded.

4.10.2 Assumptions Testing of Multivariate Analysis

The second step in the screening of univariate data was the examination of the normality of the items. Normality refers to the form of distribution and the attributes of its statistics for a single metric variable that estimates the normal distribution (Hair et al., 2010). According to Mellahi and Budhwar (2010), statistical reasoning may be less strong when there is a significant departure from normality. Hence, a normality test was conducted to identify serious departures from normality, an important step before running further multivariate analyses involving SEM or AMOS (Hair et al., 2010; Byrne, 2016). The distribution was estimated by testing for skewness and kurtosis. A statistical method was chosen instead of a graphical one for its objectivity and accuracy (Hair et al., 2010). Skewness refers to the orientation of the distribution. It identifies whether the distribution is centred or shifts to the left or right. Kurtosis refers to the 'flatness' or 'peakedness' of the distribution (Byrne, 2016). According to Byrne, a non-normal distribution inflates the chi-square value and underrates other goodness-of-fit (GOF) indices that AMOS produces. This is important because the SEM software used in this thesis is AMOS, a covariance-based software. Hair et al. (2010) suggested critical values of –2.58 to +2.58 (0.01 significance level) and –1.96 to +1.96 (0.05 significance level) for skewness and kurtosis respectively. Kline (2015) noted that a value of –10 to +10 for kurtosis must be considered.

This thesis used AMOS to evaluate the assumptions of multivariate normality. Every item was tested for skewness and kurtosis. The skewness and kurtosis values were calculated and compared with the 'rule of thumb values'. The skewness and kurtosis of all 92 metric variables are presented in Table 4.4. No variable shows a deviation from normality using the rigorous –2.58 and +2.58 crucial ratio of skewness (Hair et al., 2010) and no variable shows a deviation from normality using the rigorous –10 and +10 crucial ratio of kurtosis (Kline, 2015).

Table 4.4

Variable Skewness and Kurtosis

Variable	Skewness	Kurtosis	Variable	Skewness	Kurtosis	Variable	Skewness	Kurtosis
OI01	–.517	1.172	LC01	–.370	.729	P1	–.008	.060
OI02	–.129	–.405	LC02	–.011	–.344	P2	.008	–.268
OI03	–.408	.048	RDC01	–.108	–.501	P3	–.670	1.615
OI04	–.563	.125	RDC02	–.359	.411	P4	–.720	2.016
OI05	–.765	.824	RDC03	–.193	–.178	P5	–.836	2.162
IC01	–.504	–.161	RAC01	–.009	–1.248	P6	–.633	1.587
IC02	–.310	–.149	RAC02	–.859	1.269	P7	–.223	.120
IC03	–.163	–.510	RAC03	–.622	.978	P8	–.285	1.019
IC04	–.553	.512	RAC04	.002	–.817	P9	–.538	1.346
IC05	–.479	–.100	MC01	–.185	–.197	P10	–.595	1.471
IC06	–.019	–.709	MC02	–.103	–.353	P11	–.438	1.075
II01	–.209	–.313	MC03	–.018	–.579	P12	–.877	2.354
II02	.058	–.405	MKC01	–.056	–.635	P13	–.458	.872
II03	–.139	–.349	MKC02	–.143	–.078	SM1	–.429	–.665
II04	–.181	–.548	MKC03	.076	–.492	SM2	–.583	–.643
II05	–.368	.814	MKC04	.165	–.781	SM3	–.658	.156
II06	–.275	.108	OC01	–.243	–.491	SM4	–.350	–.568
II07	–.558	.941	OC02	–.016	–.513	SM5	–.619	.577
II08	–.296	–.215	OC03	–.080	–.434	SM6	–.507	.346
TI01	–.505	.696	SPC01	–.262	–.319	SM7	–.327	–.192
TI02	.197	–.937	SPC02	–.061	–.720	SM8	–.172	–.642
TI03	–1.138	1.119	SPC03	–.260	.099	SM9	–.479	–.451
TI04	–.744	.277	SPC04	–.416	–.241	SM10	–.528	.118
TI05	.145	–.622	SPC05	–.440	.337	SM11	.009	–1.094
NPDSP01	–.858	1.780	R1	–.675	.792	SM12	–.814	.188
NPDSP02	–.146	.442	R2	–.465	.270	SM13	–.461	–.452
NPDSP0	–.264	.649	R3	–.556	.670	SM14	–.971	.050

Variable	Skewness	Kurtosis	Variable	Skewness	Kurtosis	Variable	Skewness	Kurtosis
3								
NPDSP04	–.913	.555	R4	–.582	.950	SM15	–.481	–.662
NPDSP05	–.425	.348	R5	–.453	.534	SM16	–.496	–.252
NPDP	–.179	–.174	R6	–.362	.339	OS	–.527	–.300
			R7	–.317	.034			
			R8	–.336	–.068			

Notes. OI = Organisational Innovation, IC = Innovation Climate, II = Individual Innovation, TI = Team Innovation, NPDSP = NPD Strategic Planning, NPDP = NPD Performance, LC = Learning Capability, RDC = R&D Capability, RAC = Resource Allocation Capability, MC = Manufacturing Capability, MKC = Marketing Capability, OC = Organisation Capability, SPC = Strategic Planning Capability, R = Resource, P = Process, SM = Success Measure, OS = Overall Success.

AMOS's collinearity statistics was used to examine multicollinearity between latent variables. There might have multicollinearity issues when the Variable Inflation Factor is higher than three. This indicates that latent variables are highly correlated with each other (Hair et al., 2010).

4.10.3 Descriptive Analysis

Descriptive statistics give simple perspective about the sample and the observations that have been achieved. Univariate analysis, including central tendency (the mean, median and mode) and dispersion (the range and quantity of the data set, and measures of spread such as the variance and standard deviation), usually involves describing a single variable distribution. Characteristics of the distribution of a variable may also be presented in tabular or graphical format, including histograms and stem and leaf display. Frequency analysis is a descriptive statistical method that shows the number of occurrences of each response chosen by the respondents. When using frequency analysis, SPSS Statistics can also calculate the mean, median and mode to help users analyse the results and draw conclusions.

4.10.4 Exploratory Factor Analysis

EFA aims to reduce a large number of measurement items to a smaller number of factors. The goal of this technique is to provide an output of reliable and interpretable factors. The correlations between variables are calculated to explain factors. This approach has an exploratory nature, thus decisions about the number of factors and the rotation type usually are realistic, rather than theory oriented. EFA was designed for circumstances where the link between observed and latent variables is vague (Byrne, 2016; Tabachnick and Fidell, 2007). IBM SPSS Statistics v.25.0 was employed to conduct EFA. Univariate descriptives, initial solution, coefficients, determinant and KMO test and Bartlett's test of sphericity were calculated by using this analysis technique. Principal Component was the method selected to analyse the correlation matrix and varimax was the method used for factor analysis rotation (Morgan et al., 2012; Tabachnick and Fidell, 2007). In the interpretation, this analysis considered loadings as small as 0.35 (Hair et al., 2010; Tabachnick and Fidell, 2007). EFA was used to explore the NPD strategic planning scale as this scale was based on empirical research (Huang et al., 2002).

4.10.5 Reliability Test

Reliability refers to which variable or group of variables is consistent with what they intend to measure. In contrast with validity, which is related to what should be measured, reliability is related to how it is measured. Reliability is the degree to which the observed variable determines the true value without error. The one that consistently responds in the same way after repeated measurements is considered a more reliable measure. Despite the difference in the concepts of reliability and validity, reliability is still an indicator of convergent validity. Therefore, to obtain the higher reliability, variables and their measurement should be carefully assessed in the process of research literature (Hair et al., 2010).

In the process of evaluating the measurement items, this thesis employed Cronbach's alpha to test reliability. Cronbach's alpha is a reliability coefficient of evaluating a complete scale. For a reliable scale, the reliability coefficient should be higher than .70 (Cronbach, 1951; Robinson et al., 1991; Hair et al., 2010). A value from .60 to .70 indicates a lower limit of acceptability (Hair et al., 2010). In this thesis, the cut-off value for Cronbach's alpha was .60.

4.10.6 Correlation Analysis

Correlation is the strength of a relationship between two variables. A high or strong correlation represents a strong relationship between two or more variables, whereas a weak variables relationship is indicated by a weak or low correlation. Correlation analysis is the studying process which assesses the strength of the relationship with available statistical data. Pearson's r is the most widely used type of correlation coefficient. Values of correlation coefficients range from –1.00 (perfect negative correlation) to +1.00 (perfect positive correlation). No relationship between the tested variables is indicated by a value of 0.00.

4.10.7 Cluster Analysis

Cluster analysis or clustering is the task of grouping a set of objects in such a way that objects in the same group (a cluster) are more similar (in some sense or another) to each other than to those in other clusters. It is a main task of exploratory data mining and a common technique for statistical data analysis, used in many fields including machine learning, pattern recognition, image analysis, information retrieval, bioinformatics, data compression and computer graphics.

Cluster analysis itself is not a specific algorithm but the general task to be solved. It can be achieved by various algorithms that differ significantly in their notion of what constitutes a cluster and how to efficiently find them. Popular notions of clusters include groups with small distances among the cluster members, dense areas of the data space, intervals or particular statistical distributions. Clustering can, therefore, be formulated as a multi-objective optimisation problem. The appropriate clustering algorithm and parameter settings (including values such as the distance function to use, a density threshold or the number of expected clusters) depend on the individual data set and intended use of the results. Cluster analysis is not an automatic task but an iterative process of knowledge discovery or interactive multi-objective optimisation that involves trial and failure. It is often necessary to modify data preprocessing and model parameters until the result achieves the desired properties.

Besides the term *clustering*, there are a number of terms with similar meanings, including *automatic classification*, *numerical taxonomy*, *botryology* (from Greek βότρυς, ‘grape’) and *typological analysis*. The subtle differences are often in the usage of the results: while in data mining, the resulting groups are the matter of interest, in automatic classification the resulting discriminative power is of interest.

Cluster analysis was originated in anthropology by Driver and Kroeber in 1932 and introduced to psychology by Zubin in 1938 and Robert Tryon in 1939 and famously used by Cattell beginning in 1943 for trait theory classification in personality psychology.

4.10.8 T-Test

The t-test is an analysis of two populations means through the use of statistical examination. A t-test with two samples is commonly used with small sample sizes, testing the difference between the samples when the variances of two normal distributions are not known. The t-test looks at the t-statistic, the t-distribution and degrees of freedom to determine the probability of difference between populations. The test statistic in the test is known as the t-statistic. To conduct a test with three or more variables, an analysis of variance must be used.

4.10.9 Confirmatory Factor Analysis

CFA is a theory-driven confirmatory technique. The researcher uses a hypostatised model to estimate a population covariance matrix which the algorithm compares with the observed covariance matrix. Schreiber et al. (2006) explained that it is necessary to have the smallest reachable difference between the two matrices. Derived from CFA, it is then possible to determine convergent and discriminant validity for the measurement of a construct (Hair et al., 2010).

AMOS was used to compute CFA. In the estimation of the discrepancy, the method of ML was the selection. Byrne (2016) recommended the following settings: unbiased covariance supplied as input, unbiased covariance to be analysed, and ML and 500 random permutations. In this thesis, CFA was used to confirm the measurement model of WI and NPD capability as these two constructs have been widely used before with high reliability.

4.10.10 Indicators of Model Fit

CFA and SEM share a common set of indicators for model fit. This technique provides support for a model to the degree that the fitted population covariance matrix corresponds to the observed sample covariance matrix (Marsh et al., 1988). It statistically tests the entire model simultaneously to determine its fit with the data (Byrne, 2016).

A typical approach would reject models if the minimum discrepancy, chi-square, is large in relation to the degrees of freedom (Marsh et al., 1988). A benchmark to evaluate has its base on rules of thumb. However, there are three levels which the literature commonly considers appropriate. The minimum discrepancy is usually in association with a probability of getting an obtained value for x^2. This probability assumes the model is correct, opposed to assuming that the null hypothesis is true. Therefore, $p \geq .05$ is the recommendation as this represent the likelihood of getting a x^2

value beyond the x^2 value when H_0 is true (Arbuckle, 2010; Byrne, 2016). Browne and Cudeck (1993) endorse the 'root mean square error of approximation' (RMSEA) as one of the most regarded and informative criteria to assess model fit. RMSEA denotes how well the model would fit the population covariance matrix if it were available (Browne and Cudeck, 1993). RMSEA is non-stochastic and does not depend on sample size. Values lower than .05 indicate a good fit, between .05 and .08 represent a reasonable errors approximation, .08 to .10 a marginal fit and values more than .10 a poor fit.

This thesis uses the normed chi-square (CMIN/DF) and RMSEA as the main indicators of model fit. However, this chapter also reports the standardised root mean square residual (SRMR), comparative fit index (CFI) and incremental fit index (IFI) (see Table 4.5).

Table 4.5

Model Fit Indexes

Category	**Index Name**	**Index Abbreviation**	**Level of Acceptance**	**Source**
Absolute fit	Root mean square error of approximation	RMSEA	RMSEA<0.08	Browne and Cudeck (1993); Hooper et al. (2008)
Absolute fit	Standardised root mean residual	SRMR	SRMR<0.1	Hair et al. (2010)
Incremental fit	Comparative fit index	CFI	CFI>0.9	Bentler (1992)
Incremental fit	Incremental fit index	IFI	IFI>0.9	Bollen (1989)
Parsimonious fit	Normed chi-square	CMIN/DF	CMIN/DF<5	Wheaton et al. (1977)

4.10.11 Validity Assessment

For discriminant and convergent validity, this thesis tested the full latent variable model using AMOS. According to Hair et al. (2010), to evaluate convergent validity the composite reliability (CR) should be larger than .70 and higher than the average variance explained (AVE), and AVE should be greater than .50. Discriminant validity evaluation consists of comparing the AVE to maximum shared variance and to the average shared variance. For a factor to attain discriminant validity, the maximum shared variance and average shared variance should be greater than AVE (Hair et al., 2010). Bagozzi and Yi (1988) suggested CR should be larger than .60.

Criterion-related validity reflects the association of a scale with some criterion. Criterion-related validity is a temporarily neutral term (in contrast with construct validity) and deals with the empirical relationship between two variables, rather than causal relationships. Correlation coefficient has traditionally been the index for criterion-related validity (DeVellis, 2016). Criterion-related validity is commonly confused with construct validity as the former is a foundation for the latter. Construct validity has a direct concern for the theoretical relationship between variables. In contrast, criterion-related validity sees with neutrality at the correlations, their direction and their significance. Criterion-related validity does not indicate causality, but causality cannot be claimed if the criterion-related validity is not achieved first. Criterion-related validity only reports the fact that variables behave as expected in relation to other variables (DeVellis, 2016).

4.11 Ethics Approval

According to De Vaus (2002, p. 58), ‘ideally, a survey will be technically correct, practically efficient and ethically sound’. The principles underlying research ethics are universal and concern issues such as honesty and respect for the rights of the individual (Ticehurst and Veal, 2000). Approval for the conduct of this research was given by the Business College Human Ethics Advisory Network (BCHEAN) of RMIT University on 9 December 2014.

There are five ethical responsibilities towards survey participants stressed by most professional codes of conduct (De Vaus, 2002)—voluntary participation, informed consent, no harm, confidentiality, anonymity and privacy.

Voluntary participation means that people should not be required to participate. In this thesis, emails and letters accompanying the questionnaires, jointly authored by the researcher and the person responsible for distributing the questionnaire within the participating organisations, stated that participation was voluntary. Additionally, the wording of the introductory paragraph of the instrument stated participation was a matter of individual choice.

Informed consent of the participating organisations was sought through a letter formally seeking the organisations' involvement in this research and through discussion between the managers of the participating organisations. In addition, the letter set out the background to the study and the benefits to the organisation of participation. Questionnaire recipients were informed of the purpose of the survey both in the questionnaire and in covering letters and emails. Both the response rate and evidence of unanswered questions within the questionnaires indicated that responses were voluntary and that respondents were discriminating in the questions they answered. The use of signed consent forms is a common way to demonstrate informed consent (De Vaus, 2002), however, this was deemed unnecessary and may have conflicted with the confidentiality of the survey. Respondents were instructed in the questionnaire not to write their name or the name of any other person in answer to any of the questions. This ensured confidentiality and anonymity and guarded against contamination of the data by a third party.

Two types of harm to respondents were possible in this research. First, psychological harm through a fellow worker or manager discovering personal information about a respondent. Second, since some of the questions related to behaviours of co-workers and supervisors, harm could have been caused to the careers of respondents. Three aspects of this research minimised the risk of either harm. First, permission from BCHEAN was conditional on any analysis of the data and subsequent communication to the organisation being incapable of identifying any individual or subgroup within the organisation. Second, the survey was confidential and anonymous. Third, the researcher decided that no direct quotes from questionnaires would be communicated to the participating organisations, preventing the identification of anyone through language idiosyncrasy.

Confidentiality and anonymity were assured to maximise the quality and honesty of responses, maximise participation and protect participants from harm. No respondents recorded their name. In addition to the measures already outlined in this section, the participation of organisations in this research was conditional on the data remaining the property of the researcher, while approval from BCHEAN was conditional on the data being securely stored. Only the researcher has had access to the completed questionnaires, which have been kept in a locked facility, and no copies have been made of any completed questionnaire or part thereof.

Privacy of individual participants in this research was further guaranteed through organisations' declining permission for follow-up interviews by the researcher.

The ethical standards and practices employed in this thesis are a result of research, deliberations and discussions between the researcher, academic supervisor, BCHEAN and the representatives of participating organisations. There have been no complaints by participants brought to the researcher's attention and no ethical breaches.

4.12 Summary

This chapter detailed the methodology used to investigate the RQs and test the hypotheses. It set out the research framework within the context of the research logic, described the tools used and approaches taken in data analyses and outlined the ethics of conducting the survey. The next chapter reports the analysis of the thesis primary data.

Chapter 5: Analysis of Management Practices in NPD Projects in Vietnamese Manufacturing SMEs

This chapter reports the results from the analyses of the data collected in the main study. The chapter investigates the management practices of seniors in NPD projects in Vietnamese manufacturing SMEs from both staff and leader's perspectives. Respondents comprised 323 personnel from manufacturing SMEs in Hanoi, with 75 (23.2%) being presidents or vice presidents and 248 (76.8%) being managers or employees.

5.1 NPD Success Measure

The questionnaire included an item asking respondents if their company measured NPD project success. Of 323 respondents, 274 (84.8%) stated their company did measure NPD project success (a percentage slightly higher than the 81% reported by Huang [2004] and 76% reported by Griffin and Page [1993]), three (0.9%) said their company did not and 15 (4.6%) did not know. Figure 5.1 shows the frequency of use of the 16 PDMA criteria in SMEs to measure NPD project success.

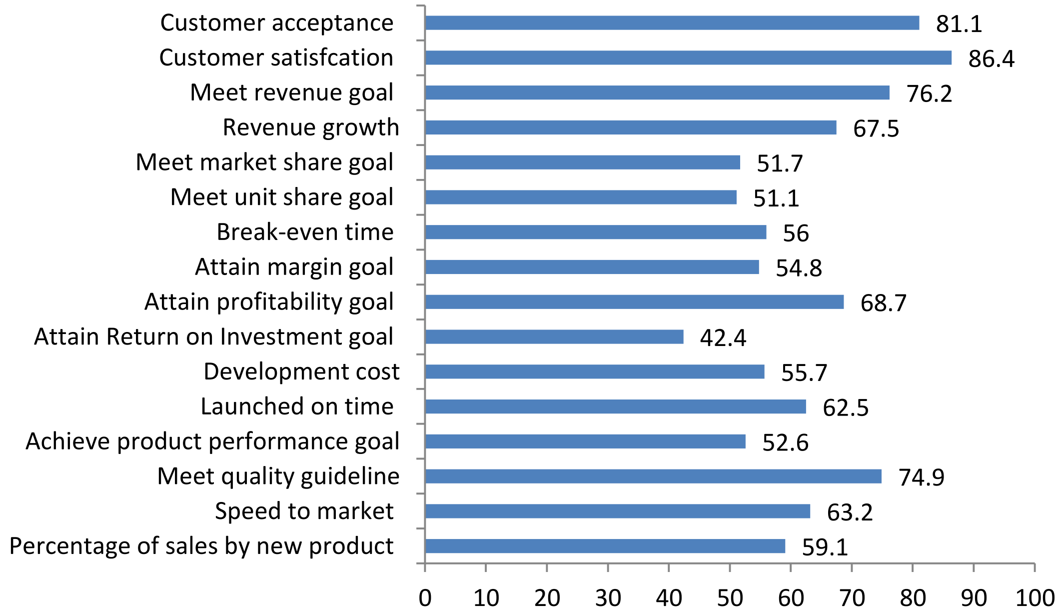

Figure 5.1. Use of the 16 PDMA Criteria in SMEs to Measure NPD Project Success (%) (N = 323).

The most frequently used measures were customer satisfaction (86.4%) and customer acceptance (81.1%). These are related to subjective customer acceptance, supporting Griffin and Page (1996) and Huang et al. (2004). Attain return on investment goal (42.4%) was the least used item. This is related to financial performance. Use of other measures varied from 51.1% to 76.2%. Table 5.1 shows the mean scores and standard deviations of the 16 PDMA criteria.

Table 5.1

Mean Scores and Standard Deviations of the 16 PDMA Criteria in SMEs to Measure NPD Project Success

NPD project success measures	**Mean[a]**	**SD**
Customer acceptance	4.35	.629
Customer satisfaction	4.38	.651
Meet revenue goal	4.13	.806
Revenue growth	4.09	.750

NPD project success measures	Mean[a]	SD
Meet market share goal	4.05	.782
Meet unit share goal	3.99	.789
Break-even time	3.79	.894
Attain margin goal	3.88	.802
Attain profitability goal	4.27	.684
Attain return on investment goal	3.93	.851
Development cost	3.95	.764
Launched on time	4.19	.849
Achieve product performance goal	4.17	.738
Meet quality guideline	4.46	.682
Speed to market	4.20	.756
Percentage of sales by new product	4.16	.737

Notes. [a] Mean scores on a five-point scale (1 = well below average and 5 = well above average). N = 323.

The mean scores for all NPD project success measures varied from 3.79 to 4.46. Respondents perceived their companies executed several measures well (especially meet quality guideline, customer acceptance and customer satisfaction). These are related to technical success and subjective customer acceptance. The measures that respondents did not perceive well were break-even time and attain margin goal. These measures are related to financial success.

The results from Table 5.1 and Figure 5.1 suggest that most Vietnamese manufacturing SMEs not only used subjective customer acceptance measures frequently but also perceived they have done well in the area. But at least some SMEs had difficulty in financial success. Financial measures were used less frequently and not as well executed as other NPD project success measures. Table 5.2 shows the completeness of the 16 PDMA criteria in SMEs to measure NPD project success.

Table 5.2

Completeness of Use of the 16 PDMA Criteria in SMEs to Measure NPD Project Success

No. of measures used	**%**
1	0
2	3.7
3	9.3
4	9.3
5	5.9
6	4.0
7	6.2
8	6.8
9	3.1
10	2.5
11	2.2
12	1.9
13	2.2
14	3.1
15	4.0
16	34.4

Notes. N = 323.

Following Huang et al. (2004), NPD success was divided into four major dimensions:

1. Subjective customer acceptance—including customer acceptance, and customer satisfaction.

2. Objective customer acceptance—including meet revenue goal, revenue growth, meet market share goal and meet unit share goal.
3. Financial performance—including break-even time, attain margin goal, attain profitability goal and attain return on investment goal.
4. Technical measures—including development cost, launched on time, achieve product performance goal, meet quality guideline and speed to market.

The sixteenth PDMA criteria, which measures the percentage of an organisation's sales obtained by all new products, is an organisational-level outcome. Figure 5.2 shows the frequencies of NPD success as measured by the four dimensions and the organisational-level measure.

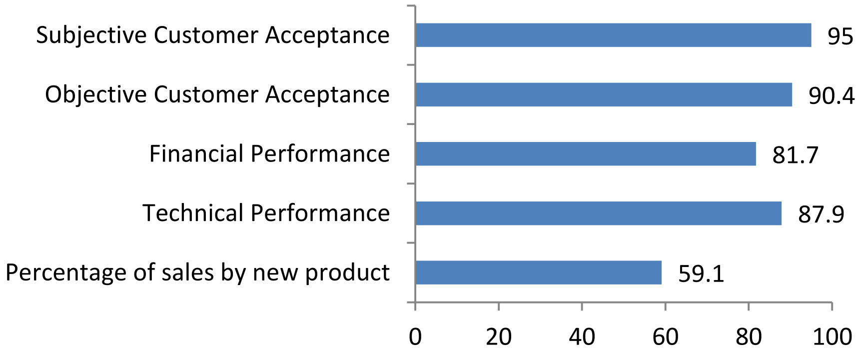

Figure 5.2. Frequencies of NPD success (%) in SMEs as measured by the Four Dimensions and Organisational-Level Measure (N = 323).

The factor loadings were similar to those of Griffin and Page (1993) and Huang et al. (2004). Success was registered most frequently in the subjective customer acceptance (95.0%) and objective customer acceptance (90.4%) dimensions, and least frequently in the percentage of sales by new product (59.1%) and financial performance (81.7%) dimensions. Table 5.3 shows the mean scores and standard deviations of the four dimensions of NPD success and the organisational-level measure.

Table 5.3

Mean Scores and Standard Deviations for the Four Dimensions of NPD Project Success and Organisational-Level Measure

NPD project success measures	**Mean[a]**	**SD**
Subjective customer acceptance	4.37	.605
Objective customer acceptance	4.10	.687
Financial performance	4.02	.729
Technical performance	4.23	.654
Percentage of sales by new product	4.16	.737

Notes. [a] Mean scores on a five-point scale (1 = well below average and 5 = well above average). N = 323.

The mean scores varied from 4.07 to 4.35. Respondents perceived their companies executed several dimensions well (especially technical success and subjective customer acceptance). Respondents did not perceive execution in financial success dimension well.

The results from Table 5.3 and Figure 5.2 suggest that most Vietnamese manufacturing SMEs not only used subjective customer acceptance measures frequently but perceived they have done well in the area. But at least some SMEs had difficulty in financial success. Financial measures were used less frequently and not as well executed as other NPD project success measures. Table 5.4 shows the completeness of use in SMEs of the four dimensions of NPD success and the organisational-level measure.

Table 5.4

Completeness of Use in SMEs of the Four Dimensions of NPD success and Organisational-Level Measure

No. of NPD project success dimensions used	**%**
1	0.6
2	10.2
3	12.1
4	20.7
5	54.8

Notes. N = 323.

All four NPD project success dimensions and the organisational-level measure were used by 54.8% of SMEs. Overall, the results suggest that most Vietnamese SMEs measured NPD project success. However, only slightly more than half used all of the four success dimensions and the organisational-level measure. Percentage of sales by new product and financial performance were the least frequently used measures. Vietnamese business managers may use the results to improve NPD project success in their organisations by formulating better policies supporting the use of both financial and non-financial innovation success measures together with the organisational-level measure.

5.2 NPD Process

NPD plays an important role in the survival of firms (Barclay et al., 2010). The questionnaire included an item asking respondents if their companies had a formal NPD process or not (see Table 5.5).

Table 5.5

SMEs with a NPD Process (Formal or Informal)

Presence of NPD process	No. of firms	%
No	15	4.6
Informal	123	38.1
Formal	170	52.6

Notes. N = 323.

A large proportion (90.7%) of firms had an NPD process (38.1% informal process and 52.6% formal process). Respondents were asked about the NPD process activities in their firm following the 13-step process model of Cooper, which is the most consistent with the Vietnamese context. In this model, NPD process activities ranged from idea generation to commercialisation. A six-point scale, ranging from 'excellently done' to 'not taken at all', was employed to measure the quality of activities. The frequencies of use of the 13 NPD process activities in SMEs are shown in Figure 5.3, which suggests innovators undertake most of the activities reported by Cooper (1993) and Huang et al. (2002).

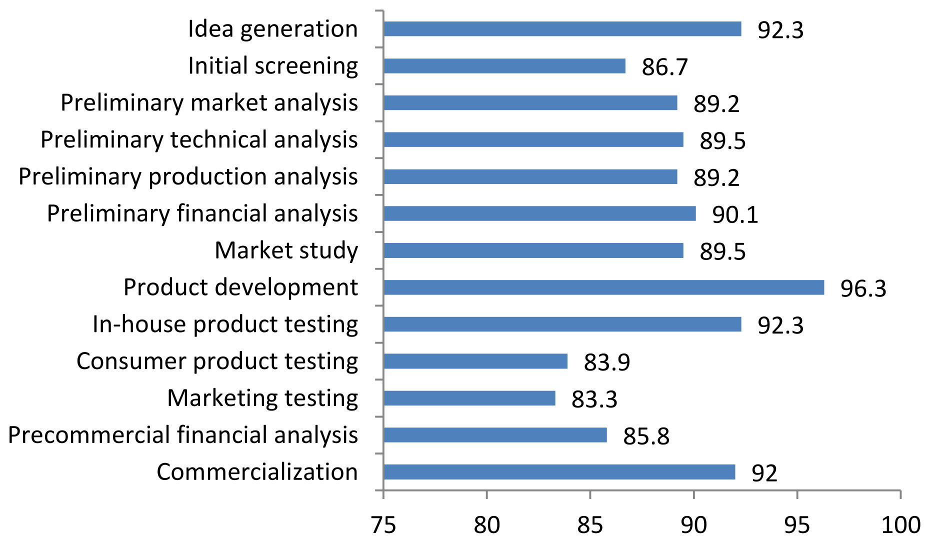

Figure 5.3. Frequency of Use of the 13 NPD Process Activities in SMEs (%).

The most frequently used activities were product development (96.3%), idea generation (92.3%) and in-house product testing (92.3%). These are related to idea generation, development, testing and validation activities. Marketing testing (83.3%), consumer product testing (83.9%) and precommercial financial analysis (85.8%) were the least frequently used activities. These are related to marketing and financial activities. The range of other measures' frequencies varied from 86.7% to 92.0%. These results are similar to those of Huang et al. (2002) in their study of Australian SMEs. The self-reported proficiency of the various NPD activities executed by the firms in this sample was undertaken to evaluate the proficiency of NPD process activities on new product performance. Table 5.6 shows the mean scores and standard deviations of the 13 activities of NPD process.

Table 5.6

Mean Scores and Standard Deviations of the 13 NPD Process Activities

NPD process activities	**Mean[a]**	**SD**
Idea generation	3.93	.570
Initial screening	3.76	.590
Preliminary market analysis	3.75	.737
Preliminary technical analysis	3.73	.703
Preliminary production analysis	3.73	.704
Preliminary financial analysis	3.76	.706
Market study	3.79	.736
Product development	3.92	.548
In-house product testing	3.75	.671
Consumer product testing	3.68	.734
Marketing testing	3.54	.789
Precommercial financial analysis	3.71	.690
Commercialisation	3.65	.692

Notes. [a] Mean scores on a five-point scale (1 = poorly done and 5 = excellently done). N = 323.

The mean scores for all NPD process activities ranged from 3.54 to 3.93. Respondents perceived their companies executed several activities well (especially idea generation, product development and market study), all related to technical activities. The activities that respondents did not perceive were executed well were marketing testing, commercialisation and consumer product testing, all related to marketing and financial activities. Similar patterns were found by Huang et al. (2002) in their study of Australian SMEs.

