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**AN EMPIRICAL INVESTIGATION INTO
INBOUND OPEN INNOVATION AND ABSORPTIVE
CAPACITY: THE CASE OF THAI DESSERT SMES**

PATSORN SAWATASUK

A thesis submitted to the University of Huddersfield in partial fulfilment of the requirements for the degree of Doctor of Philosophy

The University of Huddersfield

May 2019

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Abstract

The aim of this research is to study ‘potential absorptive capacity’ (PAC) and ‘realised absorptive capacity’ (RAC) concepts within Thai SMEs in the ‘low-medium-tech’ (LMT) sector. This research has two main objectives: 1) to explore Thai dessert SMEs’ motives and knowledge domains in relation to inbound open innovation (OI) access, and 2) to understand the effect of search breadth and search depth, local search experience, and innovation capability on PAC and RAC.

A mixed methods approach with an exploratory design was employed in this research. It was based on a qualitative approach using semi-structured interviews. The 14 sets of interview data were gained from three agencies: Thai dessert SMEs, government agencies responsible for the promotion of technology and innovation in Thai SMEs, and a large company possessing one production line for an innovative Thai dessert product. The thematic analysis findings revealed three key motives engaging Thai dessert SMEs in the inbound OI access in support of new product development (NPD): brand building, product quality, and improvement. Significantly, the findings also revealed that internal factors (employee and technology management) and the type of OI practice (openness) were two key elements that Thai dessert SMEs engaged with, along with the motives. Using a quantitative approach with a survey of 211 Thai dessert SMEs, the findings of structural equation modelling (SEM) analysis revealed that search breadth was positively related to PAC, but was not found to relate to RAC. On the other hand, search depth was found to positively relate to RAC but was not found to relate to PAC. In addition, the effects of innovation capability and local search experience were examined. The findings revealed that local search experience through frequent searching in the oriented-knowledge domain significantly influenced the PAC, while there was no moderating effect of innovation capability on the relationship between the RAC and new product performance because the linear relationship of RAC and new product performance was found to be non-significant.

This research contributes to the existing literature in three ways. Firstly, it advances the research on absorptive capacity by linking the concept of PAC and RAC with two distinct dimensions of search: search breadth and search depth, which corresponds to organisational learning, namely exploration learning and exploitation learning, respectively. To the researcher’s knowledge, this is the first study examining the effects of search breadth and depth on PAC and RAC. Secondly,

it contributes to the research on absorptive capacity by examining the moderating role of innovation capability in the relationship between RAC and new product performance. Prior research has never before examined the interaction effect of innovation capability and RAC on new product performance. This is potentially the first study examining this interaction effect. Thirdly, the study contributes to the knowledge of the implementation of inbound OI, in particular within the context of low-medium-tech (LMT) SMEs. To date, studies regarding inbound OI access of low-medium-tech SMEs are scarce. This research bridges this gap in knowledge by providing qualitative evidence of motives and knowledge in inbound OI access.

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List of Abbreviations

AC	Absorptive Capacity
CB-SEM	Covariance-based Structural Equation Modelling
CFA	Confirmatory Factor Analysis
CITC	Corrected-Item-to-Total Correlation
EFA	Exploratory Factor Analysis
IC	Innovation Capability
KBV	Knowledge-Based View
KDA	Knowledge Dissemination Ability
LMT	Low-Medium-Tech Sector
NIA	National Innovation Agency
NPD	New Product Development
NSTDA	National Science and Technology Development Agency
OI	Open Innovation
OTOP	One Tambon One Product
PAC	Potential Absorptive Capacity
RAC	Realised Absorptive Capacity
RQ	Research Question
R&D	Research and Development
SEM	Structural Equation Modelling
SME	Small and Medium Sized Enterprise
TMC	Technology Management Center
VB-SEM	Variance-Based Structural Equation Modelling

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Chapter 1 : Introduction

1.1 Background

Small and medium-sized enterprises (SMEs) are a key contributor to economic growth and job creation (Bruque & Moyano, 2007). Given the current dynamic environment and high competition, SMEs need to continually innovate and improve their processes to expand into new markets and protect their current market share (Ledwith & Nicholas, 2011; O'Regan, Ghobadian, & Sims, 2006). New product development (NPD) activity is regarded as a powerful source of competitive advantage. However, SMEs generally have limited resources to invest in a formal in-house research and development (R&D) department. Thus, they tend to use the external environment as a source of new ideas, knowledge and technology for their NPD activities (Brunswicker & Vanhaverbeke, 2014; Bullinger, Auernhammer, & Gomeringer, 2004; Muscio, 2007), which reflects a shift from closed innovation to open innovation (Chesbrough, 2003c).

The concept of open innovation (OI) in innovation management was first introduced by Chesbrough (2003c); he suggested that firms should use purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for the external use of innovation (Chesbrough, Vanhaverbeke, & West, 2006, p. 1). The underlying notion of OI is that in highly competitive business conditions, firms cannot afford to rely entirely on their ideas to advance their business or restrict their innovations to a single path (Van De Vrande, Vanhaverbeke, & Gassmann, 2010). The notion of OI has become popular in recent years, as witnessed by the growing amount of literature in the field, especially in support of firms undertaking NPD activity. Clinging to the concept, OI can be the inflow and/or outflow of ideas, knowledge and technology (Enkel, Gassmann, & Chesbrough, 2009). Focusing on the inflow or outside-in movement corresponding to a type of inbound OI, absorptive capacity (AC) is regarded as a critical factor in a firm's successful implementation of inbound OI.

AC is a concept that is strongly connected with inbound OI (Clarysse & Spithoven, 2010). As defined by Cohen and Levinthal (1990), AC refers to 'the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends'. A firm's AC comes from the firm's learning, which is primarily generated from internal R&D activity. Thus, it is not surprising that large firms or industries in the high-tech sector, which generally have high investment in R&D activity, also have a high level of AC. However, this is not the case for SMEs

or industries in the low- and medium-tech (LMT) sector, which generally have a low level of AC, resulting from a lack of formal R&D and low investment in R&D activity. To provide guidelines to SMEs or industries in the LMT sector for the development of AC, this research focuses on a study of AC in the context of SMEs based on the LMT sector, using the Thai dessert industry as an industrial case.

Thailand is a developing country that relies on the development of a knowledge-based economy and the labour-intensive manufacturing sector. SMEs play an important role in driving the Thai economy, accounting for 99.7% of all enterprises and 78% of all employment (OSMEP, 2016). However, a significant problem faced by Thai SMEs is their low