The results suggest that most Vietnamese manufacturing SMEs not only used technical activities frequently but also perceived they have done well in the area. But at least some SMEs had difficulty in marketing and financial activities. Marketing and financial activities were used less frequently and not as well executed as other NPD process activities.

The completeness of the NPD process can affect the performance of new products developed (Cooper and Kleinschmidt, 1986). Therefore, a series of t-tests were used to compare the activities undertaken by successful and unsuccessful projects. Table 5.7 shows the completeness of the 13 NPD process activities.

Table 5.7

Completeness of the 13 NPD Process Activities

No. of activities used	**%**
1	0
2	0.3
3	0.6
4	1.5
5	1.9
6	2.2
7	3.7
8	1.9
9	2.5
10	3.1
11	4.0
12	3.4
13	73.0

Notes. N = 323.

In this case, success was measured through the overall new product success item. Even though most respondent firms followed at least one of the activities (98.1%), only 73% used all 13 NPD activities, which was more likely to have been undertaken by firms with successful projects.

Another scale employed to assess the proficiency of the NPD process is a standard stage-gate system designed by (Cooper, 2008; Cooper, 1996, 1988), in which, the NPD process was divided into six major phases:

1. Phase 0—Discovery, including idea generation

2. Phase 1—Scoping, including initial screening
3. Phase 2—Building the business case and plan, including preliminary market analysis, preliminary technical analysis, preliminary production analysis, preliminary financial analysis and market study
4. Phase 3—Development, including product development
5. Phase 4—Testing and validation, including in-house product testing, consumer product testing, marketing testing and precommercial financial analysis
6. Phase 5—Product launch, including commercialisation.

Participants were asked to respond to these phases. Figure 5.4 shows the frequency of use of the six NPD phases in SMEs.

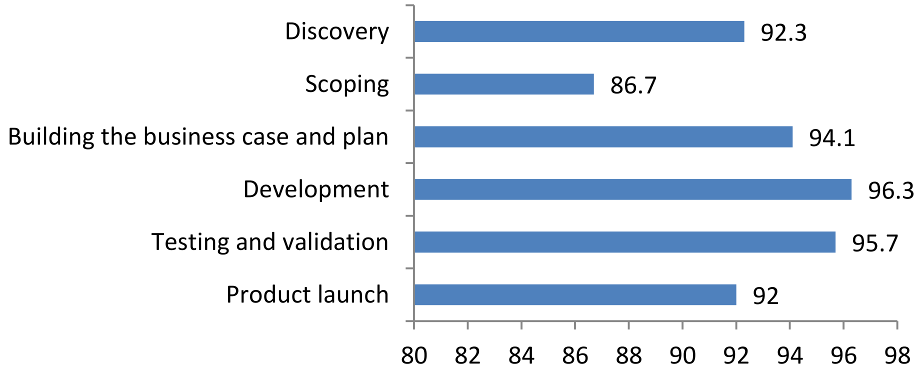

Figure 5.4. Frequency of Use of the Six Stage-Gate System Phases in SMEs (%).

The most frequently used phases were development (96.3%) and testing and validation (95.7%). Scoping (86.7%) was the least frequently used phase. The use of other phases varied from 92.0% to 94.1%. The self-reported proficiency of the various NPD process phases executed by the firms in this sample was also undertaken. Table 5.8 shows the mean scores and standard deviations of the six phases of the NPD process.

Table 5.8.

Mean Scores and Standard Deviations for the Six Stage-Gate System Phases

Phase	**Mean**	**SD**
Discovery	3.93	.570
Scoping	3.76	.590
Building the business case and plan	3.74	.584
Development	3.92	.548
Testing and validation	3.67	.562
Product launch	3.65	.692

Notes. N = 323.

Discovery and development have relatively high scores, suggesting that Vietnamese SMEs respondents perceived their companies did well in these phases.

The results suggest that the beginning phases (discovery and scoping) were used less frequently but were better executed than the ending phases (testing and validation and product launch). Vietnamese SMEs used ending phases more frequently but perceived they did not execute them well. Since the performance of the NPD can be affected by the completeness of the NPD process phases, the completeness of use of the six phases was considered (see Table 5.9).

Table 5.9

Completeness of the Six Stage-Gate System Phases

No. of phases used	**%**
1	0
2	0.6
3	3.1
4	6.2
5	7.4
6	80.8

Notes. N = 323.

Most firms (80.6%) executed all six phases. Of the 332 SMEs used in this study, 86.1% followed the phase-gate model in organising their NPD process while 13.9% did not follow this model.

The NPD activities undertaken and their quality can be affected by a number of factors, including managerial practices such as having an NPD process planning. Table 5.10 shows the results of a series of t-tests used to examine whether NPD process planning formality impacted the NPD process activities in Vietnamese manufacturing SMEs.

Table 5.10

Impact of NPD Process Planning Formality on NPD Process Activities

NPD process activities	Overall[a]	Informal[b]	Formal[c]
Idea generation	3.93	3.84	4.02*
Initial screening	3.76	3.65	3.86**
Preliminary market analysis	3.75	3.56	3.90**
Preliminary technical analysis	3.73	3.59	3.87**
Preliminary production analysis	3.73	3.54	3.86**
Preliminary financial analysis	3.76	3.59	3.88**
Market study	3.79	3.64	3.87*
Product development	3.92	3.77	4.01***
In-house product testing	3.75	3.64	3.86*
Consumer product testing	3.68	3.53	3.78*
Marketing testing	3.54	3.33	3.64**
Precommercial financial analysis	3.71	3.55	3.84**
Commercialisation	3.65	3.59	3.71

Notes. [a] N = 323, [b] N = 123, [c] N = 170.
* $p<.05$, ** $p<.01$, *** $p<.001$. N = 323.

Mean scores of the firms having informal NPD process planning ranges from 3.33 to 3.84 and mean scores of those having formal NPD process planning range from 3.64 to 4.02. Although firms with a formal strategy had a higher score in all the activities than those with an informal strategy, the differences were not statistically significant.

Table 5.11 shows the results of a series of t-tests used to examine whether NPD process planning formality impacted the NPD process phases in Vietnamese manufacturing SMEs.

Table 5.11

Impact of NPD Process Planning Formality on NPD Phases

NPD phases	Overall[a]	Informal[b]	Formal[c]
Discovery	3.93	3.84	4.02*
Scoping	3.76	3.65	3.86**
Building the business case and plan	3.74	3.57	3.87***
Development	3.92	3.77	4.01***
Testing and validation	3.67	3.55	3.78**
Product launch	3.65	3.59	3.71

Notes. [a] N = 248, [b] N = 123, [c] N = 170.
* $p<.05$, ** $p<.01$, *** $p<.001$.

The results show that NPD process planning formality generally supports better performance in the NPD process. SMEs with formal NPD process perceived they had better execute the NPD process than those with informal process in all phases ($p<0.05$), except for the product launch phase. This suggests that NPD process planning formality had a significant impact on the NPD process.

5.3 NPD Strategic Planning

The questionnaire asked respondents if their company had an NPD strategy (see Table 5.12). Most SMEs (93.5%) did have an NPD strategy.

Table 5.12

SMEs with a NPD Strategy (Formal or Informal)

Presence of NPD strategy	No. of firms	%
No	6	1.9
Informal	137	42.4
Formal	165	51.1

Notes. N = 323.

The five NPD strategic planning items were factor analysed. Principal components analysis revealed one factor that together explained the 51.675% of variance in the data. The final five items with their loading, after a varimax rotation to achieve simple structure, are shown in Table 5.13.

Table 5.13

Results of Factor Analysis of Five NPD Strategic Planning Items

Factor	NPD strategic planning	Communality
NPDSP01	.759	.576
NPDSP02	.720	.518
NPDSP03	.672	.452
NPDSP04	.755	.570
NPDSP05	.684	.468

Notes. N = 323.

From this, the values for NPD strategic planning were calculated. The mean score of NPD strategic planning was 3.95, suggesting that respondents perceived their companies had done well in the area. The standard deviation was .53. Cronbach's alpha (i.e., reliability) was .751, suggesting the factor is reliable and can be used with confidence (Nunnally and Bernstein, 1978). Table 5.14 shows the results of a series of t-tests was used to examine whether NPD strategic formality impacted NPD strategic planning in Vietnamese manufacturing SMEs.

Table 5.14

Impact of NPD Strategic Formality on NPD Strategic Planning

	Overall[a]	Informal[b]	Formal[c]
NPD strategic planning	3.95	3.70	4.18***

Notes. [a] N = 323, [b] N = 137, [c] N = 165.
*** $p<.001$.

NPD strategic formality generally supported better performance of NPD strategic planning. SMEs with formal NPD strategy perceived they had better performance than SMEs overall and SMEs with informal strategy. Significant difference (at $p<.001$) was found. This suggests that NPD strategic formality had a significant impact on NPD strategic planning.

5.4 NPD Resource Allocation

NPD resource allocation was measured by eight items developed by Huang et al. (2001) which measure the adequacy of a new product project's marketing, financial and technical resources. Table 5.15 shows the mean scores and standard deviations of the adequacy of the eight types of NPD resources.

Table 5.15

Mean Scores and Standard Deviations for Adequacy of NPD Resources

Type of resource	Mean[a]	SD
R&D	3.92	.831
Engineering	4.03	.710
Manufacturing	3.99	.734
Market	3.77	.786
Salesforce	3.78	.761
Distribution	3.75	.801
Advertising/Promotion	3.44	.888
Financial	3.87	.745

Notes. [a] Mean scores on a five-point scale (1 = strongly disagree and 5 = strongly agree). N = 323.

Mean scores for all NPD resources ranged from 3.44 to 4.03. Respondents perceived their companies had several adequate resources (engineering, manufacturing and R&D resources), all related to technical resources. Respondents did not perceive adequacy in advertising/promotion, market, salesforce and distribution resources. These are all related to marketing resources. Respondents perceived financial resources relatively well. Therefore, NPD resources can be divided into three groups:

1. Technical resources, including engineering, manufacturing and R&D resources
2. Marketing resources, including advertising/promotion, market, salesforce and distribution resources
3. Financial resources.

Table 5.16 shows the mean scores and standard deviations of the adequacy of these three groups of NPD resources.

Table 5.16

Mean Scores and Standard Deviations for Adequacy of NPD Resource Groups

NPD resource group	Mean[a]	SD
Technical	3.98	.620
Marketing	3.68	.646
Financial	3.87	.745

Notes. [a] Mean scores on a five-point scale (1 = strongly disagree and 5 = strongly agree). N = 323.

Mean scores varied from 3.68 to 3.98. Respondents perceived their companies had adequate technical resources, but insufficient marketing resources. These results are similar to those of Huang et al. (2001) on adequacy of marketing and technical resources for NPD in Australian SMEs. They are also consistent with RBV theory (Barney, 1991).

5.5 Multigroup Analysis

According to Cooper and Edgett (2003), senior management (leaders) must lead the way in NPD by providing leadership and commitment of necessary resources. The topic of senior management commitment and the role of senior management in NPD contains a number of critical best practices such as keeping score, engagement in the design of the firm's NPD process, new product metrics as an explicit part of senior management's personal and annual objectives, understanding the firm's NPD process, providing strong support, being committed to new products and product development, involved in the go/no-go and spending decisions for new products and not micromanaging NPD projects.

A series of t-tests was employed to examine whether there was a difference in staff and leader perceptions of senior management practices in NPD projects in Vietnamese manufacturing SMEs (including NPD success measure, process, strategic planning and resource allocation) (see Table 5.17).

Table 5.17

Difference in Staff and Leader Perceptions of Senior Management Practices in NPD Projects

Success measure type	Overall[a]	Staff[b]	Leader[c]
NPD project success			
Customer acceptance	4.35	4.32	4.44
Customer satisfaction	4.38	4.35	4.5
Meet revenue goal	4.13	4.12	4.14
Revenue growth	4.09	4.1	4.05
Meet market share goal	4.05	4.06	4
Meet unit share goal	3.99	4.02	3.83
Break-even time	3.79	3.84	3.6
Attain margin goal	3.88	3.91	3.72
Attain profitability goal	4.27	4.29	4.19
Attain return on investment goal	3.93	3.99	3.62
Development cost	3.95	3.97	3.85
Launched on time	4.19	4.21	4.1

Achieve product performance goal	4.17	4.17	4.19
Meet quality guideline	4.46	4.43	4.6
Speed to market	4.2	4.21	4.13
Percentage of sales by new product	4.16	4.15	4.21
Subjective customer acceptance	4.37	4.35	4.47
Objective customer acceptance	4.1	4.09	4.11
Financial performance	4.02	4.06	3.89
Technical measures	4.23	4.23	4.23
Organisational-level measure	4.16	4.15	4.21
NPD process			
Idea generation	3.93	3.97	3.82
Initial screening	3.76	3.81*	3.6
Preliminary market analysis	3.75	3.78	3.63
Preliminary technical analysis	3.73	3.77	3.61
Preliminary production analysis	3.73	3.79**	3.52
Preliminary financial analysis	3.76	3.77	3.73
Market study	3.79	3.79	3.78
Product development	3.92	3.93	3.89
In-house product testing	3.75	3.83**	3.49
Consumer product testing	3.68	3.75**	3.43
Marketing testing	3.54	3.61**	3.3
Precommercial financial analysis	3.71	3.77*	3.52
Commercialisation	3.65	3.70*	3.49
Discovery	3.93	3.97	3.82
Scoping	3.76	3.81*	3.6
Building the business case and plan	3.74	3.77	3.64

Development	3.92	3.93	3.89
Testing and validation	3.67	3.74***	3.43
Product launch	3.65	3.70*	3.49
NPD strategic planning	3.95	3.98	3.86
NPD resource allocation			
R&D resources	3.92	3.96	3.78
Engineering resources	4.03	4.06	3.93
Manufacturing resources	3.99	4	3.96
Market resources	3.77	3.8	3.68
Salesforce resources	3.78	3.83*	3.61
Distribution resources	3.75	3.83**	3.5
Advertising/Promotion resources	3.44	3.46	3.38
Technical resources	3.98	4	3.89
Marketing resources	3.68	3.72*	3.54
Financial resources	3.87	3.85	3.96

Notes. [a] N = 323, [b] N = 248, [c] N = 75.
* p<.05, ** p<.01, *** p<.001.

Table 5.17 clearly indicates that, in terms of NPD project success, leaders perceived a greater degree of success in the measures of customer acceptance, customer satisfaction, meet revenue goal, achieve product performance goal, meet quality guideline, percentage of sales by new product, subjective customer acceptance, objective customer acceptance and organisational-level measure than staff (including employees and managers). While success in terms of technical measures was perceived well by both leaders and staff, success in terms of other measures of NPD project success were perceived better by staff than leaders.

Similarly, in NPD process, all activities were perceived better by staff than leaders. The most significant activity is testing and validation, which reflects the nature of staff and leader in perception of this activity. The other significant NPD process activities perceived as better by staff are preliminary production analysis, in-house product testing, consumer product testing and marketing testing. The better perception of staff compared to leaders was also evidenced in NPD strategic planning and some resource measures in NPD resource allocation.

5.6 Summary

This chapter presented the descriptive analyses of senior management practices in NPD projects in Vietnamese manufacturing SMEs, including NPD success measure, process strategic planning and resource allocation. T-tests were applied to each item and each dimension of the construct to examine the difference between the two groups of staff and leaders in perceptions about each practice.

Chapter 6: Analysis of Success Factors of NPD in Vietnamese Manufacturing SMEs

This chapter reports the analyses of the data collected in the main study which identifies the success factors of NPD in Vietnamese manufacturing SMEs from both staff and leaders' perspectives. The reliability of WI, NPD capability and NPD strategic planning are also determined in this chapter. Respondents comprised 248 personnel (all employees and managers) from manufacturing SMEs in Hanoi.

6.1 Success Factors of NPD in Vietnamese Manufacturing SMEs—Staff Perspective

6.1.1 Measurement Reliability

6.1.1.1 WI concept and dimensions

WI was divided and assessed through four measures—organisational innovation, innovation climate, individual innovation and team innovation. Table 6.1 shows the mean scored, standard deviations, and reliability (Cronbach's alpha) of these dimensions of WI. Reliability ranged from .730 to .864, suggesting the factors are reliable and can be used with confidence (Nunnally and Bernstein, 1978). These scores were consistent with that reported by McMurray and Dorai (2003).

Table 6.1

Mean Scores, Standard Deviations and Reliability of Dimensions of WI

Dimension	Mean	SD	Cronbach's α
Organisational Innovation	4.06	.54	.730
Innovation Climate	3.90	.62	.864
Individual Innovation	3.57	.61	.798
Team Innovation	3.32	.80	.759

Notes. N = 248.

Mean scores of 3.32 to 4.06 suggest that respondents perceived their companies have implemented relatively successfully in WI, with the strongest result in organisational innovation (mean score of 4.06), followed by innovation climate (3.9). Less innovation is perceived in individual innovation (3.57) and team innovation (3.52).

6.1.1.2 NPD capability

NPD capability was divided and assessed through seven measures—learning capability, R&D capability, resources allocation capability, manufacturing capability, marketing capability, marketing capability, organisation capability and strategic planning capability. Table 6.2 shows the mean score, standard deviation and reliability (Cronbach's alpha) of these dimensions. Reliability ranged between .599 and .810, suggesting the factors are reliable and can be used with confidence (Nunnally and Bernstein, 1978).

Table 6.2

Mean Scores, Standard Deviations and Reliability of Measures of NPD Capability

Measure	**Mean**	**SD**	**Cronbach's α**
Learning capability	4.05	.52	.599
R&D capability	3.90	.58	.759
Resources allocation capability	4.11	.49	.686
Manufacturing capability	3.95	.55	.760
Marketing capability	3.79	.60	.805
Organisation capability	3.83	.64	.769
Strategic planning capability	4.00	.55	.810

Notes. N = 248.

Mean scores ranging from 3.79 to 4.11 suggest that respondents perceived their companies have done well in all areas. From a staff perspective, Vietnamese manufacturing SMEs are very good in learning and resources allocation capability, but relatively weak in marketing.

6.1.1.3 NPD strategic planning

The five NPD strategic planning items were factor analysed. Principal components analysis revealed one factor that together explained the 52.511% variance in the data. The final five items with their loading, after a varimax rotation to achieve simple structure, are shown in Table 6.3. Reliability (Cronbach's alpha) ranged from .689 to .764, suggesting the factors are reliable and can be used with confidence.

Table 6.3

Results of Factor Analysis of Five NPD Strategic Planning Items (Staff Perception)

Factor	NPD strategic planning	Communality
NPDSP01	.733	.537
NPDSP02	.733	.537
NPDSP03	.702	.493
NPDSP04	.764	.583
NPDSP05	.689	.475

Notes. N = 248.

From this, the values for NPD strategic planning (staff perception) were calculated. The mean score of NPD strategic planning was 3.98, suggesting that respondents perceived their companies had done well in the area. The standard deviation was .53. Cronbach's alpha (i.e., reliability) was .761, suggesting the factor is reliable and can be used with confidence (Nunnally and Bernstein, 1978). This reliability also matches Yam et al. (2004).

6.1.2 Perceived Success Factors of NPD in Vietnamese Manufacturing SMEs

The NPD success factors were further investigated by evaluating staff's perception of NPD overall success. The mean score of NPD overall success was 3.39 (scored on a five-point scale, 1 = very unsuccessful and 5 = very successful) and the standard deviation was 1.02. The overall success measure was used to group respondents into two categories—High Performers (successful respondents) and Low Performers (neutral and unsuccessful respondents). The mean score of 3.39 supports the conclusion that Vietnamese manufacturing SMEs are relatively successful in NPD, which is consistent with the results obtained from analysing staff's perception of separated factors (Section 6.1.1).To evaluate the relationship between WI, NPD capabilities, NPD strategic planning, NPD resource allocation, NPD process, the four dimensions of NPD success and the organisational-level measure as well as their impact on the overall NPD success in Vietnamese manufacturing SMEs, a series of t-tests were carried out (see Table 6.4).

Table 6.4

Impact of WI, NPD Capabilities, NPD Strategic Planning, NPD Resource Allocation, NPD Process, the Four Dimensions of NPD Success and the Organisational-Level Measure on Overall NPD Success

Success measure	**Overall[a]**	**Low Performers[b]**	**High Performers[c]**
WI			
Organisational innovation	4.06	3.89	4.20***
Innovation climate	3.9	3.68	4.07***
Individual innovation	3.57	3.55	3.61
Team innovation	3.32	3.3	3.35

NPD capabilities			
Learning capability	4.05	3.89	4.18***
R&D capability	3.9	3.74	4.03***
Resources allocation capability	4.11	4	4.19**
Manufacturing capability	3.95	3.88	4
Marketing capability	3.79	3.7	3.85
Organisation capability	3.83	3.66	3.96***
Strategic planning capability	4	3.86	4.11***
NPD strategic planning	3.98	3.88	4.07**
NPD resource allocation			
Technical resources	4	3.89	4.09**
Marketing resources	3.72	3.69	3.75
Financial resources	3.85	3.77	3.92
NPD process			
Discovery	3.97	3.89	4.03
Scoping	3.81	3.74	3.86
Building the business case and plan	3.77	3.66	3.85*
Development	3.93	3.86	3.98
Testing and validation	3.74	3.65	3.81*
Product launch	3.7	3.73	3.66
Four dimensions of NPD project success			
Subjective customer acceptance	4.35	4.25	4.42*
Objective customer acceptance	4.1	3.98	4.17*
Financial performance	4.07	4	4.11
Technical measures	4.24	4.1	4.33**
Organisational-level measure	4.15	3.95	4.26**

Notes. [a] N = 248, [b] N = 110, [c] N = 134.
* p<.05, ** p<.01, *** p<.001.

Staff perceived that overall NPD success generally followed organisational innovation, innovation climate, learning capability, R&D capability, resources allocation capability, organisation capability, strategic planning capability, NPD strategic planning, technical resources, building the business case and plan, testing and validation, subjective customer acceptance, objective customer acceptance, technical success and percentage of sales by new product. High Performers perceived they had better performance than the overall and Low Performers in all these areas. Significant differences (at p<.05) were found in these areas. This suggests that organisational innovation, innovation climate, learning capability, R&D capability, resources allocation capability, organisation capability, strategic planning capability, NPD strategic planning, technical resources, building the business case and plan, testing and validation, subjective customer acceptance, objective customer acceptance, technical success and percentage of sales by new product had a significant impact on overall NPD project success. These can be defined as the NPD success factors for Vietnamese manufacturing SMEs, and most are in same pattern as those NPD success factors identified by Cooper and Kleinschmidt (2000).

Staff perceived individual innovation, team innovation, manufacturing capability, marketing capability, marketing resources, financial resources, discovery, scoping, development, product launch and financial performance as not having a significant impact on overall NPD project success.

6.1.3 Success Factors of NPD in Vietnamese Manufacturing SMEs

The four NPD success dimensions were used to group respondents using Ward's hierarchical agglomeration procedure. A large jump was apparent in the clustering criterion when the number of clusters was increased from one to two. Using AMOS's suggested criterion, a two-cluster solution addressing High Performers and Low

Performers was most appropriate. SMEs in the High Performers cluster perceived they had better NPD success than the overall and those SMEs in the Low Performers cluster. Significant differences (at p<.001) were found between the two clusters in all four dimensions (see Table 6.5).

Table 6.5

SME Clusters[a]

NPD performance dimension	**Overall**[b]	**Low Performers**[c]	**High Performers**[d]
Subjective customer acceptance	4.35	3.92	4.58***
Objective customer acceptance	4.10	3.48	4.45***
Financial performance	4.07	3.49	4.41***
Technical measures	4.24	3.78	4.51***

Notes. [a] Mean scores on a five-point scale (1 = strongly disagree and 5 = strongly agree), [b] N = 248, [c] N = 248, [d] N = 248.
* p<.05, ** p<.01, *** p<.001.

Table 6.6 shows the results of a series of t-tests used to examine whether WI, NPD capabilities, NPD strategic planning, NPD resource allocation and NPD process impacted NPD success in Vietnamese manufacturing SMEs.

Table 6.6

Impact of WI, NPD Capabilities, NPD Strategic Planning, NPD Resource Allocation and NPD Process on NPD Project Success

Success measure	**Overall**[a]	**Lower Performers**[b]	**High Performers**[c]
WI			
Organisational innovation	4.06	3.9	4.21***
Innovation climate	3.9	3.71	4.18***
Individual innovation	3.57	3.48	3.69*
Team innovation	3.32	3.37	3.37

NPD Capabilities:			
Learning capability	4.05	3.96	4.21**
R&D capability	3.9	3.67	4.15***
Resources allocation capability	4.11	3.98	4.26***
Manufacturing capability	3.95	3.76	4.09***
Marketing capability	3.79	3.72	3.87
Organisation capability	3.83	3.7	3.97**
Strategic planning capability	4	3.84	4.22***
NPD strategic planning	3.98	3.88	4.16***
NPD resource allocation			
Technical resources	4	3.86	4.20***
Marketing resources	3.72	3.6	3.89**
Financial resources	3.85	3.55	4.16***
NPD process			
Discovery	3.97	3.86	4.03
Scoping	3.81	3.7	3.91*
Building the business case and plan	3.77	3.63	3.94***
Development	3.93	3.72	4.08***
Testing and validation	3.74	3.59	3.84**
Product launch	3.7	3.45	3.81**

Notes. [a] N = 248, [b] N = 76, [c] N = 110.
* p<.05, ** p<.01, *** p<.001.

NPD project success generally followed organisational innovation, innovation climate, individual innovation, learning capability, R&D capability, resources allocation capability, manufacturing capability, organisation capability, strategic planning capability, NPD strategic planning, technical resources, marketing resources, financial resources, scoping, building the business case and plan, development, testing and validation and product launch. High Performers perceived they had better performance than Low Performers in all of these areas. Significant differences (at $p<.05$) were found in these areas. This suggests these factors had a significant impact on NPD project success. These results are consistent with staff's perceived success factors of NPD in Vietnamese manufacturing SMEs. From staff's perspective, team innovation, marketing capability and discovery did not have a significant impact on NPD project success.

Higher Performers in terms of WI confirmed the theory of knowledge creation which enables Vietnamese manufacturing SMEs to engage in creative activities that can bring innovation and, consequently, lead to NPD success (Nonaka and Takeuchi, 1995). Since innovation is a natural outcome of knowledge creation, five phases for the success of the WI in Vietnamese manufacturing SMEs need to be followed—sharing tacit knowledge, creating concepts, justifying concepts, building an archetype and cross-levelling knowledge.

The significant differences in the areas of NPD capability confirmed the performance success of NPD projects. This indicates that Vietnamese manufacturing SMEs react extremely well to a rapidly changing environment. This NPD project success of Vietnamese manufacturing SMEs based on high performers of NPD capability was consistent with DCV theory (Teece et al., 1997). NPD success of Vietnamese manufacturing SMEs was also determined by the three main groups of NPD resource allocation (technical, marketing and financial resources), in line with RBV (Barney, 1991).

6.2 Success Factors of NPD in Vietnamese Manufacturing SMEs—Leader Perspective

The section presents the perspectives of leaders in Vietnamese manufacturing SMEs in Hanoi (N = 75, all presidents or vice presidents).

6.2.1 Measurement Reliability

6.2.1.1 WI Concept and Dimensions

From leaders' perspectives, WI was divided and assessed through four measures—organisational innovation, innovation climate, individual innovation and team innovation. Table 6.7 shows the mean scores, standard deviations and reliabilities (Cronbach's alpha) of these dimensions. Reliability ranged from .701 to .882, suggesting the factors are reliable and can be used with confidence (Nunnally and Bernstein, 1978). These reliability scores were consistent with those reported by McMurray and Dorai (2003).

Table 6.7

Mean Scores, Standard Deviations and Reliabilities of the Four Dimensions of WI

Factors	Mean	SD	Cronbach's alpha
Organisational innovation	4.03	.58	.830
Innovation climate	3.94	.61	.882
Individual innovation	3.80	.57	.701
Team innovation	3.44	.81	.727

Notes. N = 75.

Mean scores of 3.44 to 4.03 suggest that respondents perceived their companies have done well in the areas, with the strongest performance in organisational innovation (mean score of 4.03), followed by innovation climate (3.94). Less innovation was identified for individual innovation (3.80) and team innovation (3.44). This order is identical to that obtained from staff (see Section 6.1.1.1).

6.2.1.2 NPD capability

Table 6.8 shows the mean scores, standard deviations and reliabilities (Cronbach's alpha) of the dimensions of NPD capabilities. Reliability ranged from .713

to .826, suggesting the factors are reliable and can be used with confidence (Nunnally and Bernstein, 1978).

Table 6.8

Mean Scores, Standard Deviations and Reliabilities of the Dimensions of NPD Capabilities

Factors	Mean	SD	Cronbach's alpha
Learning capability	4.09	.57	.713
R&D capability	3.74	.58	.808
Resources allocation capability	4.10	.50	.738
Manufacturing capability	3.80	.57	.816
Marketing capability	3.73	.57	.750
Organisation capability	3.81	.63	.802
Strategic planning capability	3.78	.57	.826

Notes. N = 75.

Mean scores of 3.73 to 4.10 suggest that respondents perceived their companies have done well in all areas. Similar to staff's perception, leader's perceived good performance in learning (mean score of 4.09) and resources allocation capability (4.10), with lowest performance being in capability for marketing (3.79).

6.2.1.3 NPD strategic planning

The five NPD strategic planning items were factor analysed. Principal components analysis revealed one factor that explained the 48.207% variance in the data. The final five items with their loading, after a varimax rotation to achieve simple structure, are shown in Table 6.9. Reliability (Cronbach's alpha) ranged from .689 to .764, suggesting the factors are reliable and can be used with confidence.

Table 6.9

Results of Factor Analysis of Five NPD Strategic Planning Items (Leader Perception)

Factor	NPD strategic planning	Communality
NPDSP01	.845	.714
NPDSP02	.660	.436
NPDSP03	.523	.273
NPDSP04	.733	.537
NPDSP05	.671	.450

Notes. N = 75.

From this, the values for NPD strategic planning (leader perception) were calculated. The mean score of NPD strategic planning was 3.86, suggesting that respondents perceived their companies had implemented relatively well for NPD strategic planning. The standard deviation was .49. Cronbach's alpha (i.e., reliability) was .705, suggesting the factor is reliable and can be used with confidence (Nunnally and Bernstein, 1978).

6.2.2 Perceived Success Factors of NPD in Vietnamese Manufacturing SMEs

NPD success factors were further investigated by evaluating leaders' perception of NPD overall success. The mean score of NPD overall success was 3.32 (scored on a five-point scale, 1 = very unsuccessful and 5 = very successful) and the standard deviation was .903. The overall success measure was used to group respondents into two categories—High Performers (successful respondents) and Low Performers (neutral and unsuccessful respondents). The mean score of 3.32, lower than that of staff's perception, supports the conclusion that the Vietnamese manufacturing SMEs are relatively successful in NPD, which is consistent with the results obtained from analysing leaders' perception of separated factors (Section 6.2.1.1).

To examine whether WI, NPD capabilities, NPD strategic planning, NPD resource allocation, NPD process, the four dimensions of NPD success and the organisational-level measure impacted overall NPD success in Vietnamese manufacturing SMEs, a series of t-tests was performed (see Table 6.10).

Table 6.10

Impact of WI, NPD Capability, NPD Strategic Planning, NPD Resource Allocation, NPD Process, the Four Dimensions of NPD Success and the Organisational-Level Measure on Overall NPD Success

Success measure	**Overall**[a]	**Low Performers**[b]	**High Performers**[c]
WI			
Organisational innovation	4.03	3.99	4.08
Innovation climate	3.94	3.75	4.15**
Individual innovation	3.8	3.73	3.88
Team innovation	3.44	3.32	3.58
NPD capability			
Learning capability	4.09	4	4.2
R&D capability	3.74	3.52	4.00***
Resources allocation capability	4.1	4	4.2
Manufacturing capability	3.8	3.77	3.83
Marketing capability	3.73	3.61	3.86
Organisation capability	3.81	3.65	4.00*
Strategic planning capability	3.78	3.65	3.93*
NPD strategic planning	3.86	3.83	3.9
NPD resource allocation			
Technical resources	3.89	3.74	4.06*

Success measure	Overall[a]	Low Performers[b]	High Performers[c]
Marketing resources	3.54	3.46	3.62
Financial resources	3.96	3.93	4
NPD process			
Discovery	3.82	3.74	3.91
Scoping	3.6	3.54	3.68
Building the business case and plan	3.64	3.5	3.80*
Development	3.89	3.74	4.06**
Testing and validation	3.43	3.32	3.56
Product launch	3.49	3.34	3.67*
NPD project success			
Subjective customer acceptance	4.47	4.37	4.55
Objective customer acceptance	4.11	3.99	4.23
Financial performance	3.89	3.91	3.86
Technical measures	4.23	4.13	4.32
Organisational-level measure	4.21	3.83	4.41*

Notes. [a] N = 75, [b] N = 40, [c] N = 35.
* p<.05, ** p<.01, *** p<.001.

Vietnamese manufacturing SMEs leaders perceived that overall NPD success generally followed innovation climate, R&D capability, organisation capability, strategic planning capability, technical resources, building the business case and plan, development, product launch and percentage of sales by new product. High Performers perceived they had better performance than the overall and Low Performers in all of these areas. Significant differences (at p<.05) were found in these areas. This suggests that these factors had a significant impact on overall NPD project success.

Leaders perceived that organisational innovation, individual innovation, team innovation, learning capability, resources allocation capability, manufacturing capability, marketing capability, marketing resources, financial resources, discovery, scoping, testing and validation, subjective customer acceptance, objective customer acceptance, and financial performance did not have a significant impact on overall NPD project success.

6.2.3 Success Factors of NPD in Vietnamese Manufacturing SMEs

The four dimensions of NPD success were used to group respondents using Ward's hierarchical agglomeration procedure. A large jump was apparent in the clustering criterion when the number of clusters was increased from one to two. Using SPSS's suggested criterion, a two-cluster solution addressing High Performers and Low Performers was deemed most appropriate. SMEs in the High Performers cluster perceived they had better NPD success than SMEs overall and those in the Low Performers cluster. Significant differences (at $p<.001$) were found between both clusters in all four dimensions (see Table 6.11).

Table 6.11

SME Clusters[a]

NPD performance dimension	**Overall**[b]	**Low Performers**[c]	**High Performers**[d]
Subjective customer acceptance	4.47	4.00	4.68***
Objective customer acceptance	4.11	3.38	4.51***
Financial performance	3.89	3.17	4.19***
Technical measures	4.23	3.40	4.61***

[a] Mean scores on a five-point scale (1 = strongly disagree and 5 = strongly agree), [b] N = 75, [c] N = 18, [d] N = 29.
* p<.05, ** p<.01, *** p<.001.

Table 6.12 shows the results of a series of t-tests used to examine whether WI, NPD capabilities, NPD strategic planning, NPD resource allocation and NPD process impacted NPD success in Vietnamese manufacturing SMEs.

Table 6.12

Impact of WI, NPD Capabilities, NPD Strategic Planning, NPD Resource Allocation and NPD Process on NPD Project Success

Success measure	**Overall**[a]	**Lower Performers**[b]	**High Performers**[c]
WI			
Organisational innovation	4.03	3.87	4.20*
Innovation climate	3.94	3.83	4.1
Individual innovation	3.8	3.72	3.89
Team innovation	3.44	3.55	3.58
NPD capabilities			
Learning capability	4.09	4	4.24
R&D capability	3.74	3.5	4.06**
Resources allocation capability	4.1	3.86	4.39***
Manufacturing capability	3.8	3.83	3.8
Marketing capability	3.73	3.61	3.75
Organisation capability	3.81	3.62	3.97
Strategic planning capability	3.78	3.61	4.04*
NPD strategic planning	3.86	3.9	4.1
NPD resource allocation			
Technical resources	3.89	3.98	4.05
Marketing resources	3.54	3.54	3.7
Financial resources	3.96	3.67	4.14*

NPD process			
Discovery	3.82	3.88	3.85
Scoping	3.6	3.44	3.67
Building the business case and plan	3.64	3.65	3.83
Development	3.89	3.78	3.96
Testing and validation	3.43	3.41	3.56
Product launch	3.49	3.13	3.61*

Notes. [a] N = 75, [b] N = 18, [c] N = 29.
* p<.05, ** p<.01, *** p<.001.

NPD project success generally followed organisational innovation, R&D capability, resources allocation capability, strategic planning capability and product launch. High Performers perceived they had better performance than Low Performers in all of these areas. Significant differences (at p<.05) were found in these areas. This suggests that these factors had a significant impact on NPD project success.

Leaders did not perceive innovation climate, individual innovation, team innovation, learning capability, manufacturing capability, marketing capability, organisation capability, technical resources, marketing resources, discovery, scoping, building the business case and plan, development and testing and validation to have a significant impact on NPD project success.

6.3 Summary

This chapter presented the analyses results of the survey data to identify the success factors in NPD projects in Vietnamese manufacturing SMEs from staff and leaders' perspectives. T-test analyses were performed independently between two groups of staff (employee and managers) and leaders (presidents and vice presidents), which showed their similar views on the success factors of NPD projects. The next chapter details the analysis of the relationship between WI, NPD capability, NPD strategic planning and new product performance as well as the model of NPD performance in Vietnamese manufacturing SMEs.

Chapter 7: Analysis of the Model of NPD Performance in Vietnamese Manufacturing SMEs

7.1 Objective

This chapter investigates and details the relationship between WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs from a staff perspective. The results of assessment of mean and standard deviation, CFA estimation and assessment, and model testing are also presented in this chapter.

7.2 Assessment of Mean and Standard Deviation

WI, NPD capability, NPD strategic planning and NPD performance are the four central concepts of this thesis. The descriptive statistics are presented first for each concept. In the survey, a five-point Likert scale measured WI, NPD capability and NPD strategic planning (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree). Table 7.1 shows the mean scores and standard deviations of the four dimensions of WI, the seven dimensions of NPD capability, NPD strategic planning and NPD performance.

Table 7.1

Mean Scores and Standard Deviations of the Four Dimensions of WI, Seven Dimensions of NPD Capability, NPD Strategic Planning and NPD Performance

Factor	Mean	SD
WI		
Organisational innovation	4.06	.54
Innovation climate	3.90	.62
Individual innovation	3.57	.61

Team innovation	3.32	.80
NPD capability		
Learning capability	4.05	.52
R&D capability	3.90	.58
Resources allocation capability	4.11	.49
Manufacturing capability	3.95	.55
Marketing capability	3.79	.60
Organisation capability	3.83	.64
Strategic planning capability	4.00	.55
NPD strategic planning	3.98	.53
NPD performance	3.64	.81

Within WI, the highest mean was for organisational innovation (mean score of 4.06, SD = .54). This was followed by innovation climate (3.90, SD = .62), individual innovation (3.57, SD = .61) and team innovation (3.32, SD = .80). This shows that, in regard to WI, staff perceived that leaders practice the attributes of organisational innovation and innovation climate better than other forms of WI: individual innovation and team innovation, which were practiced by the staff.

In regard to NPD capability, the highest mean was for resources allocation capability (mean score of 4.11, SD = .49). This was followed by learning capability (4.05, SD = .52), strategic planning capability (4.00, SD = .55), manufacturing capability (3.95, SD = .55), R&D capability (3.90, SD = .58), organisation capability (3.83, SD = .64) and marketing capability (3.79, SD = .60). This shows that, in regard to NPD capability, staff perceived that their SMEs' resources allocation capability and learning capability were high while marketing capability was low.

The mean score for NPD strategic planning was 3.98 (SD = .53), and the mean score for NPD performance was 3.64 (SD = .81), suggesting that staff perceived their companies have done well in these areas.

7.3 Confirmatory Factor Analysis

This thesis used AMOS to compute CFA. In the estimation of the discrepancy, the method of ML was the selection. CFA was employed to estimate and assess construct validity, reliability and unidimensionality. Details of the analysis are provided in Sections 7.3.1–7.3.5.

7.3.1 WI Dimensions

WI is comprised of four dimensions—organisational innovation, innovation climate, individual innovation and team innovation. Sections 7.3.1.1—7.3.1.5 provide details of the estimation and assessment for the measurement model of each dimension and the full measurement model of the construct.

7.3.1.1 Organisational innovation

Organisational innovation was hypothesised to comprise five items. The CFA model of organisational innovation is presented in Figure 7.1. Table 7.2 presents the statistics for the measurement model of organisational innovation. The GOF is poor: RMSEA = .191, SRMR = .0931, CFI = .834, IFI = .837, CMIN/DF = 10.000.

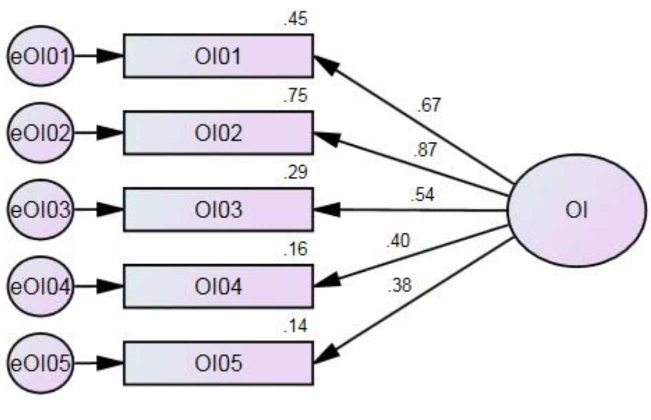

Figure 7.1. CFA Model of the Items of Organisational Innovation Dimension of WI.

Table 7.2

Goodness-of-Fit Statistics for the Measurement Model of Organisational Innovation Dimension of WI

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
OI01	.67	.45	RMSEA = .191	CFI = .834	CMIN/DF = 10.000
OI02	.87	.75	SRMR = .0931	IFI = .837	
OI03	.54	.29			
OI04	.40	.16			
OI05	.38	.14			

All the factor loadings (except OI03, OI04 and OI05), ranging from .67 to .87, were larger than the threshold level of .60. All the SMC values (except OI03, OI04 and OI05), ranging from .45 to .75, were greater than the threshold level of .40. The factor loading of item OI03, OI04, OI05 were .54, .40, .38 respectively, which were less than the threshold level of .60. The SMC value of items OI03, OI04 and OI05 were .29, .16 and .14 respectively, which were less than the threshold level of .40.

The final factor, after deleting items OI03, OI04 and OI05, has two items, OI01 and OI02. As it has less than four items, it will be estimated and assessed later in the full measurement model of the construct (in Section 7.3.1.5) (Kline, 2015).

7.3.1.2 Innovation climate

Innovation climate was hypothesised to comprise six items. The CFA model of innovation climate is presented in Figure 7.2. Table 7.3 presents the statistics for the measurement model of innovation climate. The GOF is good in terms of RMSEA: RMSEA = .107, SRMR = .0356, CFI = .960, IFI = .961, CMIN/DF = 3.818.

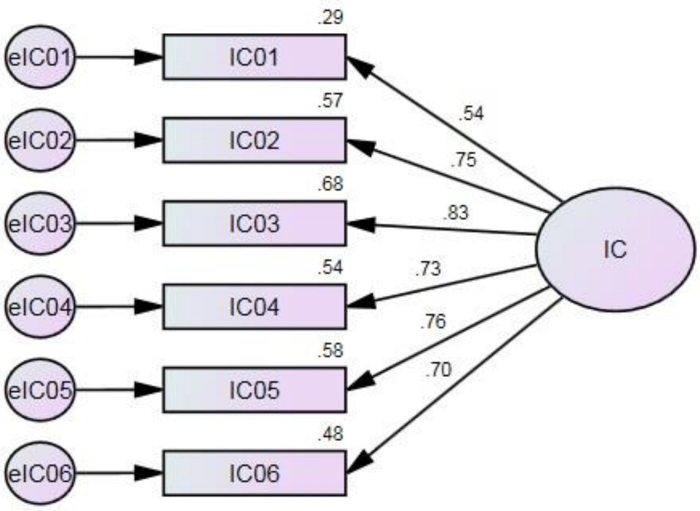

Figure 7.2. CFA Model of the Items of Innovation Climate Dimension of WI.

Table 7.3

Goodness-of-Fit Statistics for the Measurement Model of Innovation Climate Dimension of WI

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
IC01	.54	.29	RMSEA = .107	CFI = .960	CMIN/DF = 3.818
IC02	.75	.57	SRMR = .0356	IFI = .961	
IC03	.83	.68			
IC04	.73	.54			
IC05	.76	.58			
IC06	.70	.48			

All the factor loadings (except IC01), ranging from .70 to .83, were larger than the threshold level of .60. All the SMC values (except IC01), ranging from .48 to .68, were greater than the threshold level of .40. The factor loading of item IC01 was .54, less than the threshold level of .60. The SMC value of item IC01 was .29, less than the threshold level of .40.

The modified factor, after deleting item IC01, has five items, IC02, IC03, IC04, IC05 and IC06. The CFA model of the modified factor is presented in Figure 7.3. Table 7.4 presents the statistics for the measurement model of the modified factor. The GOF statistics are: RMSEA = .149, SRMR = .0401, CFI = .952, IFI = .952, CMIN/DF = 6.506.

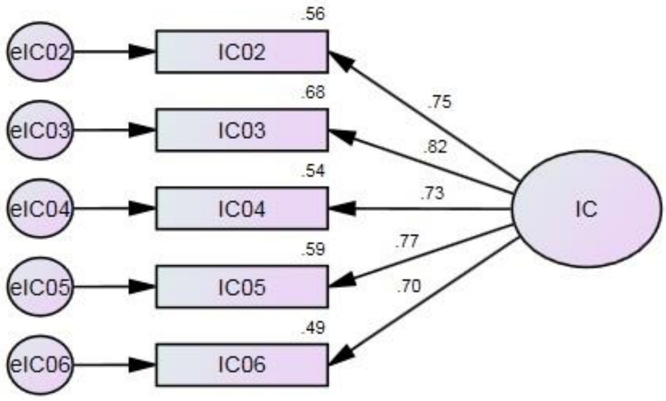

Figure 7.3. CFA Model of Innovation Climate Dimension of WI (after deleting Item IC01).

Table 7.4

Goodness-of-Fit Statistics for the Measurement Model of Innovation Climate Dimension of WI (after deleting Item IC01)

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
IC02	.75	.56	RMSEA = .149	CFI = .952	CMIN/DF = 6.506
IC03	.82	.68	SRMR = .0401	IFI = .952	
IC04	.73	.54			
IC05	.77	.59			
IC06	.70	.49			

All the factor loadings, ranging from .70 to .82, were larger than the threshold level of .60. All the SMC values, ranging from .49 to .68, were greater than the threshold level of .40.

Although the values of factor loadings and SMC in all items were greater than .60 and .40, the measurement model did not reach the acceptable range in terms of the RMSEA and CMIN/DF, so the modifications indices (MI) were examined to find the cause of the misfit (see Table 7.5).

Table 7.5

Modification Indices (Covariances)

Items			**MI**	**Par Change**
eIC03	<-->	eIC02	15.896	.072
eIC05	<-->	eIC04	15.437	.087

Following Awang (2012), a high MI (above 15) indicates a pair of items which are redundant in the model. Hair et al. (2010) suggests that significant MI indicates the potential for cross-loadings to exist. From the MI values, there was an issue in the covariances between eIC02 and eIC03 and between eIC04 and eIC05. To solve the redundant items, Awang (2012) suggests deleting one item (the one with the lower factor loading) or setting the pair of redundant items as free parameter estimate. In this thesis, the former was chosen and items IC02 and IC04 were deleted as they had lower factor loading compared to IC03 and IC05 respectively. The final factor, after deleting items IC02 and IC04, has three items, IC03, IC05 and IC06. As it has less than four items, it will be estimated and assessed later in the full measurement model of the construct (in Section 7.3.1.5) (Kline, 2015).

7.3.1.3 Individual innovation

Individual innovation dimension was hypothesised to have eight indicators. The CFA model of individual innovation is presented in Figure 7.4. Table 7.6 presents the statistics for the measurement model of individual innovation. The GOF is poor in terms of RMSEA, SRMR, CFI and IFI: RMSEA = .127, SRMR = .0784, CFI = .844, IFI = .846, CMIN/DF = 4.991.

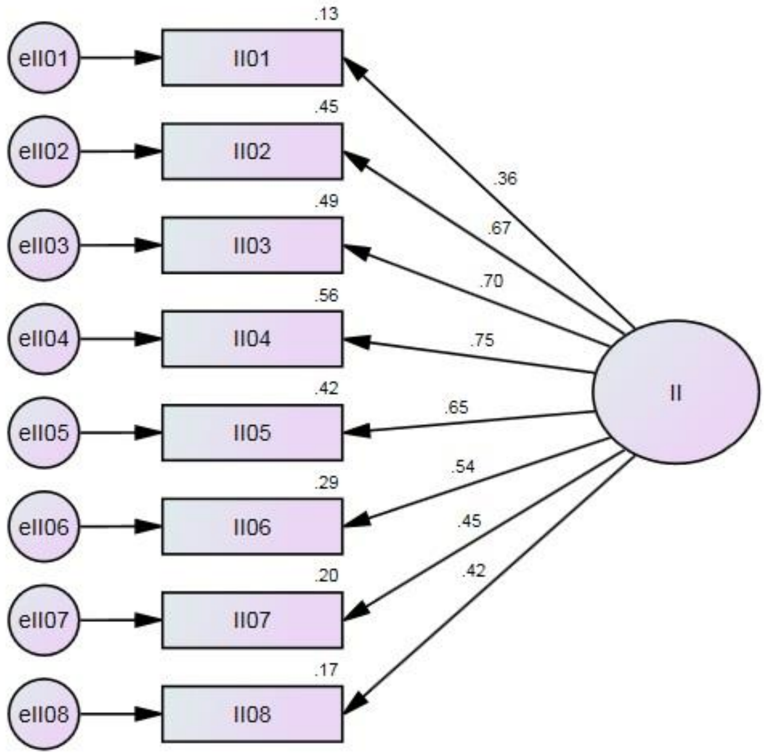

Figure 7.4. CFA Model of the Items of Individual Innovation Dimension of WI.

Table 7.6

Goodness-of-Fit Statistics for the Measurement Model of Individual Innovation Dimension of WI

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
II01	.36	.13	RMSEA = .127	CFI = .844	CMIN/DF = 4.991
II02	.67	.45	SRMR = .0784	IFI = .846	
II03	.70	.49			
II04	.75	.56			
II05	.65	.42			
II06	.54	.29			
II07	.45	.20			
II08	.42	.17			

All the factor loadings (except II01, II06, II07 and II08), ranging from .65 to .75, were larger than the threshold level of .60. All the SMC values (except II01, II06, II07 and II08), ranging from .42 to .56, were greater than the threshold level of .40. The factor loadings of items II01 (.36), II06 (.54), II07 (.45) and II08 (.42) were less than the threshold level of .60. The SMC value of items II01 (.13), II06 (.29), II07 (.20) and II08 (.17) were less than the threshold level of .40.

The modified factor, after deleting items II01, II06, II07 and II08, has four items, II02, II03, II04 and II05. The CFA model of the modified factor is presented in Figure 7.5. Table 7.7 presents the statistics for the measurement model of the modified factor. The corresponding GOF is poor in terms of RMSEA: RMSEA = .081, SRMR = .0229, CFI = .989, IFI = .989, CMIN/DF = 2.604.

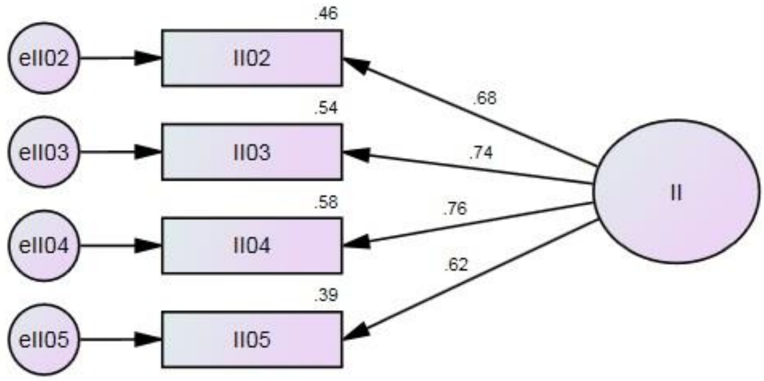

Figure 7.5. CFA Model of Individual Innovation Dimension of WI (after deleting Items II01, II06, II07 and II08).

Table 7.7

Goodness-of-Fit Statistics for the Measurement Model of Individual Innovation Dimension of WI (after deleting Items II01, II06, II07 and II08)

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
II01	.36	.13	RMSEA = .081	CFI = .989	CMIN/DF = 2.604
II02	.67	.45	SRMR = .0229	IFI = .989	
II03	.70	.49			
II04	.75	.56			

All the factor loadings (except II01), ranging from .67 to .75, were larger than the threshold level of .60. All the SMC values (except II01), ranging from .45 to .56, were greater than the threshold level of .40. The factor loading of item II01 was .36, less than the threshold level of .60. The SMC value of item II01 was .13, less than the threshold level of .40. The final factor, after deleting item II01, has three items—II02, II03, II04—and will be examined later in the full measurement model of the construct (in Section 7.3.1.5).

7.3.1.4 Team innovation

Team innovation dimension was hypothesised to have five indicators. The CFA model of team innovation is presented in Figure 7.6. Table 7.8 presents the statistics for the measurement model of individual innovation. The GOF is good in terms of RMSEA: RMSEA = .092, SRMR = .0438, CFI = .964, IFI = .964, CMIN/DF = 3.074.

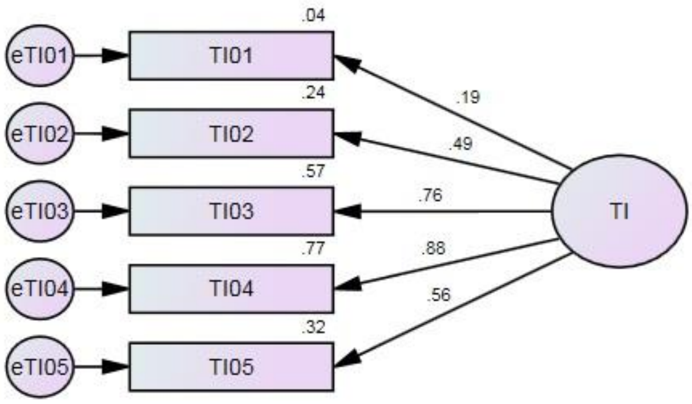

Figure 7.6. CFA Model of the Items of Team Innovation Dimension of WI.

Table 7.8

Goodness-of-Fit Statistics for the Measurement Model of Team Innovation Dimension of WI

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
TI01	.19	.04	RMSEA = .092	CFI = .964	CMIN/DF = 3.074
TI02	.49	.24	SRMR = .0438	IFI = .964	
TI03	.76	.57			
TI04	.88	.77			
TI05	.56	.32			

All the factor loadings (except TI01, TI02 and TI05), ranging from .76 to .88, were larger than the threshold level of .60. All the SMC values (except TI01, TI02 and

TI05), ranging from .57 to .77, were greater than the threshold level of .40. The factor loading of items TI01, TI02 and TI05 were .19, .49 and .56 respectively, less than the threshold level of .60. The SMC value of items TI01, TI02 and TI05 were .04, .24 and .32 respectively, less than the threshold level of .40. The final factor, after deleting items TI01, TI02 and TI05, has two items, TI03 and TI04, and will be examined later in the full measurement model of the construct (in Section 7.3.1.5).

7.3.1.5 Full CFA measurement model of the WI construct

In Sections 7.3.1.1–7.3.1.4, four dimensions of WI were independently estimated and assessed. Figure 7.7 and Tables 7.9 and 7.10 provide the results of full CFA measurement model of the construct. The outcome had sufficient GOF: RMSEA = .058, SRMR = .0521, CFI = .968, IFI = .969, CMIN/DF = 1.819.

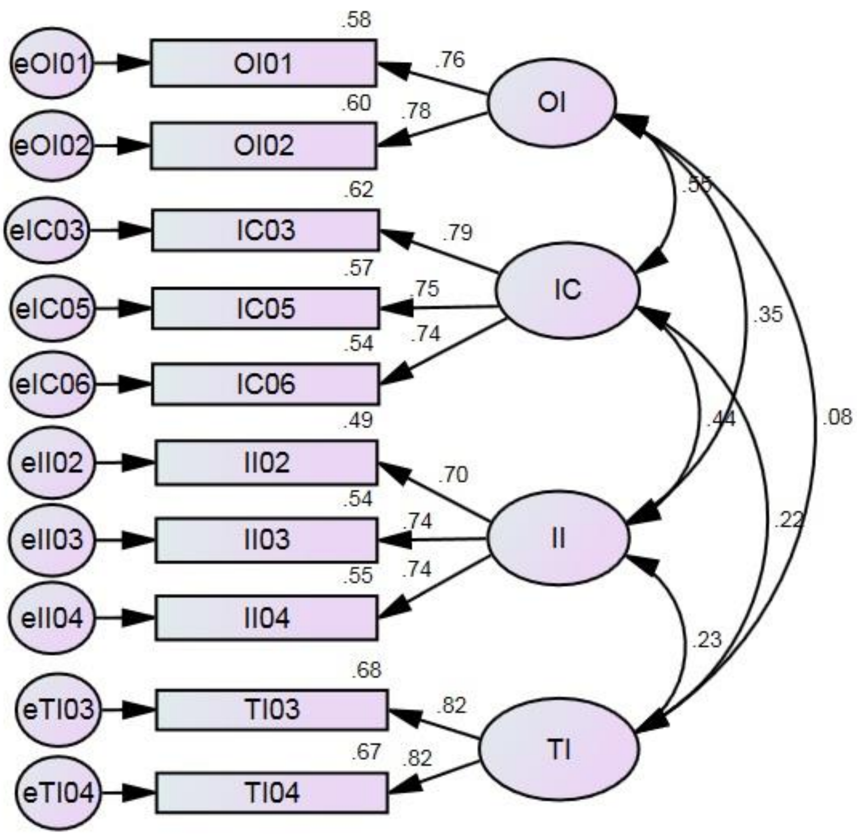

Figure 7.7. CFA Model of the WI Construct.

Table 7.9

Result of Goodness-of-Fit Statistics, Unidimensionality, Validity and Reliability of the Full CFA Model of the WI Construct

Factor	**Item**	**CR**	**AVE**	**Cronbach's alpha**	**Factor loading**	**SMC**	**Goodness-of-fit indices**		
							Absolute	**Incremental**	**Parsimony**
OI	OI01	.74	.59	.74	.76	.58	RMSEA = .058	CFI = .968	CMIN/DF
	OI02				.78	.60	SRMR = .0521	IFI = .969	= 1.819
IC	IC03	.80	.58	.80	.79	.62			
	IC05				.75	.57			
	IC06				.74	.54			
II	II02	.77	.53	.77	.70	.50			
	II03				.74	.54			
	II04				.74	.55			
TI	TI03	.80	.67	.81	.82	.68			
	TI04				.82	.67			

All the factor loadings, ranging from .70 to .82, were larger than the threshold level of .60. All the SMC values, ranging from .50 to .68, were greater than the threshold level of .40. The model's reliability (Cronbach's alpha>.6) and the CR (>0.6) was supported. The model's convergent validity based on the AVE (>0.5) was also supported. After establishing the model fit, the reliability and convergent validity, the discriminant validity was measured (see Table 7.10).

Table 7.10

Result of Discriminant Validity of Full CFA Model of the WI Construct

	OI	**IC**	**II**	**TI**
OI	.59 (AVE)	-	-	-
IC	.30	.58 (AVE)	-	-
II	.12	.19	.53 (AVE)	-
TI	.01	.05	.05	.67 (AVE)

To support the discriminant validity, the AVE values should be greater than the squared correlation estimate (Hair et al., 2010). The results from Table 7.10 indicate that the discriminant validity was supported. The correlation between the four dimensions of WI were also less than .85, supporting the discriminant validity (Kline, 2015).

Full CFA measurement model (see Figure 7.7) highlighted the unidimensionality of the four factors as no item loaded more than one factor and there was no correlation between the error terms (Hair et al., 2010).

7.3.2 NPD Capability

NPD capability theoretically has seven dimensions—learning capability, R&D capability, resources allocation capability, manufacturing capability, marketing capability, organisation capability and strategic planning capability. Sections 7.3.2.1–7.3.2.4 detail the estimation and assessment for the measurement model of different dimensions of NPD capability and the full measurement model of the construct.

As the dimension of learning capability was hypothesised to comprise two items and the dimensions of R&D capability, manufacturing capability and organisation capability were hypothesised to each have three items, they will be examined later in the full measurement model of the construct (in Section 7.3.2.4).

7.3.2.1 Resources allocation capability

The measurement model for resources allocation capability consists of four items. The CFA model of resources allocation capability is presented in Figure 7.8. Table 7.11 presents the result of statistics for the measurement model. The outcome had sufficient GOF: RMSEA = .059, SRMR = .0264, CFI = .989, IFI = .989, CMIN/DF = 1.867.

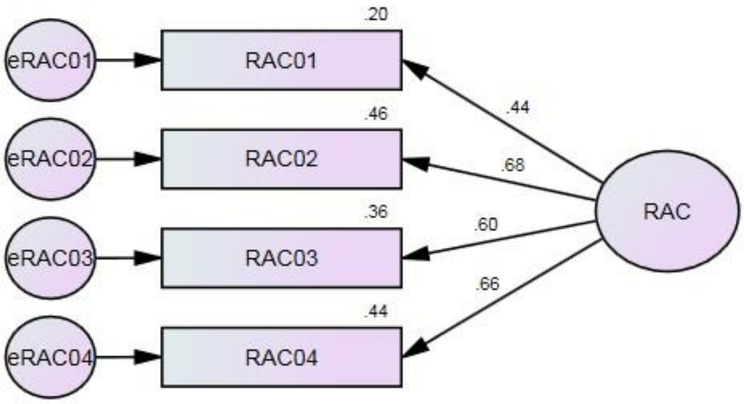

Figure 7.8. CFA Model of the Items of Resources Allocation Capability Dimension of NPD Capability.

Table 7.11

Goodness-of-Fit Statistics for the Measurement Model of Resources Allocation Capability Dimension of NPD Capability

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
RAC01	.44	.20	RMSEA = .059	CFI = .989	CMIN/DF = 1.867
RAC02	.68	.46	SRMR = .0264	IFI = .989	
RAC03	.60	.36			
RAC04	.66	.44			

All the factor loadings (except RAC01), ranging from .60 to .68, were larger than the threshold level of .60. All the SMC values (except RAC01 and RAC03), ranging from .44 to .46, were greater than the threshold level of .40. The factor loading of item RAC01 (.44) was less than the threshold level of .60. The SMC value of items RAC01 (.20) and RAC03 (.36) were less than the threshold level of .40. The final factor, after deleting items RAC01 and RAC03, has two items, RAC02 and RAC04, and will be examined later in the full measurement model of the construct (in Section 7.3.2.4).

7.3.2.2 Marketing capability

Marketing capability was hypothesised to comprise four items. The CFA model of marketing capability is presented in Figure 7.9. Table 7.12 presents the statistics for the measurement model. The outcome had sufficient GOF: RMSEA = .062, SRMR = .0208, CFI = .994, IFI = .994, CMIN/DF = 1.937.

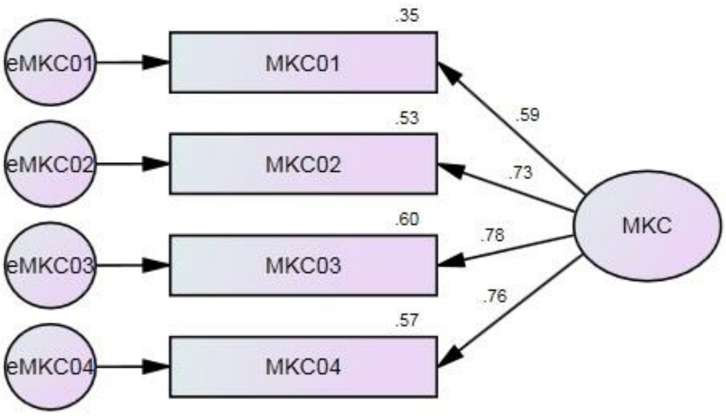

Figure 7.9. CFA Model of the Items of Marketing Capability Dimension of NPD Capability.

Table 7.12

Goodness-of-Fit Statistics for the Measurement Model of Marketing Capability Dimension of NPD Capability

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
MKC01	.59	.35	RMSEA = .062	CFI = .994	CMIN/DF = 1.937
MKC02	.73	.53	SRMR = .0208	IFI = .994	
MKC03	.78	.60			
MKC04	.76	.57			

All the factor loadings (except MKC01), ranging from .73 to .78, were larger than the threshold level of .60. All the SMC values (except MKC01), ranging from .53 to .60, were greater than the threshold level of .40. The factor loading of item MKC01 (.59) was less than the threshold level of .60. The SMC value of item MKC01 (.35) was less than the threshold level of .40. The final factor, after deleting item MKC01, has three items, MKC02, MKC03 and MKC04, and will be estimated and assessed later in the full measurement model of the construct (in Section 7.3.2.4).

7.3.2.3 Strategic planning capability

Strategic planning capability was hypothesised to include five items. The CFA model of strategic planning capability is presented in Figure 7.10. Table 7.13 presents the statistics for the measurement model of strategic planning capability. The outcome had acceptable GOF, except for RMSEA (.172) and CMIN/DF (8.286), which were greater than the threshold value of .08 and 5.0 respectively.

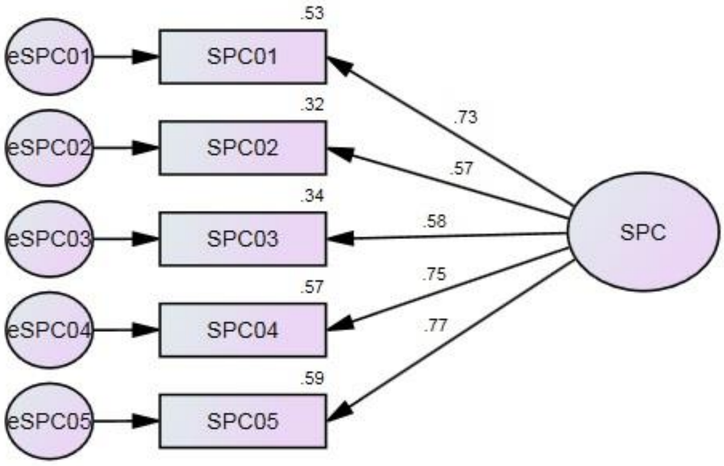

Figure 7.10. CFA Model of the Items of Strategic Planning Capability Dimension of NPD Capability.

Table 7.13

Goodness-of-Fit Statistics for the Measurement Model of Strategic Planning Capability Dimension of NPD Capability

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
SPC01	.73	.53	RMSEA = .172	CFI = .910	CMIN/DF = 8.286
SPC02	.57	.32	SRMR = .0560	IFI = .911	
SPC03	.58	.34			
SPC04	.75	.57			
SPC05	.77	.59			

All the factor loadings (except SPC02 and SPC03), ranging from .73 to .77, were larger than the threshold level of .60. All the SMC values (except SPC02 and SPC03), ranging from .53 to .59, were greater than the threshold level of .40. The factor loadings of items SPC02 (.57) and SPC03 (.58) were less than the threshold level of .60. The SMC values of items SPC02 (.32) and SPC03 (.34) were less than the threshold level of .40. The final factor, after deleting items SPC02 and SPC03, has three items, SPC01, SPC04 and SPC05, and will be examined later in the full measurement model of the construct (in Section 7.3.2.4).

7.3.2.4 Full CFA measurement model of the NPD capability construct

In Sections 7.3.2.1–7.3.2.3, three dimensions of NPD capability—resources allocation, marketing and strategic planning capability—were independently estimated and assessed. Figure 7.11 and Table 7.14 present the results of full CFA measurement model of the NPD capability construct. The outcome had sufficient GOF.

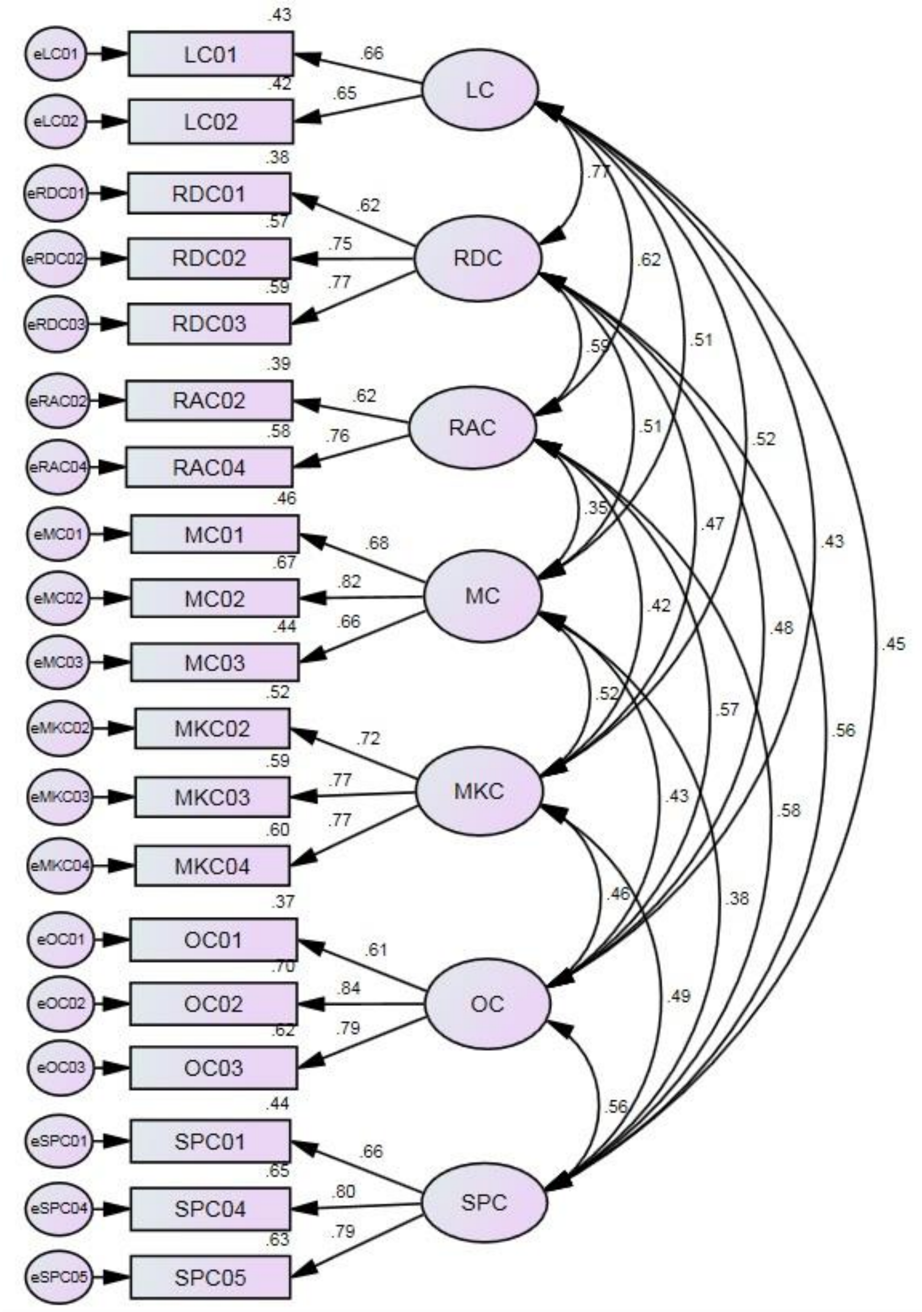

Figure 7.11. CFA Model of the NPD Capability Construct.

Table 7.14

Result of Goodness-of-Fit Statistics, Unidimensionality, Validity and Reliability of the Full CFA Model of the NPD Capability Construct

Factor	Item	CR	AVE	Cronbach's alpha	Factor loading	SMC	Goodness-of-fit indices		
							Absolute	Incremental	Parsimony
LC	LC01	.60	.43	.60	.66	.43	RMSEA = .065	CFI = .919	CMIN/DF = 2.052
	LC02				.65	.42	SRMR = .0550	IFI = .920	
RDC	RDC01	.76	.51	.76	.62	.38			
	RDC02				.75	.57			
	RDC03				.77	.59			
RAC	RAC02	.65	.48	.63	.62	.39			
	RAC04				.76	.58			
MC	MC01	.77	.52	.76	.68	.46			
	MC02				.82	.67			
	MC03				.66	.44			

Factor	Item	CR	AVE	Cronbach's alpha	Factor loading	SMC	Goodness-of-fit indices		
							Absolute	Incremental	Parsimony
MKC	MKC02	.80	.57	.80	.72	.52			
	MKC03				.77	.59			
	MKC04				.77	.60			
OC	OC01	.79	.57	.77	.61	.37			
	OC02				.84	.70			
	OC03				.79	.62			
SPC	SPC01	.80	.57	.79	.66	.44			
	SPC04				.80	.65			
	SPC05				.79	.63			

Two factors, learning capability and resources allocation capability, did not reach the acceptable range of AVE (above .50), and SMC values of items RDC01 and OC01 were less than the threshold level of 0.4. Thus, these two factors and two items were excluded from the measurement model. Figure 7.12 and Table 7.15 present the results of full CFA measurement model of the NPD capability construct after deleting the learning capability and resources allocation capability dimensions and items RDC01 and OC01. The outcome had sufficient GOF: RMSEA = .050, SRMR = .0415, CFI = .970, IFI = .970, CMIN/DF = 1.621.

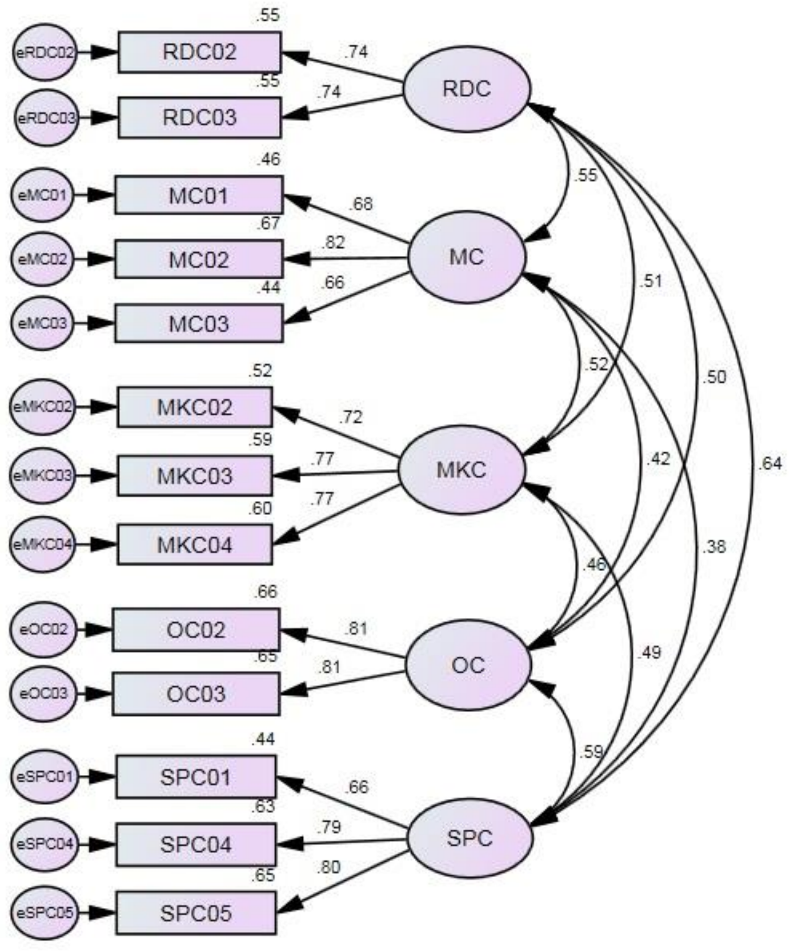

Figure 7.12. CFA Model of the NPD Capability Construct (after deleting Learning Capability and Resources Allocation Capability Dimensions and Items RDC01 and OC01).

Table 7.15

Result of Goodness-of-Fit Statistics, Unidimensionality, Validity and Reliability of the Full CFA Model of the NPD Capability Construct (after deleting Learning Capability and Resources Allocation Capability Dimensions and Items RDC01 and OC01)

Factor	Item	CR	AVE	Cronbach's alpha	Factor loading	SMC	Goodness-of-fit indices		
							Absolute	**Incremental**	**Parsimony**
RDC	RDC02	.71	.55	.71	.74	.55	RMSEA = .050	CFI = .970	CMIN/DF
	RDC03				.74	.55	SRMR = .0415	IFI = .970	= 1.621
MC	MC01	.77	.52	.76	.68	.46			
	MC02				.82	.67			
	MC03				.66	.44			
MKC	MKC02	.80	.57	.80	.72	.52			
	MKC03				.77	.59			
	MKC04				.77	.60			
OC	OC02	.79	.66	.79	.81	.66			
	OC03				.81	.65			
SPC	SPC01	.80	.57	.79	.66	.44			
	SPC04				.79	.63			
	SPC05				.80	.65			

All the factor loadings, ranging from .66 to .82, were larger than the threshold level of .60. All the SMC values, ranging from .44 to .67, were greater than the threshold level of .40. The model's reliability (Cronbach's alpha>.6) and the CR (>0.6) was supported. The model's convergent validity based on the AVE (>0.5) was also supported. After establishing the model fit, the reliability and convergent validity, the discriminant validity was measured (see Table 7.16).

Table 7.16

Result of Discriminant Validity of Full CFA Model of the NPD Capability Construct

	RDC	MC	MKC	OC	SPC
RDC	.55 (AVE)	-	-	-	-
MC	.30	.52 (AVE)	-	-	-
MKC	.26	.27	.57 (AVE)	-	-
OC	.25	.18	.21	.66 (AVE)	-
SPC	.41	.14	.24	.35	.57 (AVE)

To support the discriminant validity, the AVE values should be greater than the squared correlation estimate (Hair et al., 2010). The results from Table 7.16 indicate that the discriminant validity was supported. The correlation between the four dimensions of NPD Capability were also less than .85, supporting the discriminant validity (Kline, 2015).

Full CFA measurement model (see Figure 7.12) highlighted the unidimensionality of the five factors as no item loaded more than one factor and there was no correlation between the error terms (Hair et al., 2010).

7.3.3 NPD Strategic Planning

NPD strategic planning was hypothesised to comprise five items. The CFA model of NPD strategic planning is presented in Figure 7.13. Table 7.17 presents the statistics for the measurement model of NPD strategic planning. The outcome has poor GOF: RMSEA = .215, SRMR = .0722, CFI = .828, IFI = .830, CMIN/DF = 12.416.

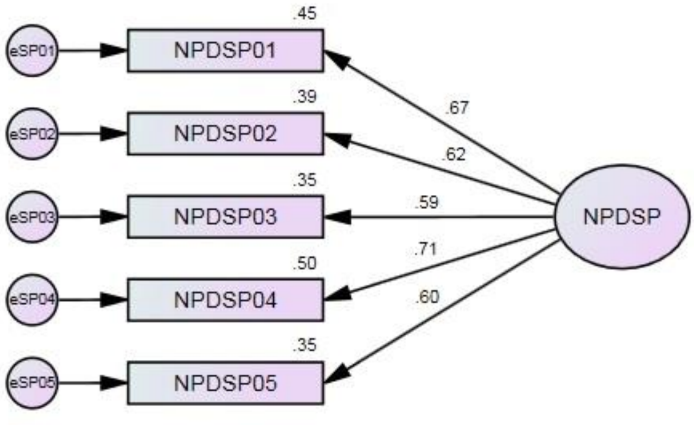

Figure 7.13. CFA Model of the NPD Strategic Planning Construct.

Table 7.17

Goodness-of-Fit Statistics for the Measurement Model of NPD Strategic Planning Construct

Item	**Std. Estimate**	**SMC**	**Goodness-of-fit indices**		
			Absolute	**Incremental**	**Parsimony**
NPDSP01	.67	.45	RMSEA = .215	CFI = .828	CMIN/DF = 12.416
NPDSP02	.62	.39	SRMR = .0722	IFI = .830	
NPDSP03	.59	.35			
NPDSP04	.71	.50			
NPDSP05	.60	.35			

All the factor loadings (except NPDSP03), ranging from .60 to .71, were larger than the threshold level of .60. All the SMC values (except NPDSP02, NPDSP03 and NPDSP05), ranging from .45 to .50, were greater than the threshold level of .40. The factor loading of item NPDSP03 (.59) was less than the threshold level of .60. The SMC value of items NPDSP02 (.35), NPDSP03 (.35) and NPDSP05 (.39) were less than the threshold level of .40. The final factor, after deleting items NPDSP02, NPDSP03 and

NPDSP05, has two items, NPDSP01 and NPDSP04, and will be examined later in the full measurement model (in Section 7.3.5).

7.3.4 NPD Performance

NPD Performance was a single-item measure and considered an observed variable.

7.3.5 Full Measurement Model

In Sections 7.3.1–7.34, three constructs—WI, NPD capability and NPD strategic planning—were independently estimated and assessed. Figure 7.14 and Table 7.18 provide the results of the full CFA measurement model. The outcome had sufficient GOF: RMSEA = .057, SRMR = .0525, CFI = .921, IFI = .924, CMIN/DF = 1.791.

Table 7.18

Result of Goodness-of-Fit Statistics, Unidimensionality, Validity and Reliability of the Full CFA Model

Factor	Item	CR	AVE	Cronbach's alpha	Factor loading	SMC	Goodness-of-fit indices		
							Absolute	**Incremental**	**Parsimony**
OI	OI01	.74	.58	.74	.78	.60	RMSEA = .057	CFI = .921	CMIN/DF = 1.791
	OI02				.76	.58	SRMR = .0525	IFI = .924	
IC	IC03	.80	.57	.77	.79	.63			
	IC05				.74	.55			
	IC06				.74	.55			
II	II02	.77	.53	.77	.65	.42			
	II03				.74	.54			
	II04				.79	.62			
TI	TI03	.81	.68	.81	.83	.68			
	TI04				.82	.67			
RDC	RDC02	.71	.55	.71	.74	.55			
	RDC03				.74	.55			

Factor	Item	CR	AVE	Cronbach’s alpha	Factor loading	SMC	Goodness-of-fit indices		
							Absolute	**Incremental**	**Parsimony**
MC	MC01	.77	.52	.76	.68	.46			
	MC02				.82	.67			
	MC03				.66	.44			
MKC	MKC02	.80	.57	.80	.74	.55			
	MKC03				.76	.58			
	MKC04				.76	.58			
OC	OC02	.79	.66	.79	.81	.66			
	OC03				.81	.65			
SPC	SPC01	.80	.57	.79	.67	.45			
	SPC04				.80	.64			
	SPC05				.78	.61			
SP	SP01	.67	.50	.68	.77	.60			
	SP04				.64	.41			

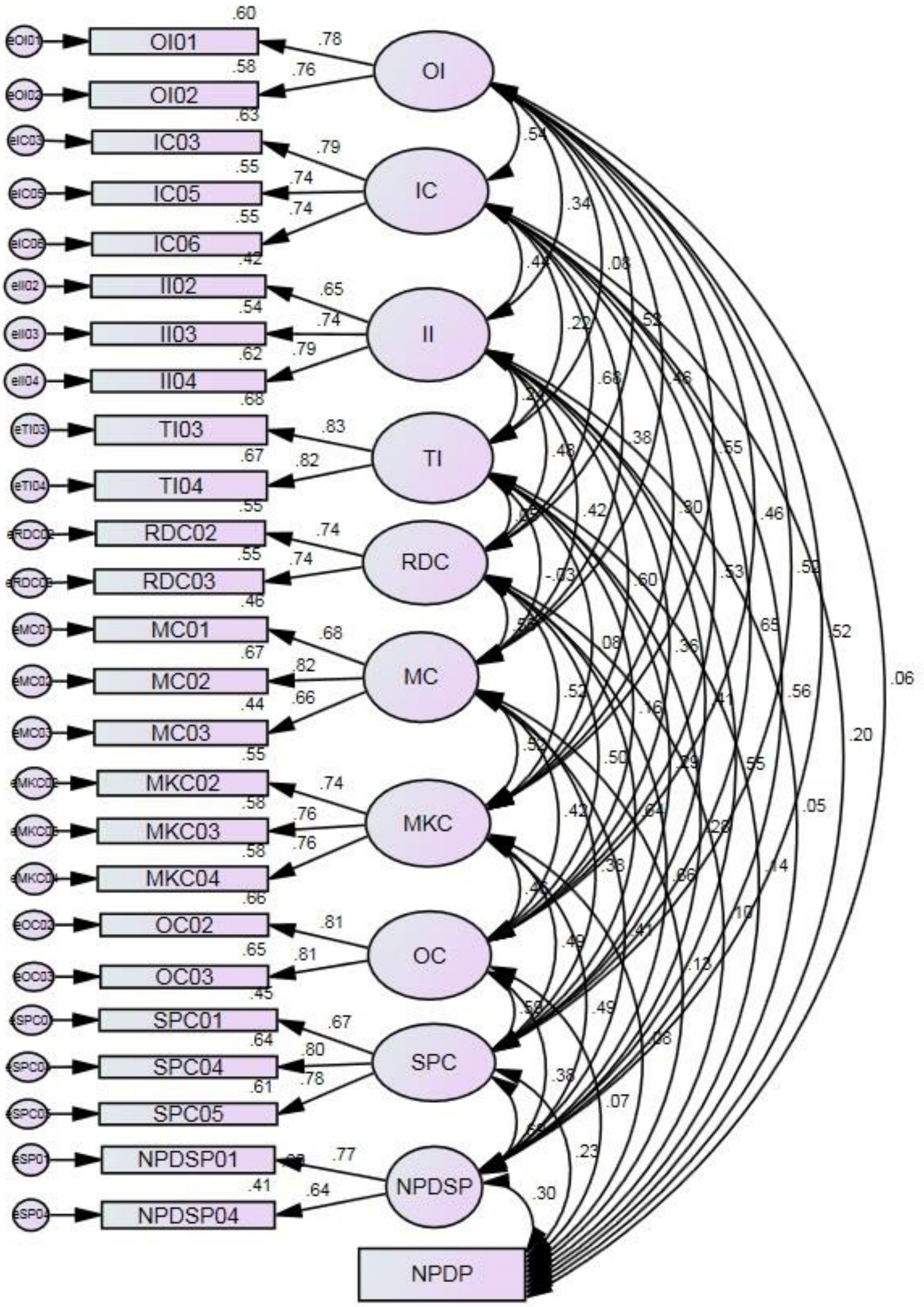

Figure 7.14. Full CFA Measurement Model.

All the factor loadings, ranging from .64 to .83, were larger than the threshold level of .60. All the SMC values, ranging from .41 to .68, were greater than the threshold level of .40. The model's reliability (Cronbach's alpha>.6) and the CR (>0.6) was supported. The model's convergent validity based on the AVE (>0.5) was also supported. After establishing the model fit, the reliability and convergent validity, the discriminant validity was measured (see Table 7.19).

Table 7.19

Result of Discriminant Validity of the Full CFA Measurement Model

	OI	IC	II	TI	RDC	MC	MKC	OC	SPC	SP
OI	.59 (AVE)	-	-	-	-	-	-	-	-	-
IC	.30	.58 (AVE)	-	-	-	-	-	-	-	-
II	.12	.19	.53 (AVE)	-	-	-	-	-	-	-
TI	.01	.05	.05	.67 (AVE)	-	-	-	-	-	-
RDC	.27	.46	.23	.003	.55 (AVE)	-	-	-	-	
MC	.21	.14	.18	.001	.30	.52 (AVE)	-	-	-	
MKC	.30	.09	.36	.01	.26	.27	.57 (AVE)	-	-	
OC	.21	.28	.13	.03	.25	.18	.21	.66 (AVE)	-	
SPC	.27	.42	.17	.08	.41	.14	.24	.35	.57 (AVE)	
SP	.27	.31	.30	.08	.45	.17	.24	.14	.48	.50 (AVE)

To support the discriminant validity, the AVE values should be greater than the squared correlation estimate (Hair et al., 2010). The results from Table 7.19 indicate that the discriminant validity was supported. The correlation between the four dimensions of WI was less than .85, supporting the discriminant validity (Kline, 2015). Full CFA measurement model (see Figure 7.14) highlighted the unidimensionality of all the factors in the model as no item loaded more than one factor and there was no correlation between the error terms.

7.4 Hypothesis Testing

Three constructs—WI, NPD capability and NPD strategic planning—were independently estimated and assessed. The full structural model is presented in Figure 7.15. The outcome had sufficient GOF. As the final assessment for the structural model, Table 7.20 presents the strengths of the structural paths in the model by showing how the research hypotheses were tested.

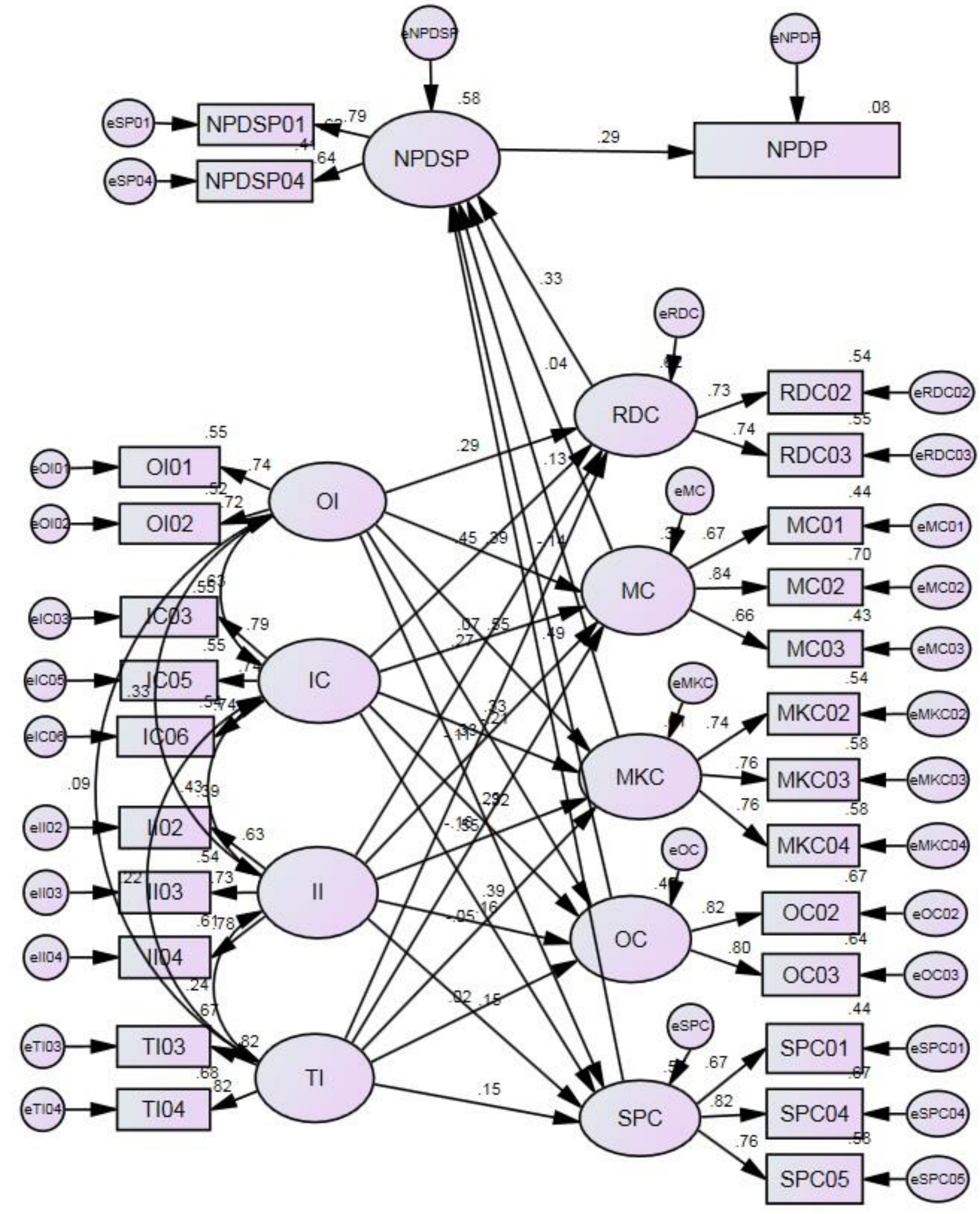

Figure 7.15. Full Structural Model.

Table 7.20

Structural Paths[a]

Hypotheses	Relationship			Estimate	Std. Estimate	SE	CR	P	Supported
H1a2	RDC	<---	OI	0.326	0.286	0.105	3.094	0.002	Yes
H1a4	MC	<---	OI	0.39	0.391	0.103	3.791	***	Yes
H1a5	MKC	<---	OI	0.713	0.553	0.133	5.345	***	Yes
H1a6	OC	<---	OI	0.405	0.329	0.117	3.454	***	Yes
H1a7	SPC	<---	OI	0.328	0.322	0.09	3.636	***	Yes
H1b2	RDC	<---	IC	0.371	0.452	0.08	4.617	***	Yes
H1b4	MC	<---	IC	0.051	0.07	0.071	0.712	0.477	No
H1b5	MKC	<---	IC	–0.194	–0.209	0.092	–2.107	0.035	Yes
H1b6	OC	<---	IC	0.257	0.29	0.087	2.975	0.003	Yes
H1b7	SPC	<---	IC	0.289	0.393	0.069	4.192	***	Yes
H1c2	RDC	<---	II	0.186	0.266	0.057	3.248	0.001	Yes
H1c4	MC	<---	II	0.205	0.333	0.056	3.683	***	Yes
H1c5	MKC	<---	II	0.435	0.548	0.074	5.897	***	Yes
H1c6	OC	<---	II	0.118	0.156	0.063	1.882	0.06	Yes[b]
H1c7	SPC	<---	II	0.095	0.151	0.047	2.013	0.044	Yes
H1d2	RDC	<---	TI	–0.075	–0.114	0.046	–1.614	0.106	No
H1d4	MC	<---	TI	–0.092	–0.16	0.043	–2.127	0.033	Yes
H1d5	MKC	<---	TI	–0.035	–0.047	0.052	–0.677	0.498	No
H1d6	OC	<---	TI	0.017	0.024	0.051	0.328	0.743	No
H1d7	SPC	<---	TI	0.091	0.155	0.039	2.352	0.019	Yes
H2b	NPDSP	<---	RDC	0.373	0.334	0.125	2.991	0.003	Yes
H2d	NPDSP	<---	MC	0.053	0.042	0.11	0.487	0.626	No
H2e	NPDSP	<---	MKC	0.13	0.132	0.088	1.48	0.139	No
H2f	NPDSP	<---	OC	–0.144	–0.139	0.092	–1.568	0.117	No
H2g	NPDSP	<---	SPC	0.616	0.495	0.129	4.786	***	Yes
H3	NPDP	<---	NPDSP	0.388	0.286	0.097	3.991	***	Yes

Notes. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.
[a] 10 hypotheses (H1a1, H1a3, H1b1, H1b3, H1c1, H1c3, H1d1, H1d3, H2a and H2c) excluded from table. These were not tested due to deletion of learning capability and resources allocation capability dimensions of NPD capability.
[b] In $p<0.1$.

From the 26 theorised structural paths, 10 were significant at $p<.001$, four were significant at $p<.01$ and one was significant at $p<0.1$. Assessment of the structural model revealed that H1a2, H1a4–H1a7, H1b2, H1b5–H1b7, H1c2, H1c4–H1c7, H1d4, H1d7, H2b, H2g and H3 were supported, meaning that in Vietnamese manufacturing SMEs there is a relationship between:

- organisational innovation and R&D capability
- organisational innovation and manufacturing capability
- organisational innovation and strategic planning capability
- innovation climate and R&D capability
- climate and marketing capability
- innovation climate and strategic planning capability
- individual innovation and R&D capability
- individual innovation and manufacturing capability
- individual innovation and strategic planning capability
- team innovation and manufacturing capability
- team innovation and strategic planning capability
- R&D capability and NPD strategic planning
- strategic planning capability and NPD strategic planning
- NPD strategic planning and NPD performance.

Thus, the relationships between WI and NPD capability, NPD capability and NPD strategic planning, and NPD strategic planning and NPD performance were demonstrated.

The structural paths in Table 7.20 also demonstrate there is no relationship between innovation climate and manufacturing capability (H1b4), team innovation and R&D capability (H1d2), team innovation and marketing capability (H1d5), team innovation and organisation capability (H1d6), manufacturing capability and NPD strategic planning (H2d), marketing capability and NPD strategic planning (H2e) or organisation capability and NPD strategic planning (H2f). As two dimensions of NPD capability (learning capability and resources allocation capability) did not reach the acceptable range of validity and were deleted, 10 hypotheses (H1a1, H1a3, H1b1, H1b3, H1c1, H1c3, H1d1, H1d3, H2a and H2c) could not be tested and were excluded. Figure 7.16 shows the developed research model and the hypotheses testing results.

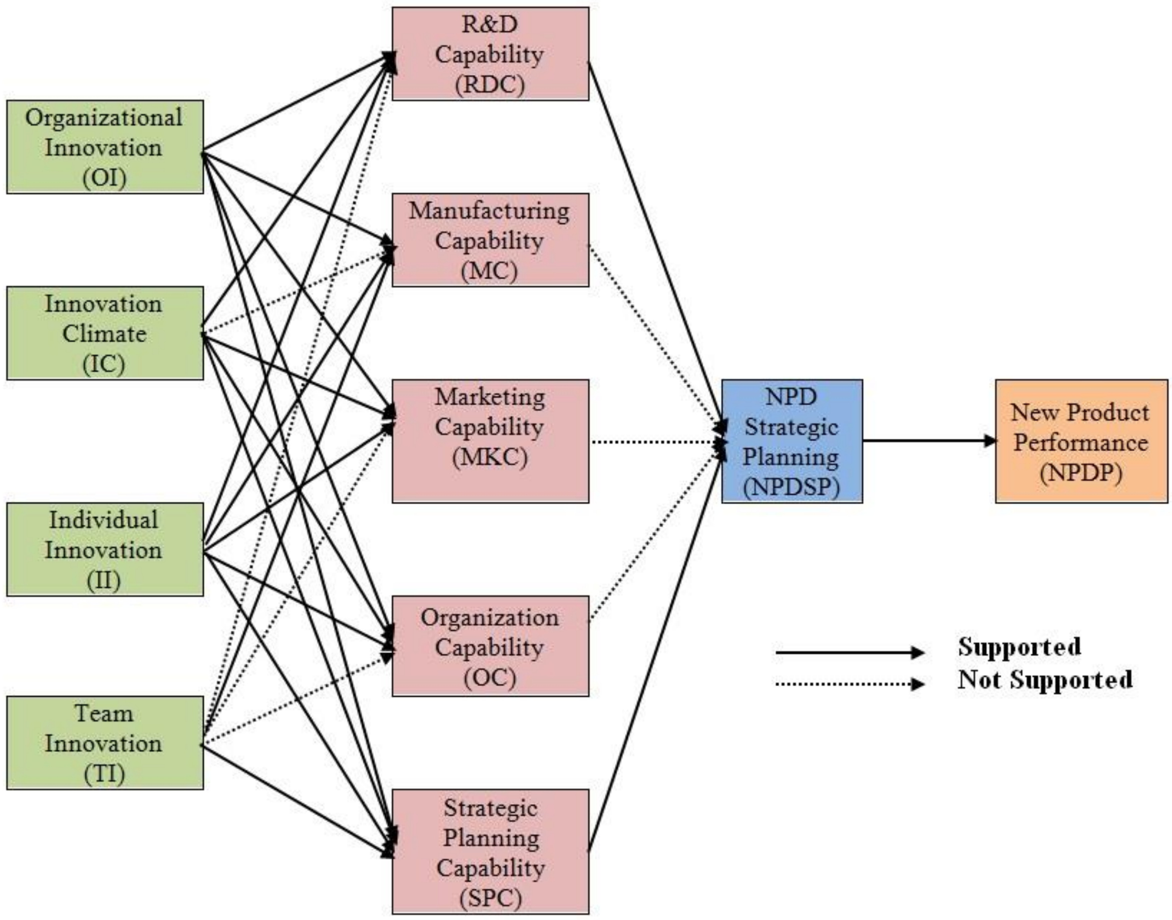

Figure 7.16. Hypotheses Testing Results.

There is a relationship between WI and NPD capabilities (H1) in Vietnamese manufacturing SMEs. This result is consistent with Farhang's (2017) findings of positive relationship between innovation and capabilities and supports Delgado-Verde et al.'s (2011) findings of relationships between organisational knowledge assets and the innovation capability of a firm.

There is a clear positive relationship between NPD capability and NPD strategic planning in Vietnamese manufacturing SMEs (H2). This is in a similar pattern to Barczak's (1995) identified correlation between NPD strategy and firm's corporate goals and capabilities and Ng and Hamilton's (2015) confirmation financial and organisational capabilities had direct positive effects on performance irrespective of strategy.

There is a relationship between NPD strategic planning and NPD performance (H3). This supports the findings of Calantone et al. (2003) and Liu et al. (2005) on the relationship between NPD corporate strategic planning and NPD program performance.

These identified relationships in Vietnamese manufacturing SMEs confirm the conceptual framework (Figure 1.1) developed in this thesis following the contingency theory. These results were supported by many studies derived from contingency theory (Miller and Friesen, 1983) about the relationship between environment, strategy and performance in different contexts. For example, Ward et al. (1995), in their study on Singapore manufacturing, found the relationship between competitive strategy and performance was mediated by manufacturing strategy. In another study, Ward and Duray (2000) compared the industry environment impact with the impact of firm strategy and market orientation culture on small manufacturing firm performance. Recently, Osuagwu (2016) constructed a model of the relations among marketing environment, strategic marketing decisions and effectiveness which revealed the impacts of marketing environment on strategic marketing decisions and effectiveness and of strategic marketing decisions on strategic marketing effectiveness.

7.5 Multigroup Analysis

The AMOS program also provides a powerful and unique strategy for multiple group analysis that is known as critical ratio differences method. This method displays a critical ratio for each pair of parameter estimates and provides a test of the hypothesis that the two parameters are equal (Byrne, 2016). Thus, this method can produce a listing of critical ratios for the pairwise differences among all parameter estimates (Byrne, 2016). For the pairwise parameter comparison test, critical ratios for differences between two parameters in question are calculated by dividing the difference between the parameter estimates by an estimate of the standard error of the difference (Arbuckle, 2010). The difference between two parameters is seen as z-scores. That is, if the difference between two parameters (z-scores) is above ±2.58, ±1.96 or ±1.645, it indicates that there is significance of difference between two parameters at $p<0.01$, $p<0.05$ or $p<0.1$ (which indicates difference between two parameters is significant at 99%, 95% or 90% respectively).

In this thesis, the multiple-group moderating effect was utilised to ascertain whether the hypothesised model is different between managers and employee. Table 7.21 presents the result of regression weights on two different groups, 124 managers and 124 employees, with the level of the parameters between two groups. The table shows the results of the critical ratio for differences between the groups on each hypothesis.

Table 7.21

Regression Weights of Managers and Employee with Critical Ratio for Difference between Parameters

Hypotheses	**Managers**			**Employee**			**z-score**
	Estimate	**P**	**Label**	**Estimate**	**P**	**Label**	
H1a2	0.391	0.010	par_13	0.085	0.554	par_59	–1.459
H1a4	0.375	0.013	par_14	0.109	0.337	par_60	–1.405
H1a5	0.958	0.000	par_15	0.284	0.037	par_61	–2.802***
H1a6	0.475	0.002	par_16	0.085	0.609	par_62	–1.707*
H1a7	0.489	0.000	par_17	0.077	0.475	par_63	–2.394**

Hypotheses	Managers			Employee			z-score
	Estimate	P	Label	Estimate	P	Label	
H1b2	0.281	0.002	par_18	0.820	0.000	par_64	2.319**
H1b4	0.036	0.685	par_19	0.571	0.002	par_65	2.611***
H1b5	–0.228	0.041	par_20	0.258	0.127	par_66	2.397**
H1b6	0.240	0.010	par_21	0.702	0.002	par_67	1.861*
H1b7	0.290	0.000	par_22	0.478	0.004	par_68	1.029
H1c2	0.193	0.012	par_23	0.001	0.989	par_69	–1.440
H1c4	0.262	0.001	par_24	–0.037	0.664	par_70	–2.561**
H1c5	0.404	0.000	par_25	0.262	0.014	par_71	–0.992
H1c6	0.191	0.016	par_26	–0.113	0.373	par_72	–2.034**
H1c7	0.101	0.112	par_27	–0.010	0.900	par_73	–1.078
H1d2	–0.073	0.263	par_28	–0.107	0.148	par_74	–0.339
H1d4	–0.082	0.206	par_29	–0.130	0.035	par_75	–0.541
H1d5	–0.048	0.529	par_30	–0.042	0.530	par_76	0.061
H1d6	0.053	0.433	par_31	–0.028	0.743	par_77	–0.744
H1d7	0.130	0.019	par_32	0.052	0.351	par_78	–0.998
H2b	0.466	0.000	par_33	0.209	0.549	par_79	–0.694
H2d	0.016	0.879	par_34	0.188	0.471	par_80	0.609
H2e	0.109	0.226	par_35	0.214	0.248	par_81	0.511
H2f	–0.162	0.118	par_36	–0.188	0.276	par_82	–0.129
H2g	0.555	0.000	par_37	0.765	0.005	par_83	0.700
H3	0.341	0.037	par_38	0.395	0.000	par_84	0.275

Notes. *** $p<0.01$, ** $p<0.05$, * $p<0.10$. N = 124 managers and 124 employees.

The results of the critical ratio for the difference between two groups in the relationship between OI and NPD capability revealed three hypotheses—H1a5, H1a6, and H1a7—were significant—at p<.01, p<.10 and p<.05 respectively—in z- scores. This indicates there was a moderating effect between managers and employees on the relationship between OI and marketing capability, OI and organisational capability, and OI and strategic planning capability at p<.01, p<.10 and p<.05 respectively.

In case of the relationship between IC and NPD capability, there were four hypotheses—H1b2 and H1b4–H1b6—which were exceeded 2.58, 1.96 and 1.645 in a critical ratio. This indicates that there was a significance of difference between managers and employees in the relationship between IC and manufacturing capability at p<.01, between IC and R&D capability and between IC and marketing capability at p<.05, and between IC and organisation capability at p<.10. Thus, there was a moderating effect between managers and employees in these four relationships.

There was a significance of difference between managers and employees in the relationship between individual innovation and manufacturing capability (H1c4: –2.561) and between individual innovation and organisation capability (H1c6: –2.034). Thus, there was a moderating effect at p<.05 between managers and employees in these two relationships. However, there was no moderating effect between the two groups for any of the other relationships.

Table 7.22 shows the result of hypotheses testing on each group of managers and employees (with overall hypotheses testing of the structural model displayed in Table 7.20) and the result of the moderating effect regarding the relationship of each hypothesis. This means that the perspective and recognition of the importance of each construct and relationship can differ between managers and employees.

Table 7.22

Results of Hypothesis Testing with Moderating Effect between Two Groups (Managers and Employees)

Relationship			Hypotheses supported			
			Managers	Employee	Overall (Table 7.20)	Moderating effect
RDC	<---	OI	Yes	No	Yes	No
MC	<---	OI	Yes	No	Yes	No
MKC	<---	OI	Yes	Yes	Yes	Yes
OC	<---	OI	Yes	No	Yes	Yes[a]
SPC	<---	OI	Yes	No	Yes	Yes
RDC	<---	IC	Yes	Yes	Yes	Yes
MC	<---	IC	No	Yes	No	Yes
MKC	<---	IC	Yes	No	Yes	Yes
OC	<---	IC	Yes	Yes	Yes	Yes[a]
SPC	<---	IC	Yes	Yes	Yes	No
RDC	<---	II	Yes	No	Yes	No
MC	<---	II	Yes	No	Yes	Yes
MKC	<---	II	Yes	Yes	Yes	No
OC	<---	II	Yes	No	Yes[a]	Yes
SPC	<---	II	No	No	Yes	No
RDC	<---	TI	No	No	No	No
MC	<---	TI	No	Yes	Yes	No
MKC	<---	TI	No	No	No	No
OC	<---	TI	No	No	No	No
SPC	<---	TI	Yes	No	Yes	No

Relationship			Hypotheses supported			
			Managers	**Employee**	**Overall (Table 7.20)**	**Moderating effect**
NPDSP	<---	RDC	Yes	No	Yes	No
NPDSP	<---	MC	No	No	No	No
NPDSP	<---	MKC	No	No	No	No
NPDSP	<---	OC	No	No	No	No
NPDSP	<---	SPC	Yes	Yes	Yes	No
NPDP	<---	NPDSP	Yes	Yes	Yes	No

Notes. [a] in p<0.1. N = 124 managers and 124 employees.

The table shows that while managers and employees have a relatively strong moderating effect on the relationship between WI and NPD capability, there is no moderating effect on the relationship between NPD capability and NPD strategic planning or NPD strategic planning and NPD performance.

7.6 Hypotheses Conclusions

The outcomes of hypotheses testing are summarised in Table 7.23.

Table 7.23

Results of Hypotheses Testing

	Hypothesis	Supported
1a2	There is a relationship between organisational innovation and R&D capability in Vietnamese manufacturing SMEs	Yes[a]
1a4	There is a relationship between organisational innovation and manufacturing capability in Vietnamese manufacturing SMEs	Yes[b]
1a5	There is a relationship between organisational innovation and marketing capability in Vietnamese manufacturing SMEs	Yes[b]

1a6	There is a relationship between organisational innovation and organisation capability in Vietnamese manufacturing SMEs	Yes[b]
1a7	There is a relationship between organisational innovation and strategic planning capability in Vietnamese manufacturing SMEs	Yes[b]
1b2	There is a relationship between innovation climate and R&D capability in Vietnamese manufacturing SMEs	Yes[b]
1b4	There is a relationship between innovation climate and manufacturing capability in Vietnamese manufacturing SMEs	No
1b5	There is a relationship between innovation climate and marketing capability in Vietnamese manufacturing SMEs	Yes[c]
1b6	There is a relationship between innovation climate and organisation capability in Vietnamese manufacturing SMEs	Yes[a]
1b7	There is a relationship between innovation climate and strategic planning capability in Vietnamese manufacturing SMEs	Yes[b]
1c2	There is a relationship between individual innovation and R&D capability in Vietnamese manufacturing SMEs	Yes[a]
1c4	There is a relationship between individual innovation and manufacturing capability in Vietnamese manufacturing SMEs	Yes[b]
1c5	There is a relationship between individual innovation and marketing capability in Vietnamese manufacturing SMEs	Yes[b]
1c6	There is a relationship between individual innovation and organisation capability in Vietnamese manufacturing SMEs	Yes[d]
1c7	There is a relationship between individual innovation and strategic planning capability in Vietnamese manufacturing SMEs	Yes[e]
1d2	There is a relationship between team innovation and R&D capability in Vietnamese manufacturing SMEs	No

1d4	There is a relationship between team innovation and manufacturing capability in Vietnamese manufacturing SMEs	Yes[e]
1d5	There is a relationship between team innovation and marketing capability in Vietnamese manufacturing SMEs	No
1d6	There is a relationship between team innovation and organisation capability in Vietnamese manufacturing SMEs	No
1d7	There is a relationship between team innovation and strategic planning capability in Vietnamese manufacturing SMEs	Yes[e]
1	There is a relationship between WI and NPD capability in Vietnamese manufacturing SMEs	Yes
2b	There is a relationship between R&D capability and NPD strategic planning in Vietnamese manufacturing SMEs	Yes[a]
2d	There is a relationship between manufacturing capability and NPD strategic planning in Vietnamese manufacturing SMEs	No
2e	There is a relationship between marketing capability and NPD strategic planning in Vietnamese manufacturing SMEs	No
2f	There is a relationship between organisation capability and NPD strategic planning in Vietnamese manufacturing SMEs	No
2g	There is a relationship between strategic planning capability and NPD strategic planning in Vietnamese manufacturing SMEs	Yes[b]
2	There is a relationship between NPD capability and NPD strategic planning in Vietnamese manufacturing SMEs	Yes
3	There is a relationship between NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs	Yes[b]
4	The specified model representing the effect of WI, NPD capability, NPD strategic planning on NPD performance fits the	Yes

	data gathered from Vietnamese manufacturing SMEs	
5	There is a moderating effect between two groups of managers and employee on the specified model representing the effect of WI, NPD capability, NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs	Yes

Notes. [a] significant at p<0.01, [b] significant at p<0.001, [c] significant at p<0.005, [d] significant at p<0.1, e significant at p<0.05,

Table 7.23 shows the majority of developed sub-hypotheses were supported. Sixteen of 20 sub-hypotheses derived from H1 are supported, confirming the strong relationship between WI and NPD capability in Vietnamese manufacturing SMEs. Two of five sub-hypotheses of H2 were supported, revealing a moderate relationship between NPD capability and NPD strategic planning. H3, (the relationship between NPD strategic planning and NPD performance), H4 (testing of the model fit) and moderating effect (H5) of managers and employee on the relationship between WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs are supported.

7.7 Summary

This chapter presented the details and outcomes of the measurement scale analysis, including assessment of mean and standard deviation, CFA estimation and assessment, and model testing of the survey data. CFA was used to confirm the validity of the measurement scale. For each construct, the outcomes showed the final factors indicated adequate reliability, validity and unidimensionality. The CFA results demonstrated that the measurement model has acceptable levels of fit, convergent validity, discriminant validity and unidimensionality.

All five of the main hypotheses formulated in this thesis—relationship between WI and NPD capability (H1), relationship between NPD capability and NPD strategic planning (H2), relationship between strategic planning capability and NPD strategic planning (H3), confirmation of model fitting (H4) and moderating effects (H5)—were demonstrated to be supported. In regard to the direct relationships between WI and NPD capability, 16 sub-hypotheses were shown to be supported while four sub-hypotheses were not. Evaluating the direct relationship between NPD capability and NPD strategic planning found that three sub-hypotheses were supported while two sub-hypotheses were not. Assessing the direct influence of NPD strategic planning and NPD performance revealed there was a direct and positive relationship between NPD strategic planning and NPD performance. The findings showed that the specified model representing the effect of WI, NPD capability and NPD strategic planning on NPD performance fits the data gathered from Vietnamese manufacturing SMEs and there is a moderating effect between two groups (managers and employees) on the specified model representing the effect of WI, NPD capability and NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs. The next chapter discusses the thesis findings.

Chapter 8: Discussion

This chapter discusses the findings detailed in Chapter 5, 6 and 7 in the context of the developed RQs (Section 1.2) and hypotheses (Section 3.2). This chapter relates the results from the quantitative data to the pertinent literature and the study of the relationships between WI, NPD capability, NPD strategic planning and NPD performance to identify significant contributions.

8.1 RQ1: NPD Process, Strategic Planning, Resource Allocation and Success Measure in Vietnamese Manufacturing SMEs

To answer RQ1, descriptive analysis and t-test were performed in Chapter 5. Organising NPD process, together with NPD strategic planning, allocating NPD resource and measuring NPD success are the main activities of seniors in NPD projects which could lead to project success (Ernst, 2002). Further, identification and implementation perspectives of the organisation's success factors should also be a matter of concern for obtaining productive results (Kumar et al., 2018). This thesis was the first study to investigate such management practices of senior management in NPD projects in Vietnamese manufacturing SMEs.

8.1.1 NPD Project Success in Vietnamese Manufacturing SMEs

Firstly, NPD project success in Vietnamese manufacturing SMEs was assessed. The questionnaire included an item asking respondents if their company measured NPD project success. The majority of the respondents (84.8%) indicated their company adopted the measures for NPD success. This finding reflects that of Huang et al. (2004), which found that 81% of 276 Australian SMEs in chemical and machinery industries measured NPD project success, and Griffin and Page (1993) reported 76% of sample companies measured the success of their NPD projects. The percentage of Vietnamese manufacturing SMEs measuring NPD success is slightly higher. The percentage of sales by new product and financial performance were the least frequently used and worst executed dimensions compared to other NPD project success measures. This finding is similar to that of Huang et al. (2004), which showed that percentage of sales by new product and financial performance were the least frequently used dimensions in Australian SMEs. Subjective customer acceptance was the most frequently used dimension (95%) and the best executed dimension (4.37). The same was found by Huang et al. (2004), with objective customer acceptance being the most frequently used dimension of Australian SMEs. Although Vietnamese manufacturing SMEs used objective customer acceptance measures (90.4%) more than technical performance measures (87.9%), they perceived they have done better in technical performance (4.23) than in objective customer acceptance (4.10). Objective customer acceptance was the second most used dimension in Vietnamese manufacturing SMEs, while in Huang et al. (2004), technical performance measures were the second most used dimensions in Australian manufacturing SMEs. It is notable that Vietnamese manufacturing SMEs prioritised objective customer acceptance while Australian SMEs favoured technical performance (Dang et al., 2017). While the results of Huang et al. (2004) were similar to Hard (1993), this thesis's findings were in the same pattern as Song and Parry (1997) which employed four indexes (overall profit, new product sales compared with competitors, profit rate for new product compared with competitors and new product success compared with the expected profit) to measure the comparative success level for a manufacturer's new product.

8.1.2 NPD Process in Vietnamese Manufacturing SMEs

The development of new products and services is a fundamental process for any enterprise enabling innovation and competitive advantage (Papageorgiou et al., 2017). NPD process in Vietnamese manufacturing SMEs was investigated. The questionnaire included an item asking respondents if their company had an NPD process. The questionnaire for NPD process was designed based on the stage-gate model. The results showed that a significant percentage (90.7%) did, however, only slightly over half (52.6%) had a formal process. NPD process was specified as a 13-step process model, which suggested innovators undertake most of the activities reported by Cooper (1993), Huang et al. (2002) and Owens and Atherton (2018). Frequency analysis revealed the most frequently phases were development and testing and validation. A similar pattern was found by Huang et al. (2002) in Australian SMEs in chemical and machinery industries (where building the business case and plan and development were the most frequently phases). Frequency analysis showed that the least frequently used phase in Vietnamese manufacturing SMEs was scoping, while testing and validation was the least frequently used phase in Australian SMEs (Huang et al., 2002). Descriptive analysis revealed that the beginning phases (discovery and scoping) were used less frequently but better executed than the ending phases (testing and validation and product launch). Vietnamese SMEs used ending phases more frequently but perceived they did not execute them well. Of the surveyed Vietnamese manufacturing SMEs, 86.1% were found to follow the phase-gate model, while (Cooper, 2000) found that almost 80% of North American companies implemented this model. A series of t-tests was used to examine whether NPD process planning formality impacted the NPD process phases in Vietnamese manufacturing SMEs. NPD process planning formality was found to significantly impact the five phases of the NPD process—discovery (at $p<0.05$), scoping (at $p<0.01$), building the business case and plan (at $p<0.001$), development (at $p<0.001$) and testing and validation (at $p<0.01$)—in Vietnamese manufacturing SMEs. NPD process planning formality was found not to impact the product launch phase in Vietnamese SMEs firms. This may be due to the business culture in Vietnam, which is different from other countries and also there is different in in perceptions of scoping, testing and validation, and product launch between staff and managers. This finding has important implications for developing a formal plan for NPD process in Vietnamese manufacturing SMEs.

8.1.3 NPD Strategic Planning in Vietnamese Manufacturing SMEs

The product development of a firm is affected by the NPD strategic planning process and the way the company develops them. An item asking respondents if their company had an NPD strategy was included in the questionnaire. A significant percentage (93.5%) did, however, only slightly over half (51.1%) had a formal plan. NPD strategic planning was specified as a five-item scale. Descriptive analysis revealed the mean score of 3.95, suggesting that respondents perceived their companies have done well in the area. The result indicates that NPD strategic formality generally followed better performance in NPD strategic planning. SMEs with formal NPD strategy perceived they had better performance than SMEs overall and SMEs with informal strategy, supporting Kiss and Barr’s (2017) finding that firms with longer NPD strategy implementation durations are appropriate in stable, low-growth industry environments and better performance. A series of t-tests was used to examine whether NPD strategic formality impacted NPD strategic planning in Vietnamese manufacturing SMEs. NPD strategic formality significantly impacted NPD strategic planning (at $p<0.001$), consistent with Huang et al. (2002). This is an important implication for developing a formal strategic plan in Vietnamese manufacturing SMEs.

8.1.4 NPD Resource Allocation in Vietnamese Manufacturing SMEs

NPD resource allocation was specified as an eight-item scale with three dimensions (technical, marketing and financial resources) (Huang et al., 2001) that measured the adequacy of the new product project’s resources. Descriptive analysis showed that respondents perceived their companies had adequate technical resources (mean score of 3.98) for NPD, but inadequate marketing resources (mean score of 3.68), reflecting the findings of (Huang et al., 2002). Klingebiel and Rammer (2014) found that allocating resources to a broader range of innovation projects increases new product sales, an effect that appears to outweigh that of resource intensity. This was consistent with RBV theory (Barney, 1991).

A series of t-test were conducted to examine difference in the perceptions of staff and leaders of senior management practices in NPD projects in Vietnamese manufacturing SMEs. Table 8.1 shows the results of the difference between staff and leader perceptions of each dimension of NPD project success measure, each phase of the NPD process, NPD strategic planning and each dimension of NPD resource allocation.

Table 8.1

Difference in Staff and Leaders Perceptions of Senior Management Practices in NPD Projects in Vietnamese Manufacturing SMEs

Measure	**Staff**[a]	**Leaders**[b]	**Difference**
NPD project success			
Subjective customer acceptance	4.35	4.47	No
Objective customer acceptance	4.09	4.11	No
Financial performance	4.06	3.89	No
Technical measures	4.23	4.23	No
Organisational-level measure	4.15	4.21	No
NPD process			
Discovery	3.97	3.82	No
Scoping	3.81*	3.6	Yes
Building the business case and plan	3.77	3.64	No
Development	3.93	3.89	No
Testing and validation	3.74***	3.43	Yes
Product launch	3.70*	3.49	Yes

NPD strategic planning	3.98	3.86	No
NPD resource allocation			
Technical resources	4	3.89	No
Marketing resources	3.72*	3.54	Yes
Financial resources	3.85	3.96	No

Notes. [a] N = 248, [b] N = 75.
* p<.05, ** p<.01, *** p<.001.

There was no difference in the perceptions of staff and leaders in each dimension of NPD project success and NPD strategic planning. While perceptions in the discovery, building the business case and plan and development phases of the NPD process were virtually the same, there was significant difference in perceptions of scoping (at $p<0.05$), testing and validation (at $p<0.001$) and product launch (at $p<0.05$). Staff perceived their company performed these phases more comprehensive than leaders did. For NPD resource allocation, perceptions of marketing resources were found to be different (at $p<0.05$). Staff perceived their company allocated marketing resources more adequately than leaders did. The results showed there was no difference in perceptions of technical resources and financial resources. These results are consistent with the finding of Thomas and Obal (2018). These findings help us understand the perceptions of staff and leaders regarding senior management activities. Staff seemed to perceive measures more positively (i.e., saw them as executed better) than leaders.

The survey assessed overall NPD success as perceived by staff and leaders, revealing that NPD success generally followed organisational innovation, innovation climate, learning capability, R&D capability, resources allocation capability, organisation capability, strategic planning capability, NPD strategic planning, technical resources, building the business case and plan, testing and validation, subjective customer acceptance, objective customer acceptance, technical success and percentage of sales by new product. Staff perceived that individual innovation, team innovation, manufacturing capability, marketing capability, marketing resources, financial resources, discovery, scoping, development, product launch and financial performance did not significantly impact overall NPD project success.

8.2 RQ2: NPD Success Factors in Vietnamese Manufacturing SMEs

This thesis identified the main factors for NPD success in Vietnamese manufacturing SMEs. Firstly, the questionnaire included an item asking respondents about their perception of the overall success of NPD projects (measured on a five-point scale). The overall success measure was used to group respondents into two categories, High Performers and Low Performers. A series of t-test were conducted to examine the perceived NPD success factors in Vietnamese manufacturing SMEs. Table 8.2 (adapted from Tables 6.5 and 6.12) shows NPD project success factors according to the perceptions of staff and leaders.

Table 8.2

Staff and Leader Perception of NPD Success Factors in Vietnamese Manufacturing SMEs (Firm Level)

Measure	**Perceived as a success factor**	
	Staff	**Leaders**
WI		
Organisational innovation	Yes***	No
Innovation climate	Yes***	Yes**
Individual innovation	No	No
Team innovation	No	No
NPD capability		
Learning capability	Yes***	No
R&D capability	Yes***	Yes***
Resources allocation capability	Yes**	No

Measure	Perceived as a success factor	
	Staff	Leaders
Manufacturing capability	No	No
Marketing capability	No	No
Organisation capability	Yes***	Yes*
Strategic planning capability	Yes***	Yes*
NPD strategic planning	Yes**	No
NPD resource allocation		
Technical resources	Yes**	Yes*
Marketing resources	No	No
Financial resources	No	No
NPD process		
Discovery	No	No
Scoping	No	No
Building the business case and plan	Yes*	Yes*
Development	No	Yes**
Testing and validation	Yes*	No
Product launch	No	Yes*

Notes. * p<.05, ** p<.01, *** p<.001.

Significant differences in staff's perceptions of overall NPD success were found in organisational innovation (at $p<0.001$), innovation climate (at $p<0.001$), learning capability (at $p<0.001$), R&D capability (at $p<0.001$), resources allocation capability (at $p<0.01$), organisation capability (at $p<0.001$), strategic planning capability (at $p<0.001$), NPD strategic planning (at $p<0.01$), technical resources (at $p<0.01$), building the business case and plan (at $p<0.05$) and testing and validation (at $p<0.05$). This suggests that Vietnamese manufacturing SMEs' staff considered these as NPD project success factors.

Significant differences in leaders' perceptions of overall NPD success were found in innovation climate (at $p<0.01$), R&D capability (at $p<0.001$), organisation capability (at $p<0.05$), strategic planning capability (at $p<0.05$), technical resources (at $p<0.05$), building the business case and plan (at $p<0.05$), development (at $p<0.01$) and product launch (at $p<0.05$). This suggests that Vietnamese manufacturing SMEs' leaders considered organizational innovation, innovation climate, individual innovation, learning capability, R&D capability, resources allocation capability, manufacturing capability, organization capability, strategic planning capability, NPD strategic planning, technical resources, marketing resources, financial resources, scoping, building the business case and plan, development, testing and validation, and product launch as NPD project success factors.

Both staff and leaders in Vietnamese manufacturing SMEs perceived innovation climate, R&D capability, organisation capability, strategic planning capability, technical resources and building the business case and plan as NPD project success factors. These factors further support Cooper and Kleinschmidt (1995, 2007) which identified four key factors of NPD success including the new product strategy for the company, a high-quality new product process, R&D spending levels and resource availability. This is also consistent with Montoya-Weiss and Calantone (1994) which grouped NPD success factors into four main categories (development process, strategy, market environment, and organisation). This combination of findings provides support for the role of senior management and technical resources as important success factors in NPD projects in Vietnamese manufacturing SMEs.

The recognition of innovation climate as a success factor of NPD in Vietnamese manufacturing SMEs is in the same pattern as theory of knowledge creation (Nonaka and Takeuchi, 1995). The success factors of NPD in the category of NPD capability agree with DCV theory (Teece et al., 1997). The other success factors of NPD such as technical resources are consistent with RBV theory (Barney, 1991) and previous studies (Thomas and Obal, 2018; Florén et al., 2017).

The four NPD success dimensions at the project level were used in cluster analysis to reveal two groups of respondents, High Performers and Low Performers. A series of t-test were conducted to examine NPD success factors in Vietnamese manufacturing SMEs. Table 8.3 (adapted from Tables 6.7 and 6.14) shows the results of the NPD project success factors according to the perceptions of the staff and the leaders.

Table 8.3

Staff and Leader Perception of NPD Success Factors in Vietnamese Manufacturing SMEs (Project Level)

Measure	**Perceived as a success factor**	
	Staff	**Leader**
WI		
Organisational innovation	Yes***	Yes*
Innovation climate	Yes***	No
Individual innovation	Yes*	No
Team innovation	No	No
NPD capability		
Learning capability	Yes**	No
R&D capability	Yes***	Yes**
Resources allocation capability	Yes***	Yes***
Manufacturing capability	Yes***	No
Marketing capability	No	No
Organisation capability	Yes**	No

Measure	Perceived as a success factor	
	Staff	Leader
Strategic planning capability	Yes***	Yes*
NPD strategic planning	Yes***	No
NPD resource allocation		
Technical resources	Yes***	No
Marketing resources	Yes**	No
Financial resources	Yes***	Yes*
NPD process		
Discovery	No	No
Scoping	Yes*	No
Building the business case and plan	Yes***	No
Development	Yes***	No
Testing and validation	Yes**	No
Product launch	Yes**	Yes*

Notes. * P < .05, ** P < .01, *** P < .001

Significant differences in staff's perceptions of overall NPD success were found in organisational innovation (at p<0.001), innovation climate (at p<0.001), individual innovation (at p<0.05), learning capability (at p<0.01), R&D capability (at p<0.001), resources allocation capability (at p<0.001), manufacturing capability (at p<0.001), organisation capability (at p<0.01), strategic planning capability (at p<0.001), NPD strategic planning (at p<0.001), technical resources (at p<0.001), marketing resources (at p<0.01), financial resources (at p<0.001), scoping (at p<0.05), building the business case and plan (at p<0.001), development (at p<0.001), testing and validation (at p<0.01) and product launch (at p<0.01). This suggests that Vietnamese manufacturing SMEs' staff considered these as NPD project success factors.

Significant differences in leaders' perceptions of overall NPD success were found in organisational innovation (at $p<0.05$), R&D capability (at $p<0.01$), resources allocation capability (at $p<0.001$), strategic planning capability (at $p<0.05$), financial resources (at $p<0.01$) and product launch (at $p<0.05$). This suggests that Vietnamese manufacturing SMEs' leaders considered these as NPD project success factors. This result is consistent with (Cooper and Kleinschmidt, 1995a) finding that accountability of senior management has a positive effect on the success of a new product. Incentives for management play an important guiding role, since senior management can make strategic decisions regarding resource allocation which may exercise considerable influence on the support for the development of new products, particularly if in conflict with existing core business.

By answering RQ2, two significant findings were derived. Firstly, the success factors for NPD projects in Vietnamese manufacturing SEMs were identified (for the first time)—innovation climate, R&D capability, organisation capability, strategic planning capability, technical resources, building the business case and plan, development and product launch. This finding supports DCV and RBV theories and is consistent with previous studies (Barney, 1991; Thomas and Obal, 2018; Florén et al., 2017). This finding also expands on previous works in terms of WI and NPD capabilities (Cooper and Kleinschmidt, 1995a). Secondly, it was found that both staff and leaders in Vietnamese manufacturing SMEs have the perception of the success factors for an NPD project. This thesis is the first study to confirm this, particularly in the context of Vietnamese manufacturing SMEs. These findings provide support for the role of senior management and commercial factors as important success factors in NPD projects in Vietnamese manufacturing SMEs.

8.3 RQ3: Relationship Between WI, NPD Capability, NPD Strategic Planning and NPD Performance in Vietnamese Manufacturing SMEs

The central objective of this thesis was to understand the impact of WI, NPD capabilities and NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs and relationship among these factors. This was addressed by RQ3. By answering this RQ, a novel specific model was constructed, significantly contributing to the literature. SEM was conducted to test the hypotheses. Table 7.23 (in Section 7.6) and Figure 7.16 (in Section 7.4) present the outcomes of hypotheses testing, with RQ3 answered by testing hypotheses 1a2, 1a4, 1a5–1a7, 1b2, 1b4–1b7, 1c2, 1c4–1c7, 1d2, 1d4–1d7, 1, 2b, 2d–2g, 2 and 3. The majority of developed hypotheses were supported.

8.3.1 H1: Relationship Between WI and NPD Capability

It was established there is a relationship between WI and NPD capability in Vietnamese manufacturing SMEs. WI was specified as a second-order construct with four dimensions (organisational innovation, innovation climate, individual innovation and team innovation) and NPD capabilities was specified as a second-order construct with five dimensions (R&D capability, manufacturing capability, marketing capability, organisation capability and strategic planning capability). The relationship of each dimension of WI with the dimensions of NPD capabilities was investigated to evaluate the relationship between WI and NPD capabilities.

8.3.1.1 Relationship between organisation innovation and NPD capabilities

Few works have investigated the relationship between organisational innovation and capabilities. Chang and Lee (2008) explored the effect of knowledge accumulation capability on organisational innovation and found interaction between external environment or organisational culture and knowledge accumulation ability will influence organisational innovation. They reported that through an established system for knowledge management in the organisation, effective use of resources to achieve organisational goals and provide organisational innovation is facilitated. The link between marketing learning capability and organisational innovation in the banking system was identified by Alinezhad and Beygzadeh (2016). No study has been reported for the relationships between organisational innovation and NPD capabilities. This thesis aims to fill this gap.

Five sub-hypotheses (H1a2, H1a4, H1a5, H1a6 and H1a7) were tested to investigate the potential relationship between organisational innovation and NPD capabilities. The results showed that organisational innovation was positively and significantly related to the individual dimensions of NPD capabilities—R&D capability ($r = .292$, $p<0.01$), manufacturing capability ($r = .423$, $p<0.001$), marketing capability ($r = .612$, $p<0.001$), organisation capability ($r = .340$, $p<0.001$) and strategic planning capability ($r = .349$, $p<0.001$). Boso et al. (2017) indicated NPD capabilities partially mediate the effect of novelty and usefulness elements of organisational creativity on market performance. This demonstrated the strong relationship between organisational innovation and NPD capabilities in Vietnamese manufacturing SMEs.

8.3.1.2 Relationship between innovation climate and NPD capabilities

Continuous innovation and dynamic capability theory consider innovation capability to be related to learning (Boer et al., 2001; Boer and Gertsen, 2003; Boer et al., 2006). The former focuses on the capacity of learning and knowledge sharing to make incremental and radical improvements, while the latter derives from competence and resource-based theory (Björkdahl and Börjesson, 2012). Both theories emphasise the influence of culture and climate to capability. Woschke and Hasse (2016) indicated positive effects following two types of climate innovations—innovations in organisational procedures and in organisational forms of NPD capabilities. The results implied that SMEs aiming to improve capabilities important for the first phases of NPD should change their organisational procedures. Conversely, firms gearing towards advances in the final phases of NPD should concentrate internal changes on their general work organisation. The relationship between innovation climate and capabilities was also mentioned by (Rui et al., 2007). However, the relationship between innovation climate and NPD capabilities (especially in SMEs) have not identified in the literature. The relationship between innovation climate and NPD capabilities was investigated in this thesis through five sub-hypotheses (H1b2, H1b4, H1b5, H1b6, and H1b7). The results indicate that innovation climate was positively and significantly related to the individual dimensions of NPD capabilities—R&D capability ($r = .451$, $p<0.001$), marketing capability ($r = –.291$, $p<0.01$), organisation capability ($r = .281$, $p<0.01$) and strategic planning capability ($r = .346$, $p<0.001$). Even though the dimension of manufacturing capability was found to be not significantly related to innovation climate, the relationship of the remaining dimensions of NPD capabilities with innovation climate demonstrated the strong relationship between them.

8.3.1.3 Relationship between individual innovation and NPD capabilities

This thesis is the first study to investigate the relationship between individual innovation and NPD capabilities. To identify this, five sub-hypotheses (H1c2, H1c4, H1c5, H1c6 and H1c7) were tested. Results suggested that individual innovation was positively and significantly related to the individual dimensions of NPD capabilities—R&D capability ($r = .253$, $p<0.01$), manufacturing capability ($r = .339$, $p<0.001$), marketing capability ($r = .566$, $p<0.001$), organisation capability ($r = .147$, $p<0.1$) and strategic planning capability ($r = .150$, $p<0.05$). Even if the relationship between individual innovation and NPD capabilities needs to be demonstrated in other contexts, this result is one of the significant findings of this thesis.

8.3.1.4 Relationship between team innovation and NPD capabilities

This thesis is the first study to investigate the relationship between team innovation and NPD capabilities. To identify this, five sub-hypotheses (H1d2, H1d4, H1d5, H1d6 and H1d7) were tested. Results showed team innovation is positively and significantly related to the individual dimensions of NPD capabilities—manufacturing capability ($r = -.153$, $p<0.05$) and strategic planning capability ($r = .170$, $p<0.05$). However, the dimensions of R&D capability, marketing capability and organisation capability were found to be not significantly related to team innovation. A possible explanation for this is that specialisation in production within the manufacturing industry prevents individual innovation and team innovation. Thus, while the relationship between team innovation and NPD capabilities was relatively weak, it was significant enough to conclude that the hypotheses were supported.

Since separate dimensions of WI were demonstrated to be related to NPD capabilities, it could be concluded there is a strong relationship between WI and NPD capabilities in general. These results support the finding of Camisón and Villar-López (2014), Zhaoquan (2011a), Sok and O’Cass (2011) and Guo-quan (2008).

The significance of this finding is due to the contribution of knowledge creation. The ontological dimension of knowledge creation ranges from the individual to team, group, organisation and beyond (Nonaka and Takeuchi, 1995). The significant influence of organisational innovation on NPD in Vietnamese manufacturing SMEs reflects the importance of creating the context for knowledge creation, which supports Farhang’s (2017) findings of positive relationship between innovation and capabilities and Delgado-Verde et al. (2011). One issue that emerges from these findings is the specialisation in production within the manufacturing industry limiting team innovation and knowledge creation.

This finding also contributes to RBV theory in the aspect of the relationship between the firm's resources (WI) and capabilities. In particular, this finding in Vietnamese manufacturing SMEs belongs to the first stream of RBV research which adopts the position that the firm's heterogeneous resources that are valuable, rare, inimitable and non-substitutable drive performance differentials (Barney, 1991; Crook et al., 2008).

As WI and NPD capability are multidimensional constructs, the findings in this thesis help provide detailed results to expand the literature. These results may help us to understand the characteristics of the manufacturing industry and SMEs. This is an important aspect for the future research. Future studies may build on this thesis to investigate the impact of WI, NPD capability and NPD strategic planning on NPD performance in service and other industries and in large companies.

8.3.2 H2: Relationship Between NPD Capability and NPD Strategic Planning

Although capability and strategy are vital for the survival of firms (Salaman and Asch, 2003; Bates et al., 2001), very few papers have studied the relationship between them. Bates et al. (2001) studied the relationship between strategy and capability by using an Australian approach to concept development and experimentation. NPD capability rooted in outsourcing may be transient whereas an in-house strategy means the firm can fully appropriate the value of the NPD capability despite initial higher investment costs. Control over the full NPD capability afforded through an in-house strategy might then enable superior long-term movement to an entirely new value chain position or an entirely new value chain for the firm. In effect, make-or-buy decisions such as in-house development can enable greater benefits over time beyond simply transaction cost benefits (Cánez et al., 2000). The relationship between NPD capability and NPD strategic planning in Vietnamese manufacturing SMEs was obtained by testing H2, which was divided into seven sub-hypothesis. Five sub-hypotheses (H2b, H2d, H2e, H2f, and H2g) were tested to identify the relationship between NPD capability and NPD strategic planning. Two dimensions of NPD capability were found to be significantly related to strategic planning—R&D capability (at $p<0.01$) and strategic planning capability (at $p<0.01$), which showed that the hypotheses were supported. The dimension of manufacturing capability, marketing capability and organisation capability were found to not be significantly related to NPD strategic planning. Since the majority of NPD capabilities demonstrated to be related to NPD strategic planning, it could be concluded that there is a relatively strong relationship between NPD capabilities and NPD strategic planning in general.

This finding is consistent with Vickery et al. (2013), Barczak (1995), Ng and Hamilton (2015) and Chew et al. (2008) and supports the findings of Akter et al. (2016) and Mu et al. (2017). In an analysis of 214 US manufacturing firms from four industries: fabricated metal products, industrial and commercial machinery, electronics, and transportation equipment, they confirmed the existence of positive influence of NPD capability on NPD strategy (Vickery et al. (2013)). This is also consistent with Barczak's work (1995) about the correlation between NPD strategy and its corporate goals and capabilities, and Ng and Hamilton, which confirmed that financial and organizational capabilities had direct positive effects on performance irrespective of strategy. The finding also supports the work of Chew et al. (2008), which confirmed the relationships between capability and strategy. He suggested a need to align core capability and competitive strategy as a precondition for superior performance. Akter et al. (2016) in the findings from two Delphi studies and 152 online surveys of business analysts in the U.S. indicated the significant moderating impact of analytics capability–business strategy alignment relationship. Mu et al. (2017) also highlighted that the implementation of orientation strategy requires managers in charge of new product development to have sufficient capability in order to successfully execute the polices associated with entrepreneurial strategy.

The finding supports the DCV (Teece et al., 1997) which map a firm's dynamic capabilities in strategy making including unit of analysis and analytic focus, strategic change, entry strategies, entry timing, diversification and focus and specialisation. The results indicate that developing greater NPD capability, in particular focusing on learning and R&D capability, manufacturing capability, marketing capability and dynamic planning capability, would benefit Vietnamese manufacturing SMEs in terms of improved NPD strategy. This line of investigation in this thesis has expanded the literature by investigating different dimensions of NPD capability and providing detailed results of the relationship between NPD capability and NPD strategic planning in Vietnamese manufacturing SMEs.

8.3.3 H3: Relationship Between NPD Strategic Planning and New Product Performance

The importance of firms to have an unambiguously clear new product strategy backed up by sufficiently detailed action plans has been widely acknowledged by NPD scholars. The relationship between strategic planning on NPD performance has been empirically examined in various contexts ((Calantone et al., 2003; Cooper and Kleinschmidt, 1995b, Langerak et al., 2004; Rauniar et al., 2008; Salomo et al., 2007; Slater et al., 2006; Acur et al., 2012; Hsu, 2017). For example, Cooper (1984) studied 58 innovative industrial products from 30 different industrial companies and found seven new product developing activities—the successful cases had all completed implementation activities. Hise et al., (1989) found that a company that performs its operations without a specific procedure or lacking a complete development schedule would decrease its success rate for new product development and entry to market. Cooper and Kleinschmidt first investigated the link between strategic planning and NPD performance in 1995. Later on, Slater et al. (2006) reported that strategic orientation moderates the relationship between different elements of the strategy formation capability and performance in the USA manufacturing and service business. Recently, Acur et al., (2012) further investigated this relationship and argues that strategic planning indirectly influences NPD performance through achieving better strategic alignment with the data collected from different countries such as Denmark, Finland, Norway, and the Netherlands. This study investigates this relationship in the context of Vietnamese manufacturing SMEs.

This relationship was examined by H3. NPD strategic planning was specified as a first-order construct formed by two items. Significance (at $p<0.001$) was found, which showed that the hypothesis was supported; there is a relatively strong relationship between NPD strategic planning and new product performance in Vietnamese manufacturing SMEs. This relationship is in the same pattern as that identified in Calantone et al. (2003), Acur et al. (2012) and Liu et al. (2005) in their study about the relationship between NPD corporate strategic planning and NPD program performance. This also support the findings from Cooper and Leinschmidt's (1991) work which confirmed the positive effect of implementing new product development procedures.

These results further confirmed the relationship between WI and NPD capability, NPD capability and NPD strategic planning, and NPD strategic planning and NPD performance espoused in previous studies (Chattejee, 2009; Song et al., 2008; Zhaoquan, 2011b; Delgado-Verde et al., 2011; Camisón and Villar-López, 2014; Farhang, 2017; Shan and Jolly, 2013; Vickery et al., 2013; Calatone et al., 2003). This indicates that the conceptual framework developed in this thesis is correct and reasonable.

Based on contingency theory (Miller and Friesen, 1983), many studies have reported on the relationship between environment, strategy and performance in different contexts. Ward et al. (1995) investigated the relationship between competitive strategy and performance which was mediated by manufacturing strategy in their study in Singapore manufacturing. Ward and Duray (2000) compared the industry environment impact with the impact of firm strategy and market orientation culture on small manufacturing firm performance. Recently, Osuagwu (2016) constructed a model of the relations between marketing environment, strategic marketing decisions and effectiveness, which revealed the impacts of marketing environment on strategic marketing decisions and effectiveness, and impacts of strategic marketing decisions on strategic marketing effectiveness. In recent years, there was an expansion of the contingency theory which studied the relationship among four factors. Low and Cheng (2006) studied managers' perceptions of environment, capability, strategy and business performance in Taiwan and China. Based on an analysis of survey data collected from the fastener industry, they showed that the industrial environment and network capability are significantly associated with performance in China.

There are, however, limited studies about the relationship between environment (WI), capabilities, strategy and performance, especially for the NPD. Moreover, the majority of works employing contingency theory considered environment as the external environment. This thesis considered WI as the internal environment, which showed the strong relationship with NPD capabilities. In this thesis, a model was successfully constructed and developed that revealed the relationship between WI (internal environment), capabilities, strategy (strategic planning and long-term strategy) and performance for the first time. This model presenting the relationship between WI, NPD capability, NPD strategic planning and NPD performance is the first ever reported.

Therefore, the contribution of the new conceptual framework in this study expands the literature based on contingency theory. While the strong relationship between WI and NPD capabilities in Vietnamese manufacturing SMEs support RBV and knowledge creation theory, the relationship between NPD capabilities and NPD strategic planning further supports DCV theory.

8.4 RQ4: Model Fit

RQ4 aimed to evaluate the fit of the specified model with the data gathered from Vietnamese manufacturing SMEs. SEM was conducted to test the hypotheses. Table 7.23 (in Section 7.6) and Figure 7.16 (in Section 7.4) present the outcomes of hypotheses testing, with RQ4 answered by testing H4.

The outcome of the specified model had sufficient GOF (RMSEA = .058, SRMR = .0602, CFI = .908, IFI = .910, CMIN/DF = 1.844), which showed the hypothesis was supported. This finding provides important support for expanding contingency theory (Miller and Friesen, 1983) from a model of environment–strategy–performance to a new model of environment–capability–strategy–performance, reflecting on the confirmed simultaneously relationships of WI-NPD capability-NPD strategic planning-NPD performance. This thesis is the first study to confirm the co-evolution and co-alignment of environment–capability–strategy–performance, manifested through the field of NPD. Future studies may apply this model in other fields of research and other context, such large enterprises, the service industry or other countries.

8.5 RQ5: Moderation of Two Groups (Managers and Employees) on the Model in Vietnamese Manufacturing SMEs

RQ5 asked to what extent two groups (managers and employees) moderate the model representing the effect of WI, NPD capability and NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs and was answered through testing H5. Multigroup analysis was first conducted using the AMOS program, which provides a powerful and unique strategy for multiple group analysis known as critical ratio differences method (results in Table 7.21). The results indicate there was a moderating effect between managers and employees on the relationship between organisational innovation and marketing capability (at $p<.01$), organisational innovation and organisational capability (at $p<.10$) and organisational innovation and strategic planning capability (at $p<.05$). It was also confirmed there was a moderating effect between managers and employees in the relationship between innovation climate and NPD capability, and individual innovation and manufacturing capability.

SEM was conducted to further test the hypothesis. Table 7.23 (in Section 7.6) and Figure 7.16 (in Section 7.4) present the outcomes of hypotheses testing, with RQ5 answered by testing H5. The hypothesis was significantly supported. The results of the moderating effect between managers and employees on each individual relationship in the model are presented in Table 7.22 (in Section 7.5). There was a moderating effect between managers and employee on nine of 26 individual relationships, which were the relationships between:

- the dimension of organisational innovation and the dimensions of marketing capability, organisation capability and strategic planning capability
- the dimension of innovation climate and the dimensions of R&D capability, manufacturing capability, marketing capability and organisation capability
- the dimension of individual innovation and the dimensions of manufacturing capability and organisation capability.

One issue that emerges from these findings is the difference in the role of the respondents in the company leads to the difference in perceptions of the relationship between WI and NPD capability. Managers were found to appreciate the relationship between WI and NPD capability more highly than the employee. There was no moderating effect on the relationship between NPD capability and NPD strategic planning or NPD strategic planning and NPD performance. These results indicate that there is a small change needed in the conceptual model; no moderating effect on NPD capability and NPD strategic planning or NPD strategic planning and NPD performance means the arrows from managers and officials to these relationships are deleted.

8.6 Summary

This chapter provided a discussion addressing the significant results of this thesis and their contribution to the literature. The relationship between WI and NPD capability and NPD capability and NPD strategic planning were demonstrated for the first time. The relationship between NPD strategic planning and NPD performance was also confirmed in the context of Vietnamese manufacturing SMEs. Importantly, the novel findings confirm for the first time the simultaneous WI-NPD capability-NPD strategic planning-NPD performance relationships at the project level in Vietnamese manufacturing SMEs. Previous NPD research often examined the outcome aspects of the NPD projects. This thesis was the first to investigate the process of NPD in dynamic and changing conditions of WI, NPD capability and NPD strategic planning. The nature of the constructs in this thesis are multidimensional and formative, enhancing our understanding of the factors that influence NPD performance in NPD projects in SMEs. The existing NPD literature is primarily derived from developed countries. The constructs in this thesis are context specific to Vietnam, thus an implication of this thesis is the possibility that the NPD literature could be applicable to both developed and developing countries.

This chapter was the first to discuss relationships between NPD process, NPD strategic planning, NPD resource allocation and NPD success measure and identify NPD success factors in Vietnamese manufacturing SMEs. The fit of the model/conceptual framework with the data gathered from Vietnamese manufacturing SMEs was also confirmed, and the moderating effect of two groups (managers and employees) on the model was discussed and demonstrated.

Chapter 9: Conclusion

This chapter comprises six sections. Section 9.1 revisits the RQs posed in Chapter 1 and presents the conclusions drawn from them. Section 9.2 discusses the contributions of this thesis to theory and practice. Section 9.3 suggests the implications for both managerial and public policy practices. The limitations of this thesis and opportunities for further research issue are outlined in Sections 9.4 and 9.5. Section 9.6 provides concluding remarks.

9.1 Research Findings

9.1.1 Research Model

This thesis developed a new research model that reveals the relationship between WI, NPD capability, NPD strategic planning and NPD performance. This is the first time the co-evolution and co-alignment of environment–capability–strategy–performance manifested through the field of NPD was confirmed. The model proposes that the fit between WI, NPD capability and NPD strategic planning determined NPD performance in Vietnamese manufacturing SMEs. The final research model in presented in Figure 9.1. This model exhibits the relationship between WI and NPD capability, NPD capability and NPD strategy planning, and NPD strategy planning and NPD performance, and the moderating effect of managers and employees on these concepts. The model comprises four constructs—three independent variables (WI, NPD capability and NPD strategic planning) and a dependent variable (NPD performance). All four constructs were validated and produced acceptable GOF statistics. In addition to contributing to empirical findings, the research model extends contingency theory.

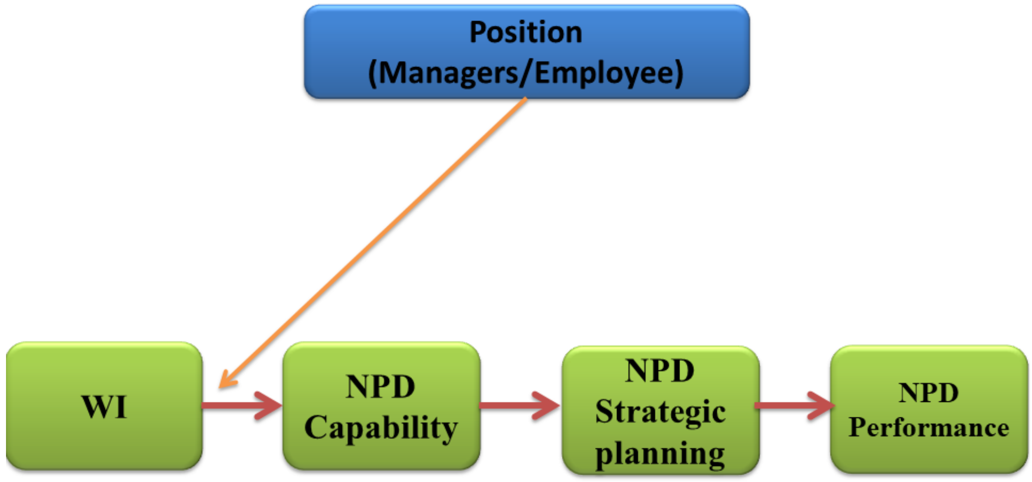

Figure 9.1. WI, NPD Capability, NPD Strategic Planning and NPD Performance Model.

Based on the research model, two analyses were performed to test the five hypotheses. The first was an empirical investigation of the influence of WI, NPD capability and NPD strategic planning on NPD performance in Vietnamese manufacturing SMEs. The second appraised the moderating influence of two groups (managers and employees) on the relationships between WI, NPD capability, NPD strategic planning and NPD performance. The findings from these two analyses are summarised below.

9.1.2 Research Questions and Hypotheses

Five RQs were formulated and answered in this thesis with significant results. The investigation of management practices of senior management in NPD projects in Vietnamese manufacturing SMEs was reported for the first time; the critical factors for NPD success in Vietnamese manufacturing SMEs were successfully identified; a novel specific model for WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs was constructed; the co-evolution and co-alignment of environment–capability–strategy–performance manifested through the field of NPD was confirmed for the first time; and managers were found to appreciate the relationship between WI and NPD capability more highly than employees.

To answer RQ1, empirical evaluations of NPD process, strategic planning, resource allocation and success measure were conducted. A series of t-test were performed to show the difference in staff and leader perception in NPD process, NPD strategic planning, NPD resource allocation and NPD success measure (see Chapter 7).

It was concluded that most respondent companies measured NPD project success and had an NPD process and NPD strategy. For NPD success measure, subjective customer acceptance was the most frequently used and the best executed dimension, while percentage of sales by new product and financial performance were the least frequently used and worst executed dimensions. For NPD process, the beginning phases (discovery and scoping) were used less frequently but better executed than the ending phases (testing and validation and product launch). NPD process planning formality significantly impacted five phases of the NPD process (discovery, scoping, building the business case and plan, development and testing and validation). NPD process planning formality was found not to impact the product launch phase. For NPD strategic planning, respondents perceived their companies had done well in the area, and NPD strategic formality significantly impacted NPD strategic planning. For NPD resource allocation, respondents perceived their companies had adequate technical resources but inadequate marketing resources. The finding of differences between staff and the leader perceptions indicates that staff seemed to perceive the performance of NPD process, NPD strategic planning, NPD resource allocation and NPD success in NPD projects more positively than leaders. Despite the difference in perceptions, this thesis suggests that leaders should use both the financial and non-financial measures to measure NPD success, develop a formal plan for NPD process, develop a formal strategic plan and allocate more marketing resources. A formal plan for NPD process seems to be relevant to the performance of NPD process and appropriate degrees of the formal plan translate into greater performance of NPD process activities. Similarly, a formal strategic plan seems to be pertinent to NPD strategic planning. The right degrees of a formal strategic plan enhance the performance of the NPD strategic planning.

To answer RQ2, empirical evaluations of NPD success factors in Vietnamese manufacturing SMEs were conducted. A series of cluster analysis and t-test were performed to investigate NPD success factors in Vietnamese manufacturing SMEs (see Chapter 7).

This thesis concludes that, based on the perceived overall success of the NPD project, Vietnamese manufacturing SME staffs perceived organisational innovation, innovation climate, learning capability, R&D capability, resources allocation capability, organisation capability, strategic planning capability, NPD strategic planning, technical resources, building the business case and plan, and testing and validation as NPD project success factors. Vietnamese manufacturing SME leaders perceived innovation climate, R&D capability, organisation capability, strategic planning capability, technical resources, building the business case and plan, development and product launch as NPD project success factors. This finding indicates that both staff and leaders in Vietnamese manufacturing SMEs recognise innovation climate, R&D capability, organisation capability, strategic planning capability, technical resources and building the business case and plan as perceived NPD project success factors. This suggests the role of senior management and technical resources were important perceived success factors in NPD project in Vietnamese manufacturing SMEs. Factors of innovation climate, R&D capability, organisation capability, strategic planning capability, technical resources and building the business case and plan seem to be relevant to the perceived success of NPD projects in Vietnamese manufacturing SMEs, and that appropriate degrees of these will translate into greater perceived success of NPD projects in Vietnamese manufacturing SMEs.

This thesis concludes that, based on the four dimensions of NPD success at the project level (subjective customer acceptance, objective customer acceptance, financial performance and technical performance), Vietnamese manufacturing SME staff perceived organisational innovation, innovation climate, individual innovation, learning capability, R&D capability, resources allocation capability, manufacturing capability, organisation capability, strategic planning capability, NPD strategic planning, technical resources, marketing resources, financial resources, scoping, building the business case and plan, development, testing and validation and product launch as NPD project success factors. Vietnamese manufacturing SME leaders perceived organisational innovation, R&D capability, resources allocation capability, strategic planning capability, financial resources and product launch as NPD project success factors. This finding indicates that both staff and leaders in Vietnamese manufacturing SMEs recognise organisational innovation, R&D capability, resources allocation capability, strategic planning capability, financial resources and product launch as NPD project success factors. This suggests the role of senior management and commercial factors as important success factors in NPD projects in Vietnamese manufacturing SMEs. Factors of organisational innovation, R&D capability, resources allocation capability, strategic planning capability, financial resources and product launch seem to be pertinent to the NPD project success in Vietnamese manufacturing SMEs, and that appropriate degrees of these would enhance the NPD project success in Vietnamese manufacturing SMEs.

RQ3 generated three hypotheses (H1, H2 and H3) and 35 sub-hypotheses. To answer RQ3, empirical examinations of the sequential relationship between WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs were carried out. A structural model was developed to present the conceptual model and permit confirmation of these three main hypotheses (see Chapter 6). This thesis concludes that there is a relationship between WI and NPD capability, NPD capability and NPD strategic planning, and NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs. H1, H2 and H3 were supported.

The findings of the relationship between WI and NPD capability, NPD capability and NPD, and NPD strategic planning and NPD performance indicate that WI positively and significantly influences NPD capability, NPD capability has a positively and significant effect on NPD strategic planning, and NPD strategic planning positively and significantly influences NPD performance. This suggests that leaders need to concentrate on WI to optimise project-level NPD capability, which would positively impact on NPD strategic planning. NPD strategic planning should be considered a good determinant of NPD performance.

The factors of the WI construct appear to be related to the factors of NPD capability, and appropriate degrees of WI will translate into greater NPD capability. Factors of NPD capability seem to be relevant to NPD strategic planning and the right degrees of NPD capability would enhance NPD strategic planning. NPD strategic planning seems to be pertinent to NPD performance, thus a good degree of NPD strategic planning will translate into greater NPD performance.

RQ4 generated one hypothesis (H4). SEM was conducted to test this hypothesis. The outcome of the specified model had sufficient fit, which showed H4 was supported (see Chapter 6). This thesis concludes that the model representing the impact of WI, NPD capability and NPD strategic planning on NPD performance sufficiently fits the data gathered from Vietnamese manufacturing SMEs. This finding indicates that the fit between WI, NPD capability and NPD strategic planning will determine NPD performance. It suggests that there is a co-evolution and co-alignment of WI-NPD capability-NPD strategic planning-NPD performance manifested through the field of NPD. WI, NPD capability, NPD strategic planning and NPD performance seem to be dependent on each other and appropriate degrees of WI will result in greater NPD capability, NPD strategic planning and NPD performance.

RQ5 generated one hypothesis (H5). Empirical evaluations of the moderating effect of the two groups (managers and employees) on the specified model were conducted to test this hypothesis. A multigroup analysis was performed, which showed the hypothesis was supported (see Chapter 6). This thesis concludes that there was a moderating effect between managers and employees on nine of 26 individual relationships, which were the relationship between

- the dimension of organisational innovation and the dimensions of marketing capability, organisation capability and strategic planning capability
- the dimension of innovation climate and the dimensions of R&D capability, manufacturing capability, marketing capability and organisation capability
- the dimension of individual innovation and the dimensions of manufacturing capability and organisation capability.

This finding indicates that managers and employees in Vietnamese manufacturing SMEs had different perceptions of the relationship between WI and NPD capability. Managers were found to appreciate the relationship between WI and NPD capability more highly than employees. This suggests it is vital for leaders in Vietnamese manufacturing SMEs to appropriately identify and understand differences in ideas and perspectives on WI and NPD capability to realise better success and maximise impact. While there is a strong moderating effect of the two groups on the relationship between WI and NPD capability, no moderating effect on the relationship between NPD capability and NPD strategic planning or between NPD strategic planning and NPD performance has been confirmed.

9.1.3 Significant Results

This thesis studied the WI and NPD in Vietnamese manufacturing SMEs. Several significant findings were drawn from this study:

- In this thesis the relationship of WI, NPD capability, NPD strategic planning and NPD performance simultaneously, particularly in manufacturing SMEs in Vietnam is evaluated for the first time. Despite extensive empirical studies that consider WI and NPD, to date the literature has neglected to hypothesise about, or test, the relationships between WI, NPD capability, NPD strategic planning and NPD performance. This thesis has also successfully studied these relationships. These relationships were tested through five main hypotheses and 35 sub-hypotheses. 25 out of 39 main hypotheses and sub-hypotheses were successfully tested with 21 were supported, which indicated a relatively strong relationship between WI, NPD capability, NPD strategic planning, and NPD performance.
- The conceptual model—which reveals the relationship between WI and NPD capability, NPD capability and NPD strategic planning, and NPD strategic planning and NPD performance, and the moderating effect for the first time —was successfully constructed based on theories and quantitative data. Hypotheses derived from RQs were successfully formulated and tested.
- This thesis is the first study to discuss NPD processes, NPD strategic planning, NPD resource allocation and NPD success measures in Vietnamese manufacturing SMEs. The results indicate that Vietnamese manufacturing SMEs have implemented relatively well in these area, with high mean scores of >4.00, >3.90, 3.95 and 3.98 for NPD success, NPD process, NPD strategic planning and NPD resource allocation respectively.

- This thesis is the first study to identify the success factors of NPD in Vietnamese manufacturing SMEs, which include innovation climate, R&D capability, organisation capability, strategic planning capability, technical resources, building the business case and plan, development, product launch and percentage of sales by new product. All of these factors have a p level of >0.05.
- This thesis also identifies that managers and employees in Vietnamese manufacturing SMEs significantly affect WI and NPD capability. No moderating effects of these groups on the relationship between NPD capability and NPD strategic planning and NPD strategic planning and NPD performance have been found in Vietnamese manufacturing SMEs, which is also significant contribution to the literature in general and to strategic planners in the Vietnamese Government in particular.

These results are significant and hugely beneficial, to manufacturing SMEs in Vietnam in particular and other industries and countries in general, in expanding knowledge of the factors underpinning the success of NPD.

9.2 Contributions

This thesis provides a major contribution to the field of WI and NPD research from both theoretical and practical perspectives. Theoretically, this thesis contributes to the existing literature in the field of WI and NPD in organisations by 1) integrating the framework of the contingency theory and dynamic capability view to the study of investigating the relationship between WI, NPD capability, NPD strategic planning and NPD performance; 2) developing a validated conceptual framework for examining the relationship between WI, NPD capability, NPD strategic planning and NPD performance in Vietnamese manufacturing SMEs; and 3) observing a difference of perspective between employee and managers on these relationships. This thesis confirmed for the first time the simultaneous relationship between WI, NPD capability, NPD strategic planning and NPD performance, thereby expanding contingency theory to a new environment–capability–strategic planning–performance paradigm (see Figure 9.2).

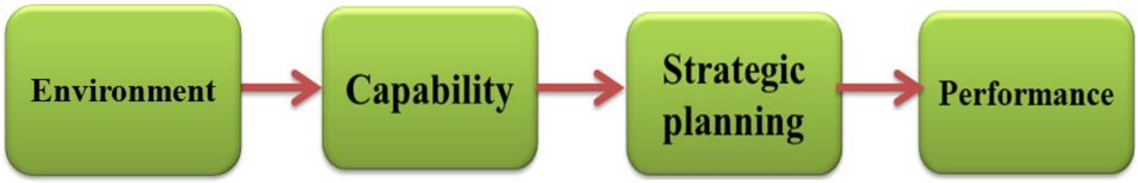

Figure 9.2. Environment–Capability–Strategic Planning–Performance Paradigm.

Practically, the thesis findings enhance understanding about senior management in NPD projects and NPD success factors in Vietnamese manufacturing SMEs at the project level, and assists business managers to improve NPD in their organisations and policymakers to formulate better policies for supporting WI.

9.3 Implications

The findings of this thesis have contributed to filling gaps in the WI and NPD literature. Further, the findings provided convergence between disciplines whereby greater dialogue and collaboration between researchers may take place.

This thesis has implications for both managerial and public policy practices, enabling them to make reasonable policies and solutions supporting the development of SMEs in terms of WI and NPD, especially Vietnamese manufacturing SMEs. For example, Vietnamese manufacturing SMEs should focus on NPD success, NPD process, NPD strategic planning and NPD resource allocation; since managers and employees in Vietnamese manufacturing SMEs significantly affect WI and NPD capability, therefore managers and employees should be well-trained in these areas.

Practitioners could also pay close attention to those NPD success factors so that success of the NPD projects can be maximised. This thesis also has implications of providing good WI and NPD practices for SMEs in other areas to learn and follow.

9.4 Limitations

While this research revealed significant findings pertaining to the relationships between WI, NPD capability, NPD strategic planning and NPD performance and enhanced understanding about senior management in NPD projects and NPD success factors in Vietnamese manufacturing SMEs at the project level, it has two large limitations. First, this thesis was cross-sectional. A longitudinal study could extend the significant findings of this thesis (primarily the relationships between WI, NPD capability, NPD strategic planning and NPD performance). Secondly, this thesis was conducted within the context of Vietnamese manufacturing SMEs. The findings and conclusions may have been different had the thesis had been conducted, for example, in a developed country or service industry or focused on large companies.

9.5 Future Research

This thesis suggests several directions for future research. To test the generalisability of the findings of this thesis, the relationship between WI, NPD capability, NPD strategic planning and NPD performance could be replicated within another industry sector, for example, the service industry. Further, investigation of the relationships between WI, NPD capability, NPD strategic planning and NPD performance in a developed country or large companies would extend the findings of this thesis. This thesis could also be expanded on by examining NPD success factors in the service industry or large companies in Vietnam, and investigating senior management practices in NPD projects in other countries.

9.6 Summary

This thesis achieved its objectives by examining NPD and NPD success factors in Vietnamese manufacturing SMEs at the project level. Further, it investigated the relationships between WI, NPD capability, NPD strategic planning and NPD performance. In doing so, this thesis has shed new light on research, integrating WI and

NPD and expanding contingency theory (Miller and Friesen, 1983) to a new environment–capability–strategic planning–performance paradigm. This thesis has added new knowledge by building on theory, thereby contributing to the literature.

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Appendix A. List of Vietnam Standard Industrial Classification 2007

(Decision numbered 10/2007/QD-TTg on 23/1/2007 of Prime Minister issued the Vietnam Standard Industrial Classification 2007)

Manufacturing

01. Manufacture of food products
02. Manufacture of beverages
03. Manufacture of tobacco products
04. Manufacture of textiles
05. Manufacture of wearing apparel
06. Manufacture of leather and related products
07. Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
08. Manufacture of paper and paper products
09. Printing and reproduction of recorded media
10. Manufacture of coke and refined petroleum products
11. Manufacture of chemicals and chemical products
12. Manufacture of pharmaceuticals, medicinal chemical and botanical products
13. Manufacture of rubber and plastics products
14. Manufacture of other non-metallic mineral products
15. Manufacture of basic metals
16. Manufacture of fabricated metal products, except machinery and equipment
17. Manufacture of computer, electronic and optical products
18. Manufacture of electrical equipment
19. Manufacture of machinery and equipment n.e.c.

- *Manufacture of general purpose machinery:*
  + Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
  + Manufacture of fluid power equipment
  + Manufacture of other pumps, compressors, taps and valves
  + Manufacture of bearings, gears, gearing and driving elements
  + Manufacture of ovens, furnaces and furnace burners
  + Manufacture of lifting and handling equipment
  + Manufacture of office machinery and equipment except computers and peripheral equipment
  + Manufacture of power-driven hand tolls

+ Manufacture of other general-purpose machinery

- *Manufacture of special-purpose machinery:*
  + Manufacture of agricultural and forestry machinery
  + Manufacture of metal-forming machinery and machine tools
  + Manufacture of machinery for metallurgy
  + Manufacture of machinery for mining, quarrying and construction
  + Manufacture of machinery for food, beverage and tobacco processing
  + Manufacture of machinery for textile, apparel and leather production
  + Manufacture of other special-purpose machinery

20. Manufacture of motor vehicles; trailers and semitrailers
21. Manufacture of other transport equipment
22. Manufacture of furniture
23. Other manufacturing

- *Manufacture of jewellery, bijouterie and related articles*
- *Manufacture of musical instruments*
- *Manufacture of sports goods*
- *Manufacture of games and toys*
- *Manufacture of medical and dental instruments and supplies, shape-adjusted and ability reco apparatus*
- *Other manufacturing n.e.c.*

24. Repair and installation of machinery and equipment

Appendix B. Survey Invitation Letter (English)

VIETNAM CHAMBER OF COMMERCE AND INDUSTRY	SOCIALIST REPUBLIC OF VIETNAM Independence - Freedom - Happiness

Hanoi, April 16th, 2015

SURVEY INVITATION LETTER

To: Board of Directors

Innovation has an important role for businesses, not only in the world but also in Vietnam. Thanks to innovation, enterprises could enhance their competitiveness and adapt to the changing environment, this is also an important factor in determining the success of businesses when they are entering global integration.

The Vietnam Chamber of Commerce and Industry (VCCI) in collaboration with staff and research students from RMIT University are conducting a survey on the status of innovation in manufacturing enterprises in Vietnam. The research results of the survey will assist the governance in improving innovation activities of enterprises and help policy makers to build better policies to support innovation activities.

VCCI look forward to the cooperation of your organization. All of your answers will be collected anonymously and kept secret. The results of the research will only be analyzed based on integrated data.

If you have any questions related to the project, please do not hesitate to contact:

1. Dang Hoang Thanh Nga, PhD Candidate, School of Management, RMIT University

2. Le Quang Viet, Vietnam Chamber of Commerce and Industry.

Thank you much for your cooperation.

Sincerely yours,

GENERAL SECRETARY

(signed)

Pham Thi Thu Hang

Appendix C. Survey Invitation Letter (Vietnamese)

PHÒNG THƯƠNG MẠI
VÀ CÔNG NGHIỆP VIỆT NAM
VIỆN PHÁT TRIỂN DOANH NGHIỆP

Số:.......18......./PTDN-NC
V/v: Mời tham gia khảo sát

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc

Hà nội, ngày 16 tháng 04 năm 2015

THƯ MỜI THAM GIA KHẢO SÁT

Kính gửi: Ban Lãnh đạo Doanh nghiệp/Đơn vị

Đổi mới sáng tạo có ý nghĩa quan trọng đối với doanh nghiệp trên thế giới nói chung và Việt Nam nói riêng. Nhờ khả năng đổi mới sáng tạo mà các doanh nghiệp có thể tăng cường khả năng cạnh tranh và thích ứng với những thay đổi từ môi trường, đây cũng là yếu tố quan trọng quyết định sự thành công khi doanh nghiệp bước vào sân chơi toàn cầu.

Viện Phát triển doanh nghiệp thuộc Phòng Thương mại và Công nghiệp Việt Nam (VCCI) phối hợp với đội ngũ giảng viên và nghiên cứu sinh thuộc trường Đại học RMIT tiến hành dự án khảo sát nhanh về thực trạng đổi mới sáng tạo trong các doanh nghiệp sản xuất ở Việt Nam. Kết quả nghiên cứu của cuộc khảo sát sẽ hỗ trợ các nhà quản trị trong việc nâng cao hoạt động đổi mới sáng tạo tại doanh nghiệp và giúp các nhà hoạch định chính sách xây dựng tốt hơn các chính sách hỗ trợ hoạt động đổi mới sáng tạo.

Chúng tôi rất mong nhận được sự tham gia khảo sát của Quý Doanh nghiệp/Đơn vị. Tất cả các câu trả lời quý vị cung cấp sẽ được thu thập ẩn danh và giữ bí mật. Nghiên cứu sẽ chỉ đưa ra báo cáo dựa trên dữ liệu tổng hợp.

Chi tiết vui lòng liên hệ:

1. Đặng Hoàng Thanh Nga, Nghiên cứu sinh, Trường Quản lý, Đại học RMIT
2. Lê Quang Việt, Viện Phát triển doanh nghiệp – Phòng Thương mại và Công nghiệp Việt Nam

Trân trọng cảm ơn sự hợp tác của Quý Doanh nghiệp/Đơn vị.

Nơi nhận:
- Như trên
- Lưu: VT, Viện PTDN.

Viện trưởng

Phạm Thị Thu Hằng

Appendix D. Plain Language Statement (English)

INNOVATION IN THE VIETNAMESE MANUFACTURING SMES

Investigators:

- Professor Adela McMurray (Deputy Head Research and Innovation, School of Management) RMIT University.
- Dr Charlie Huang (Senior Lecturer, School of Management), RMIT University.
- Ms Nga Hoang Thanh Dang (PhD Candidate, School of Management), RMIT University.

Plain Language Statement for Online Survey participants

You are invited to participate in a research project being conducted by RMIT University staff and PhD student. The information provided describes the project. Please read this information carefully and be confident that you understand its contents before deciding whether to participate. If you have any questions about the project, please ask any of the investigators.

Who is involved in this research project? What is the project about? Why is it being conducted?

The research project is conducted by Adela McMurray, Charlie Huang, and Nga Hoang Thanh Dang, of RMIT University. This research project is a preliminary study aimed at exploring the relationship between innovation capability, workplace and technological innovations, and their impact on innovation performance in Vietnamese manufacturing SMEs. This research will survey Hanoi small and medium-sized enterprises (SMEs) via a questionnaire.

It is anticipated that the findings of this research will assist business managers to improve innovation performance in their organisations and policy-makers to formulate better policies supporting workplace innovation.

The research has been approved by the RMIT Human Research Ethics Committee.

Why have you been approached? If I agree to participate, what will I be required to do?

You are being approached to participate in the project because you are a member of Vietnam Chamber of Commerce (VCCI). Participation involves answering an online questionnaire. If you agree to participate, we will be asking you to describe your organisation and its innovation activities. Specifically you will be asked to offer insight on your organisation's innovation capability, workplace and technological innovations, and innovation performance.

The questionnaire will take about 20 minutes to complete. Please note that participation in the research is completely voluntary and you are under no pressure whatsoever to participate.

What are the risks or disadvantages associated with participation?

There are no personal or professional risks associated with participation in the project apart from the risks that derive from normal day to day activities. We guarantee anonymity of participants and their organisations in the various outputs from the study, including study reports and publications and we guarantee absolute confidentiality in the use of the information you provide.

Should you become concerned about your participation in the study, please contact Professor Roslyn Russell - Chair of the School of Business Human Ethics Advisory Network, College of Business, RMIT University. She will deal with your concerns, discuss them confidentially and suggest appropriate follow-up.

What are the benefits associated with participation?

Your participation and sharing of your organisation's activities on this important issue will enhance our understanding of the effect of innovation capability, workplace and technological innovation to innovation performance. It will enhance your organisation's competitiveness and assist your organisations to achieve better performance in terms of profitability, sales growth, exports, and employment growth.

What will happen to the information I provide?

Your answers to the survey are strictly confidential and anonymous, and only members of the research team from RMIT University will ever see individual survey responses. The responses you provide will be collected anonymously and no identifying information (i.e. name or address) will be required. Responses will be collated and stored online as group data, then subjected to statistical analyses. The results of the survey will only be used for research, in the form of a thesis. Your confidentiality will be maintained at all times. We will also ensure confidentiality of the information you provide to us in any published work or any reports that are produced. Any information that you provide can be disclosed only if:

(1) It is to protect you or others from harm,

(2) A court order is produced, or

(3) You provide the researchers with written permission.

The information you provide will be kept in a secure place at RMIT University for five years after completion of the project and then destroyed as appropriate.

What are my rights as a participant?

At any point in the survey you have:

- The right to withdraw your participation at any time, without prejudice.
- The right to have any unprocessed data withdrawn and destroyed, provided it can be reliably identified, and provided that doing so does not increase the risk for the participant.
- The right to have any questions answered at any time.

Whom should I contact if I have any questions?

Should you have any questions about the project please contact Professor Adela McMurray (details above).

Any complaints about your participation in this project may be directed to:

The Secretary, Human Research Ethics Sub Committee, Business Portfolio, RMIT University.

Details of the complaints procedure are available at: http://www.rmit.edu.au/rd/hrec_complaints

We thank you for your consideration to participate in this project.

Adela McMurray ________________________________

Charlie Huang __________________________________

Nga Hoang Thanh Dang _________________________

Appendix E. Plain Language Statement (Vietnamese)

ĐỔI MỚI SÁNG TẠO

TRONG CÁC DOANH NGHIỆP SẢN XUẤT Ở VIỆT NAM

Người nghiên cứu:

1. Giáo sư Adela McMurray (Phó Hiệu trưởng Phụ trách Nghiên cứu và Đổi mới sáng tạo, Trường Quản lý) Đại học RMIT.
2. Tiến sĩ Charlie Huang (Giảng viên chính, Trường Quản lý) Đại học RMIT.
3. Đặng Hoàng Thanh Nga, Nghiên cứu sinh tiến sỹ, Đại học RMIT

THƯ MỜI THAM GIA KHẢO SÁT TRỰC TUYẾN

Bạn được mời tham gia vào một dự án nghiên cứu được thực hiện bởi đội ngũ nhân viên Đại học RMIT. Các thông tin được cung cấp mô tả dự án. Vui lòng đọc kỹ thông tin này và tự tin rằng bạn hiểu nội dung của nó trước khi quyết định tham gia. Nếu bạn có bất kỳ câu hỏi về dự án, hãy hỏi bất kỳ của các nhà điều tra.

Ai tham gia vào dự án nghiên cứu này? Các dự án về là gì? Tại sao nó được thực hiện?

Các dự án nghiên cứu được tiến hành bởi Adela McMurray, Charlie Huang, và Nga Hoàng Thanh Dang, của Đại học RMIT. Dự án nghiên cứu này là một nghiên cứu sơ bộ nhằm khám phá các mối quan hệ giữa khả năng sáng tạo, nơi làm việc và đổi mới công nghệ, và tác động của hoạt động đổi mới trong các doanh nghiệp sản xuất Việt Nam. Nghiên cứu này sẽ khảo sát Hà Nội doanh nghiệp vừa và nhỏ (SMEs) thông qua một bảng câu hỏi trực tuyến.

Đó là dự đoán rằng những phát hiện của nghiên cứu này sẽ giúp các nhà quản lý kinh doanh để cải thiện hiệu suất đổi mới trong tổ chức của họ và các nhà hoạch định chính sách để xây dựng chính sách hỗ trợ đổi mới tốt hơn nơi làm việc.

Nghiên cứu này đã được sự chấp thuận của Ủy ban Đạo đức nghiên cứu RMIT Nhân. Nó được tài trợ bởi Chương trình 165 - Trung ương Đảng Cộng sản Việt Nam và Ủy ban của Đại học RMIT.

Tại sao bạn đã được tiếp cận? Nếu tôi đồng ý tham gia, những gì tôi sẽ phải làm gì?

Bạn đang được tiếp cận để tham gia vào dự án này bởi vì bạn là một thành viên của Hiệp hội Doanh nghiệp vừa và nhỏ Hà Nội (HASMEA). Tham gia bao gồm trả lời một bảng câu hỏi trực tuyến. Nếu bạn đồng ý tham gia, chúng tôi sẽ yêu cầu bạn mô tả tổ chức của bạn và các hoạt động đổi mới của nó. Cụ thể bạn sẽ được yêu cầu để cung cấp cái nhìn sâu sắc về khả năng của tổ chức đổi mới, nơi làm việc và đổi mới công nghệ, đổi mới và hiệu suất.

Các câu hỏi sẽ mất khoảng 20 phút để hoàn thành. Xin lưu ý rằng việc tham gia nghiên cứu là hoàn toàn tự nguyện và bạn không có áp lực nào để tham gia.

Những rủi ro hoặc bất lợi liên quan đến tham gia là gì?

Không có rủi ro cá nhân hoặc chuyên nghiệp kết hợp với sự tham gia trong dự án ngoài các rủi ro phát xuất từ ngày bình thường để hoạt động ngày. Chúng tôi đảm bảo tính ẩn danh của người tham gia và tổ chức của họ trong các kết quả đầu ra từ các nghiên cứu, bao gồm các báo cáo nghiên cứu và các ấn phẩm và chúng tôi đảm bảo giữ bí mật tuyệt đối trong việc sử dụng những thông tin bạn cung cấp.

Nên bạn trở nên lo lắng về việc tham gia vào nghiên cứu, vui lòng liên hệ giáo sư Roslyn Russell - Chủ tịch của Trường Kinh doanh Mạng Lưới Nhân Đạo đức tư vấn, College of Business, Đại học RMIT. Cô sẽ đối phó với các mối quan tâm của bạn, thảo luận kín đáo và gợi ý phù hợp theo dõi.

Các lợi ích gắn liền với sự tham gia là gì?

Tham gia và chia sẻ các hoạt động của tổ chức của bạn về vấn đề quan trọng này sẽ tăng cường sự hiểu biết của chúng ta về những tác động của năng lực đổi mới, nơi làm việc và đổi mới công nghệ để thực hiện đổi mới. Nó sẽ tăng cường khả năng cạnh tranh của tổ chức và hỗ trợ các tổ chức của bạn để đạt được hiệu suất tốt hơn về mặt lợi nhuận, tăng trưởng doanh thu, kim ngạch xuất khẩu, tăng trưởng và việc làm.

Điều gì sẽ xảy ra với những thông tin mà tôi cung cấp?

Câu trả lời của bạn để khảo sát là bí mật và ẩn danh, và chỉ có các thành viên của nhóm nghiên cứu từ Đại học RMIT bao giờ sẽ thấy câu trả lời khảo sát cá nhân. Các câu trả lời mà bạn cung cấp sẽ được thu thập nặc danh và không có thông tin xác định (tức là tên hoặc địa chỉ) sẽ được yêu cầu. Phản hồi sẽ được đối chiếu và lưu trữ trực tuyến như nhóm dữ liệu, sau đó được kết quả analyses.The thống kê của cuộc điều tra sẽ chỉ được sử dụng cho nghiên cứu, trong các hình thức của một luận án. Bí mật của bạn sẽ được duy trì ở tất cả các lần. Chúng tôi cũng sẽ đảm bảo tính bảo mật của những thông tin mà bạn cung cấp cho chúng ta trong bất kỳ công việc xuất bản hoặc bất kỳ báo cáo được sản xuất. Bất kỳ thông tin mà bạn cung cấp có thể được tiết lộ chỉ khi:

(1) Nó là để bảo vệ bạn hoặc những người khác khỏi bị tổn hại,

(2) Một lệnh của tòa án được sản xuất, hoặc

(3) Bạn cung cấp cho các nhà nghiên cứu với sự cho phép bằng văn bản.

Các thông tin bạn cung cấp sẽ được giữ ở một nơi an toàn tại Đại học RMIT trong năm năm sau khi hoàn thành dự án và sau đó bị phá hủy một cách thích hợp.

Quyền của tôi như một người tham gia là gì?

Tại bất kỳ điểm nào trong cuộc khảo sát bạn có:

• Các quyền rút tham gia của bạn bất cứ lúc nào, mà không có thành kiến.

• Quyền được rút bất kỳ dữ liệu chưa qua chế biến và tiêu hủy, miễn là nó có thể được xác định đáng tin cậy, và được cung cấp rằng làm như vậy không làm tăng nguy cơ cho người tham gia.

• Quyền được có bất kỳ câu hỏi đã trả lời bất cứ lúc nào.

Tôi nên liên hệ nếu tôi có thắc mắc?

Nếu bạn có bất kỳ câu hỏi về dự án xin vui lòng liên hệ với Giáo sư Adela McMurray (chi tiết ở trên).

Bất kỳ khiếu nại về việc tham gia vào dự án này có thể được hướng tới:

Các Bộ trưởng, Sub Ủy ban Đạo đức Nghiên cứu con người, kinh doanh hàng, Đại học RMIT.

Chi tiết về các thủ tục khiếu nại có sẵn tại: http://www.rmit.edu.au/rd/hrec_complaints

Chúng tôi cảm ơn bạn đã quan tâm của bạn để tham gia vào dự án này.

Adela McMurray ________________________________

Charlie Huang __________________________________

Đặng Hoàng Thanh Nga _________________________

Appendix F. Innovation in the Vietnamese Manufacturing Industry Questionnaire (English)

RMIT UNIVERSITY

INNOVATION IN THE VIETNAMESE MANUFACTURING INDUSTRY

School of Management

Please answer **ALL** questions by **TICKING (√)** the appropriate box, which BEST describes your situation. All information will be treated in **STRICTEST CONFIDENCE**, and no person or business will be identified.

1. What is the total capital of your organisation?

□ Equal to or less than 100 billion Vietnam dong

□ More than 100 billion Vietnam dong (If your answer is More than 100 billion Vietnam dong, please go to Part SIX on page 8)

2. What is the annual average number of labourers of your organization?

□ Equal to or less than 300 persons

□ More than 300 persons (If your answer is More than 300 persons, please go to Part SIX on page 8)

3. Has your organisation developed a new product since 2013?

☐ Yes ☐ No (If your answer is No, please go to Part SIX on page 8)

Please consider the **latest** new product project developed in your organisation over the past three years (2013-)

4. When was this new product launched into the market?

☐ 2013 ☐ 2014 ☐ 2015 ☐ Not get marketed

PART ONE: NEW PRODUCT DEVELOPMENT PROCESS AND ITS MARKET

1. Does your company have a **procedure** for new product development?

☐ No ☐ Informal ☐ Formal

2. The following steps are parts of a new product development process. During the development of this project, how well was each of the following activities undertaken?

Steps	Excellently done	Well done	Average	Poorly done	poorly done	NOT taken at all
Idea generation	☐	☐	☐	☐	☐	☐
Initial screening	☐	☐	☐	☐	☐	☐
Preliminary market analysis	☐	☐	☐	☐	☐	☐
Preliminary technical analysis	☐	☐	☐	☐	☐	☐

Preliminary production analysis	☐	☐	☐	☐	☐	☐
Preliminary financial analysis	☐	☐	☐	☐	☐	☐
Market study	☐	☐	☐	☐	☐	☐
Product development	☐	☐	☐	☐	☐	☐
In-house product testing	☐	☐	☐	☐	☐	☐
Consumer product testing	☐	☐	☐	☐	☐	☐
Marketing testing	☐	☐	☐	☐	☐	☐
Precommercial financial analysis	☐	☐	☐	☐	☐	☐
Commercialisation	☐	☐	☐	☐	☐	☐

3. Is your company certifies to any of following quality systems (tick all boxes that apply):
☐ ISO 9000 ☐ ISO 9001 ☐ ISO 9002 ☐ Other, please specify: __________ ☐ None

4. Is this new product
☐ New-to-the-world ☐ Radical modification ☐ Incremental modification

5. Is this new product developed for:
☐ Industrial market ☐ Consumer market ☐ Other, please specify: __________

6. Does this new product focus on:
☐Local market ☐National market ☐ International market

PART TWO: NEW PRODUCT STRATEGY AND COMPANY RESOURCES

1. Does your company have a new product development **strategy**?

No ☐ Informal ☐ Formal ☐

2. The following statement are indicators of business strategy in developing this project. Please rate each of them by ticking the boxes

Statements	**1 - strongly agree; 2 - agree 3 - neither agree nor disagree 4 - disagree; 5 - strongly disagree**				
	1	**2**	**3**	**4**	**5**
Our organisation has a clear long-term direction for new product development	☐	☐	☐	☐	☐
Our organisation has a shared intention for new product development	☐	☐	☐	☐	☐
We know where our organisation should go for our new product development	☐	☐	☐	☐	☐
We have a written document for guiding our new product development	☐	☐	☐	☐	☐
Top management team frequently meet to discuss what new products to be developed in the future	☐	☐	☐	☐	☐

3. To what extent does each statement listed below correctly describe **this new product project**? Please indicate your agreement or disagreement by ticking a box for each statement.

Statements	1 - strongly agree; 2 - agree 3 - neither agree nor disagree 4 - disagree; 5 - strongly disagree			
For this project, our company's	**1**	**2**	**3**	**4**	**5**
R&D resources were more than adequate.	☐	☐	☐	☐	☐
ENGINEERING resources were more than adequate.	☐	☐	☐	☐	☐
MANUFACTURING resources were more than adequate.	☐	☐	☐	☐	☐
MARKET resources were more than adequate.	☐	☐	☐	☐	☐
SALEFORCE resources were more than adequate.	☐	☐	☐	☐	☐
DISTRIBUTION resources were more than adequate.	☐	☐	☐	☐	☐
ADVERTISING/PROMOTION resources were more than adequate.	☐	☐	☐	☐	☐
FINANCIAL resources were more than adequate.	☐	☐	☐	☐	☐

PART THREE: WORKPLACE INNOVATION

1. Following are statements about the workplace innovation atmosphere at your organisation. Please indicate your agreement or disagreement by ticking a box for each statement.

Statements	1 - strongly agree; 2 - agree 3 - neither agree nor disagree 4 - disagree; 5 - strongly disagree				
For this project, our company's	**1**	**2**	**3**	**4**	**5**
Organizational Innovation					
1. Our workplace has a vision that is made clear to the employees.	☐	☐	☐	☐	☐
2. The vision of my workplace often helps the employees in setting their goals.	☐	☐	☐	☐	☐
3. Innovation in my workplace is linked to its business goals.	☐	☐	☐	☐	☐
4. In our workplace opportunities to learn are created through systems and procedures.	☐	☐	☐	☐	☐
5. Our workplace rewards innovative ideas regularly.	☐	☐	☐	☐	☐
Innovation Climate					
6. My boss is our role model in creative thinking.	☐	☐	☐	☐	☐
7. I discuss with my boss regularly, on how to get ahead.	☐	☐	☐	☐	☐
8. I am always given opportunities to try new ideas and approaches to problems.	☐	☐	☐	☐	☐
9. My boss gives me useful feedback regarding my creative ideas.	☐	☐	☐	☐	☐
10. My boss gives me an opportunity to learn from my mistakes.	☐	☐	☐	☐	☐
11. My boss and my colleagues perceive me to be a creative problem solver.	☐	☐	☐	☐	☐
Individual Innovation					
12. In my workplace performance measurement of an individual is related to his or her own creativity.	☐	☐	☐	☐	☐
13. At work I sometimes demonstrate originality.	☐	☐	☐	☐	☐
14. My work requires me to make innovative decisions.	☐	☐	☐	☐	☐
15. I make time to pursue my own ideas or projects.	☐	☐	☐	☐	☐
16. I am constantly thinking of new ideas to improve my workplace.	☐	☐	☐	☐	☐
17. I express myself frankly in staff meetings.	☐	☐	☐	☐	☐
18. I work in teams to solve complex problems.	☐	☐	☐	☐	☐

19. In our workplace performance measurement is related to one's initiative to solve problems.	☐	☐	☐	☐	☐
Team Innovation					
20. We work in teams to solve complex problems.	☐	☐	☐	☐	☐
21. In our workplace teams have freedom to make decisions and act on them without needing to ask for permission.	☐	☐	☐	☐	☐
22. In my company people feel a strong sense of membership and support.	☐	☐	☐	☐	☐
23. My colleagues welcome uncertainty and unusual circumstances related to our work.	☐	☐	☐	☐	☐
24. Amongst my colleagues I am the first one to try new ideas and methods.	☐	☐	☐	☐	☐

2. What is the one word that comes to you that describes the culture of:
Your organisation: ____________________ and of Your department/division: ________________

PART FOUR: NEW PRODUCT DEVELOPMENT CAPABILITIES

To what extent does each statement listed below correctly describe about the capabilities for **this new product project**? Please indicate your agreement or disagreement by ticking a box for each statement.

Statements	**1 – strongly agree; 2- agree 3- neither agree nor disagree 4- disagree; 5- strongly disagree**				
For this project,	**1**	**2**	**3**	**4**	**5**
Learning capability					
Your company encourages work teams to identify opportunities for improvement	☐	☐	☐	☐	☐
Your company adopts accessed knowledge into your daily activities	☐	☐	☐	☐	☐
R&D capability					
Your company has high quality and quick feedbacks from manufacturing to design and engineering	☐	☐	☐	☐	☐
Your company has good mechanisms for transferring technology from research to product development	☐	☐	☐	☐	☐
Your company has great extent of market and customer feedback into technological innovation process	☐	☐	☐	☐	☐
Resources allocation capability					
Your company attaches importance to human resource	☐	☐	☐	☐	☐
Your company programs human resource in phase	☐	☐	☐	☐	☐
Your company selects key personnel in each functional department into the innovation process	☐	☐	☐	☐	☐
Your company provides steady capital supplement in innovation activity	☐	☐	☐	☐	☐
Manufacturing capability					
Your company's manufacturing department has ability in transforming R&D output into production	☐	☐	☐	☐	☐
Your company effectively applies advanced manufacturing methods	☐	☐	☐	☐	☐
Your company has capable manufacturing personnel	☐	☐	☐	☐	☐
Marketing capability					

Your company has close relationship management with major customers	☐	☐	☐	☐	☐
Your company has good knowledge of different market segments	☐	☐	☐	☐	☐
Your company has highly efficient sales-force	☐	☐	☐	☐	☐
Your company provides excellent after-sale services	☐	☐	☐	☐	☐
Organisation capability					
Your company can handle multiple innovation projects in parallel	☐	☐	☐	☐	☐
Your company has good coordination and cooperation of R&D, marketing and manufacturing department	☐	☐	☐	☐	☐
Your company has high-level integration and control of the major functions with the company	☐	☐	☐	☐	☐
Strategic planning capability					
Your company has high capability in identifying internal strengths and weaknesses	☐	☐	☐	☐	☐
Your company has high capability in identifying external opportunities and threats	☐	☐	☐	☐	☐
Your company has clear goals.	☐	☐	☐	☐	☐
Your company has a clear plan – a road map of new product and process with measurable milestones	☐	☐	☐	☐	☐
Your company is highly adapted and responsive to external environment	☐	☐	☐	☐	☐

PART FIVE: NEW PRODUCT PERFORMANCE

1. Does your company measure the success or failure of this new product?

Yes ☐ No ☐ Do not know ☐

2. Following are measures of new product performance. What measures does your company use and how well does your company rate them (the measures used) for this new product?

Measures used	Measures	Well above average	Above average	Average	Below average	Well below average
☐	Customer acceptance	☐	☐	☐	☐	☐
☐	Customer satisfaction	☐	☐	☐	☐	☐
☐	Meet revenue goal	☐	☐	☐	☐	☐
☐	Revenue growth	☐	☐	☐	☐	☐
☐	Meet market share goal	☐	☐	☐	☐	☐
☐	Meet unit share goal	☐	☐	☐	☐	☐
☐	Break-even time	☐	☐	☐	☐	☐
☐	Attain margin goal	☐	☐	☐	☐	☐
☐	Attain profitability goal	☐	☐	☐	☐	☐
☐	Attain Return on Investment goal	☐	☐	☐	☐	☐
☐	Development cost	☐	☐	☐	☐	☐
☐	Launched on time	☐	☐	☐	☐	☐
☐	Achieve product performance goal	☐	☐	☐	☐	☐
☐	Meet quality guideline	☐	☐	☐	☐	☐

☐	Speed to market	☐	☐	☐	☐	☐
☐	Percentage of sales by new product	☐	☐	☐	☐	☐
☐	Others, please specify: ______________________ ______________________ ____________	☐	☐	☐	☐	☐

3.Overall, how would like to rate this new		1	2	3	4	5	
product performance?	unsuccessful	☐	☐	☐	☐	☐	successful
4. Overall, how would you like to rate the		1	2	3	4	5	
competition for this new product?	receptive	☐	☐	☐	☐	☐	hostile
5. Overall, how would you like to rate the		1	2	3	4	5	
market size for this new product?	Vary large	☐	☐	☐	☐	☐	small

PART SIX: BACKGROUND INFORMATION

1. What industry is your organisation in? ______________________

2. What type of ownership is your organisation and their percentage?

☐ State-owned _________ %

☐ Private-owned _________ %

☐ Foreign-owned _________ %

3. In which year was your business established? ☐ ☐ ☐ ☐

4. How many people are employed in your company?
Full-time employees: ___________ Part-time employees:____________

5. Please indicate the turnover (in billions of Vietnam Dong) for the previous financial years (2014-15):
VND _________

6. Your age **(Years):** **<25** **25-30** **31-40** **41-50** **51-60** **61+**
☐ ☐ ☐ ☐ ☐ ☐

7. Your highest educational level:

☐ **Secondary education: year: _________** ☐ **College**

☐ **University Degree** ☐ **Post-graduate (e.g., Masters, and PhD)**

8. Your position in the organisation: _____________________

9. Your background is:

☐ Engineering ☐ Science ☐ Business ☐ Tradeperson ☐ Other

10. How many years have you been working in this industry? _____________

THANK YOU MUCH FOR YOUR TIME AND CO-OPERATION

If you would like a copy of the results of this survey,
please write your contact information or attach your business.

Appendix G. Innovation in the Vietnamese Manufacturing Industry Questionnaire (Vietnamese)

RMIT UNIVERSITY

ĐỔI MỚI SÁNG TẠO TRONG CÁC DOANH NGHIỆP SẢN XUẤT Ở VIỆT NAM

Trường Quản lý

Xin quý vị hãy trả lời **TẤT CẢ** các câu hỏi bằng cách **ĐÁNH DẤU (√)** vào ô thích hợp, trong đó mô tả **ĐÚNG NHẤT** tình hình doanh nghiệp của quý vị. Tất cả thông tin sẽ được **BẢO MẬT TUYỆT ĐỐI** và được thu thập ẩn danh, quý vị sẽ không phải cung cấp bất cứ thông tin xác định nào (ví dụ như tên hoặc địa chỉ) của cá nhân hay doanh nghiệp của quý vị.

1. Tổng nguồn vốn của doanh nghiệp quý vị là bao nhiêu?

□ Ít hơn hoặc bằng 100 tỷ đồng □ Nhiều hơn 100 tỷ đồng (Nếu câu trả lời của quý vị là Nhiều hơn 100 tỷ đồng, xin vui lòng chuyển tới PHẦN SÁU ở trang 8)

2. Số lượng lao động của doanh nghiệp quý vị là bao nhiêu?

□ Ít hơn hoặc bằng 300 người □ Nhiều hơn 300 người (Nếu câu trả lời của quý vị là Nhiều hơn 300 người, xin vui lòng chuyển tới PHẦN SÁU ở trang 8)

3. Doanh nghiệp của quý vị có phát triển sản phẩm nào mới kể từ năm 2013 đến nay không?

□ Có □ Không (Nếu câu trả lời của quý vị là Không, xin vui lòng chuyển tới PHẦN SÁU ở trang 8)

Xin quý vị vui lòng cho biết về dự án phát triển sản phẩm **mới nhất** trong doanh nghiệp của quý vị trong thời gian ba năm qua (từ 2013-nay)

4. Sản phẩm mới này được tung ra thị trường khi nào?

□ 2013 □ 2014 □ 2015 □ Không được bán trên thị trường

PHẦN MỘT: QUÁ TRÌNH PHÁT TRIỂN SẢN PHẨM MỚI VÀ THỊ TRƯỜNG CỦA SẢN PHẨM NÀY

1. Doanh nghiệp của quý vị có **quy trình** phát triển sản phẩm mới không?

☐ Không ☐ Không chính thức ☐ Chính thức

2. Dưới đây là các bước của một quy trình phát triển sản phẩm mới. Trong quá trình phát triển dự án sản phẩm mới này, từng hoạt động sau đây được thực hiện tốt đến mức nào?

Các bước	**Xuất sắc**	**Thực hiện tốt**	**Trung bình**	**Kém**	**Rất kém**	**Không thực hiện**
Sản xuất ý tưởng	☐	☐	☐	☐	☐	☐
Sàng lọc ban đầu	☐	☐	☐	☐	☐	☐
Phân tích thị trường sơ bộ	☐	☐	☐	☐	☐	☐
Phân tích kỹ thuật sơ bộ	☐	☐	☐	☐	☐	☐
Phân tích sản xuất sơ bộ	☐	☐	☐	☐	☐	☐
Phân tích tài chính sơ bộ	☐	☐	☐	☐	☐	☐
Nghiên cứu thị trường	☐	☐	☐	☐	☐	☐
Các bước	**Xuất sắc**	**Thực hiện tốt**	**Trung bình**	**Kém**	**Rất kém**	**Không thực hiện**
Phát triển sản phẩm	☐	☐	☐	☐	☐	☐
Thử nghiệm sản phẩm nội bộ	☐	☐	☐	☐	☐	☐
Thử nghiệm sản phẩm qua người tiêu dùng	☐	☐	☐	☐	☐	☐
Thử nghiệm tiếp thị	☐	☐	☐	☐	☐	☐
Phân tích tài chính trước khi bán	☐	☐	☐	☐	☐	☐
Thương mại hóa	☐	☐	☐	☐	☐	☐

3. Doanh nghiệp của quý vị được cấp giấy chứng nhận đối với hệ thống chất lượng nào sau đây (đánh dấu vào tất cả các hộp thích hợp):

□ ISO 9000 □ ISO 9001 □ ISO 9002 □ Khác, xin vui lòng ghi rõ: __________ □ Không

4. Mức độ mới của sản phẩm này ...

□ Mới so với thế giới □ Cải tiến một phần □ Cải tiến toàn bộ

5. Sản phẩm mới này được phát triển cho:

□ Thị trường công nghiệp □ Thị trường tiêu dùng □ Khác, xin vui lòng ghi rõ:

____

6. Sản phẩm mới này tập trung vào:

□ Thị trường địa phương □ Thị trường trong nước □ Thị trường quốc tế

PHẦN HAI: CHIẾN LƯỢC SẢN PHẨM MỚI VÀ CÁC NGUỒN LỰC CỦA DOANH NGHIỆP

1. Doanh nghiệp quý vị có **chiến lược** phát triển sản phẩm mới không?

□ Không □ Không chính thức □ Chính thức

2. Các ý kiến đánh giá dưới đây là thước đo về chiến lược kinh doanh trong phát triển dự án sản phẩm mới này. Xin quý vị vui lòng cho biết ý kiến về từng đánh giá bằng cách đánh dấu vào hộp.

Các ý kiến đánh giá	**1 - Rất đồng ý; 2 - Đồng ý 3 – Trung lập (không tán thành và cũng không bất đồng) 4 - Không đồng ý; 5 - Rất không đồng ý**				
	1	**2**	**3**	**4**	**5**
Doanh nghiệp của chúng tôi có định hướng dài hạn rõ ràng để phát triển sản phẩm mới	□	□	□	□	□
Doanh nghiệp chúng tôi có mục tiêu chung về phát triển sản phẩm mới	□	□	□	□	□
Chúng tôi biết doanh nghiệp của chúng tôi nên làm gì để phát triển sản phẩm mới	□	□	□	□	□
Chúng tôi có văn bản hướng dẫn về việc phát triển sản phẩm mới	□	□	□	□	□
Đội ngũ quản lý cấp cao nhất thường xuyên gặp nhau để thảo luận về việc sản phẩm mới nào sẽ được phát triển trong tương lai	□	□	□	□	□

3. Ở mức độ nào mà mỗi đánh giá được liệt kê dưới đây mô tả một cách chính xác về **dự án sản phẩm mới này**? Xin quý vị hãy vui lòng cho biết ý kiến của quý vị bằng cách đánh dấu vào hộp thích hợp cho mỗi đánh giá.

Các ý kiến đánh giá	**1 - Rất đồng ý; 2 - Đồng ý 3 - Trung lập (không tán thành và cũng không bất đồng) 4 - Không đồng ý; 5 - Rất không đồng ý**				
Đối với dự án này, doanh nghiệp của chúng tôi có	**1**	**2**	**3**	**4**	**5**
Nguồn lực nghiên cứu và phát triển rất đầy đủ.	□	□	□	□	□
Nguồn lực kỹ thuật rất đầy đủ.	□	□	□	□	□
Nguồn lực sản xuất rất đầy đủ.	□	□	□	□	□
Nguồn lực thị trường rất đầy đủ.	□	□	□	□	□

Nguồn lực bán hàng rất đầy đủ.	☐	☐	☐	☐	☐
Nguồn lực phân phối rất đầy đủ.	☐	☐	☐	☐	☐
Nguồn lực quảng cáo/khuyến mãi rất đầy đủ.	☐	☐	☐	☐	☐
Nguồn lực tài chính rất đầy đủ.	☐	☐	☐	☐	☐

PHẦN BA: ĐỔI MỚI SÁNG TẠO NƠI LÀM VIỆC

1. Dưới đây là các đánh giá về không khí đổi mới sáng tạo nơi làm việc ở doanh nghiệp của quý vị. Xin hãy vui lòng cho biết ý kiến của quý vị bằng cách đánh dấu vào hộp thích hợp cho mỗi đánh giá.

Các ý kiến đánh giá	**1 - Rất đồng ý; 2 - Đồng ý** **3 - Trung lập (không tán thành và cũng không bất đồng)** **4 - Không đồng ý; 5 - Rất không đồng ý**				
Đối với dự án này, doanh nghiệp của chúng tôi	**1**	**2**	**3**	**4**	**5**
Đổi mới sáng tạo cơ cấu tổ chức					
1. Nơi làm việc của chúng tôi có định hướng công việc được thể hiện rất rõ ràng đối với các nhân viên.	☐	☐	☐	☐	☐
2. Định hướng công việc tại nơi làm việc của chúng tôi thường giúp các nhân viên trong việc thiết lập các mục tiêu của họ.	☐	☐	☐	☐	☐
3. Đổi mới sáng tạo ở nơi làm việc của tôi liên quan đến các mục tiêu kinh doanh của doanh nghiệp tôi.	☐	☐	☐	☐	☐
4. Ở nơi làm việc của chúng tôi, các cơ hội để học tập được tạo ra thông qua các hệ thống và thủ tục.	☐	☐	☐	☐	☐
5. Nơi làm việc của chúng tôi thường xuyên có thưởng cho các ý tưởng sáng tạo.	☐	☐	☐	☐	☐

Các ý kiến đánh giá	**1 - Rất đồng ý; 2 - Đồng ý** **3 - Trung lập (không tán thành và cũng không bất đồng)** **4 - Không đồng ý; 5 - Rất không đồng ý**				
Đối với dự án này, doanh nghiệp của chúng tôi	**1**	**2**	**3**	**4**	**5**
Không khí đổi mới sáng tạo					
6. Sếp của tôi là hình mẫu chính của chúng tôi về tư	☐	☐	☐	☐	☐

duy sáng tạo.					
7. Tôi thảo luận với sếp của tôi thường xuyên về cách làm thế nào để vươn lên.	☐	☐	☐	☐	☐
8. Tôi luôn luôn được tạo cơ hội để thử những ý tưởng và cách tiếp cận mới đối với các vấn đề trong công việc.	☐	☐	☐	☐	☐
9. Sếp của tôi cung cấp cho tôi thông tin phản hồi hữu ích liên quan đến những ý tưởng sáng tạo của tôi.	☐	☐	☐	☐	☐
10. Sếp của tôi mang lại cho tôi cơ hội để học hỏi từ những sai lầm của tôi.	☐	☐	☐	☐	☐
11. Sếp và các đồng nghiệp của tôi cảm nhận tôi là người giải quyết vấn đề một cách sáng tạo.	☐	☐	☐	☐	☐
Đổi mới sáng tạo cá nhân					
12. Tại nơi làm việc của tôi, thước đo thành tích của một cá nhân có liên quan đến sự sáng tạo của cá nhân đó.	☐	☐	☐	☐	☐
13. Tại nơi làm việc, tôi đôi khi biểu lộ sự độc đáo.	☐	☐	☐	☐	☐
14. Công việc của tôi đòi hỏi tôi phải đưa ra các quyết định đổi mới sáng tạo.	☐	☐	☐	☐	☐
15. Tôi dành thời gian để theo đuổi những ý tưởng hoặc dự án của riêng tôi.	☐	☐	☐	☐	☐
16. Tôi luôn luôn nghĩ đến những ý tưởng mới để cải thiện môi trường làm việc của tôi.	☐	☐	☐	☐	☐
17. Tôi thẳng thắn bày tỏ bản thân trong các cuộc họp cán bộ nhân viên.	☐	☐	☐	☐	☐
18. Tôi làm việc theo nhóm để giải quyết các vấn đề phức tạp.	☐	☐	☐	☐	☐
19. Tại nơi làm việc của chúng tôi, thước đo thành tích của một cá nhân liên quan đến sáng kiến của cá nhân đó nhằm giải quyết vấn đề.	☐	☐	☐	☐	☐

1 - Rất đồng ý; 2 - Đồng ý

Các ý kiến đánh giá	3 - Trung lập (không tán thành và cũng không bất đồng) 4 - Không đồng ý; 5 - Rất không đồng ý				
Đối với dự án này, doanh nghiệp của chúng tôi	**1**	**2**	**3**	**4**	**5**
Đổi mới sáng tạo theo nhóm					
20. Chúng tôi làm việc theo nhóm để giải quyết các vấn đề phức tạp.	☐	☐	☐	☐	☐
21. Tại nơi làm việc của chúng tôi, các nhóm có quyền tự do quyết định và thực hiện các quyết định đó mà không cần phải xin phép.	☐	☐	☐	☐	☐
22. Trong doanh nghiệp của tôi, mọi người cảm thấy có ý thức mạnh mẽ về việc là thành viên của nhóm và hỗ trợ lẫn nhau.	☐	☐	☐	☐	☐
23. Các đồng nghiệp của tôi sẵn sàng đối diện với sự không chắc chắn và các hoàn cảnh bất thường liên quan đến công việc của chúng tôi.	☐	☐	☐	☐	☐
24. Trong số các đồng nghiệp của tôi, tôi là người đầu tiên thử nghiệm những ý tưởng và phương pháp mới.	☐	☐	☐	☐	☐

2. Xin hãy cho biết một từ quý vị dùng để mô tả văn hóa của:

doanh nghiệp của quý vị: ________________và bộ phận/phòng/ban của quý vị: ________________

PHẦN BỐN: CÁC NĂNG LỰC PHÁT TRIỂN SẢN PHẨM MỚI

Ở mức độ nào mỗi phát biểu được liệt kê dưới đây mô tả một cách chính xác về khả năng của **dự án sản phẩm mới này**? Xin hãy vui lòng cho biết ý kiến của quý vị bằng cách đánh dấu vào hộp thích hợp cho mỗi phát biểu.

Các ý kiến đánh giá	1 - Rất đồng ý; 2 - Đồng ý 3 - Trung lập (không tán thành và cũng không bất đồng) 4- Không đồng ý; 5- Rất không đồng ý				
Đối với dự án này,	**1**	**2**	**3**	**4**	**5**
Khả năng học tập					
Doanh nghiệp của quý vị khuyến khích làm việc nhóm để tìm ra các cơ hội cải tiến	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị áp dụng việc chia sẻ kiến thức vào các công việc hàng ngày của quý vị	☐	☐	☐	☐	☐
Khả năng nghiên cứu và phát triển					

Doanh nghiệp của quý vị có chất lượng cao và phản hồi nhanh chóng từ sản xuất đến thiết kế và kỹ thuật	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có cơ chế tốt cho chuyển giao công nghệ từ nghiên cứu đến phát triển sản phẩm	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có mức độ phản hồi rất tích cực từ thị trường và khách hàng về quá trình đổi mới sáng tạo công nghệ	☐	☐	☐	☐	☐
Các ý kiến đánh giá	**1 - Rất đồng ý; 2 - Đồng ý** **3 - Trung lập (không tán thành và cũng không bất đồng)** **4- Không đồng ý; 5- Rất không đồng ý**				
Đối với dự án này,	**1**	**2**	**3**	**4**	**5**
Khả năng phân bổ các nguồn lực					
Doanh nghiệp của quý vị coi trọng nguồn nhân lực	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị lập kế hoạch về nguồn nhân lực theo từng giai đoạn	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị lựa chọn nhân sự chủ chốt vào các bộ phận chức năng trong quá trình đổi mới sáng tạo	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị cung cấp vốn bổ sung một cách ổn định dành cho hoạt động đổi mới sáng tạo	☐	☐	☐	☐	☐
Khả năng sản xuất					
Bộ phận sản xuất của doanh nghiệp quý vị có khả năng chuyển hoá kết quả nghiên cứu và phát triển vào sản xuất thực tế	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị áp dụng hiệu quả các phương pháp sản xuất tiên tiến	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có đội ngũ nhân viên sản xuất có năng lực	☐	☐	☐	☐	☐
Khả năng tiếp thị					
Doanh nghiệp của quý vị có sự quản lý mối quan hệ chặt chẽ với các khách hàng lớn	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có kiến thức tốt về các phân khúc thị trường khác nhau	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có lực lượng bán hàng hiệu quả cao	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị cung cấp các dịch vụ sau bán hàng một cách xuất sắc	☐	☐	☐	☐	☐
Khả năng tổ chức					
Doanh nghiệp của quý vị có thể xử lý nhiều dự án đổi mới sáng tạo song song nhau.	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có sự phối hợp và hợp tác tốt giữa các bộ phận nghiên cứu và phát triển, bộ phận tiếp thị và bộ phận sản xuất	☐	☐	☐	☐	☐

Doanh nghiệp của quý vị có mức độ hội nhập và kiểm soát cao giữa các bộ phận chức năng chính trong doanh nghiệp	☐	☐	☐	☐	☐
Khả năng lập kế hoạch chiến lược					
Doanh nghiệp của quý vị có khả năng cao trong việc xác định điểm mạnh và điểm yếu của nội bộ doanh nghiệp	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có khả năng cao trong việc xác định các cơ hội và các mối đe dọa bên ngoài	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có mục tiêu rõ ràng	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị có một kế hoạch rõ ràng - một bản đồ lộ trình về sản phẩm và quy trình mới với điểm mốc có thể đo lường được	☐	☐	☐	☐	☐
Doanh nghiệp của quý vị thích nghi và đáp ứng cao với môi trường bên ngoài	☐	☐	☐	☐	☐

PHẦN NĂM: KẾT QUẢ PHÁT TRIỂN SẢN PHẨM MỚI

1. Doanh nghiệp của quý vị có đo lường sự thành công hay thất bại của sản phẩm mới này không?

Có □ Không □ Không biết □

2. Dưới đây là các thước đo kết quả phát triển sản phẩm mới. Doanh nghiệp của quý vị sử dụng các thước đo nào và đánh giá như thế nào về chúng (các thước đo đã sử dụng) trong phát triển sản phẩm mới này?

Các thước đo đã được sử dụng	Các thước đo	Cao trên trung bình	Trên trung bình	Trung bình	Dưới trung bình	Thấp dưới trung bình
☐	Sự chấp nhận của khách hàng	☐	☐	☐	☐	☐
☐	Sự hài lòng của khách hàng	☐	☐	☐	☐	☐
☐	Đạt mục tiêu doanh thu	☐	☐	☐	☐	☐
☐	Sự tăng trưởng về doanh thu	☐	☐	☐	☐	☐
☐	Đạt mục tiêu thị phần doanh thu	☐	☐	☐	☐	☐
☐	Đạt mục tiêu thị phần số lượng	☐	☐	☐	☐	☐
☐	Thời gian hoà vốn	☐	☐	☐	☐	☐
☐	Đạt mục tiêu chênh lệch giữa giá bán và giá vốn	☐	☐	☐	☐	☐
☐	Đạt mục tiêu lợi nhuận	☐	☐	☐	☐	☐
☐	Đạt mục tiêu lợi tức đầu tư	☐	☐	☐	☐	☐
☐	Chi phí phát triển	☐	☐	☐	☐	☐
☐	Ra mắt đúng thời gian	☐	☐	☐	☐	☐

☐	Đạt mục tiêu kết quả phát triển sản phẩm	☐	☐	☐	☐	☐
☐	Đạt phương châm chất lượng	☐	☐	☐	☐	☐
☐	Tốc độ đưa ra thị trường	☐	☐	☐	☐	☐
☐	Tỷ lệ phần trăm doanh số bán hàng của sản phẩm mới	☐	☐	☐	☐	☐
☐	Khác, xin vui lòng ghi rõ: ____________________________ ____________________________ _______	☐	☐	☐	☐	☐

3. Nhìn chung, quý vị đánh giá kết quả		1	2	3	4	5	
phát triển sản phẩm mới này như thế nào?	Rất không thành công	☐	☐	☐	☐	☐	Rất thành công
4. Nhìn chung, quý vị đánh giá **tính cạnh tranh** của sản phẩm mới này như thế nào?		1	2	3	4	5	
	Được chào đón	☐	☐	☐	☐	☐	Không được chào đón
5. Nhìn chung, quý vị đánh giá thị trường		1	2	3	4	5	
của sản phẩm mới này như thế nào?	Rất rộng	☐	☐	☐	☐	☐	Rất nhỏ

PHẦN SÁU: THÔNG TIN CƠ BẢN

1. Doanh nghiệp của quý vị thuộc ngành công nghiệp nào? ________________________

2. Doanh nghiệp của quý vị thuộc loại hình sở hữu nào và tỷ lệ phần trăm là bao nhiêu?

☐ Sở hữu nhà nước __________ %

☐ Sở hữu tư nhân __________ %

☐ Sở hữu nước ngoài __________ %

3. Doanh nghiệp của quý vị được thành lập vào năm nào? ☐ ☐ ☐ ☐

4. Có bao nhiêu người đang làm việc trong doanh nghiệp của quý vị?

Nhân viên toàn thời gian: ____________ Nhân viên bán thời gian: _____________

5. Xin hãy cho biết doanh thu (đơn vị: tỷ đồng Việt Nam) trong năm tài chính trước (2014-15): _______ tỷ đồng

6. Tuổi của quý vị: **<25** **25-30** **31-40** **41-50** **51-60** **61+**

☐ ☐ ☐ ☐ ☐

☐

7. Trình độ học vấn cao nhất của quý vị:

☐ **Tốt nghiệp cấp 3: năm: _________** ☐ **Cao đẳng**

☐ **Đại học** ☐ **Sau đại học (ví dụ: Thạc sĩ, Tiến sĩ)**

8. Chức vụ của quý vị trong doanh nghiệp: ______________________

9. Chuyên môn của quý vị là:

☐ Kỹ thuật ☐ Khoa học ☐ Kinh doanh ☐ Doanh nhân ☐ Khác

10. Quý vị đã làm việc trong ngành này bao nhiêu năm? ______________

CẢM ƠN QUÝ VỊ RẤT NHIỀU VÌ ĐÃ DÀNH THỜI GIAN HỢP TÁC VỚI CHÚNG TÔI

Nếu quý vị muốn có kết quả của cuộc khảo sát này,
xin vui lòng ghi thông tin liên lạc hoặc đính kèm danh thiếp.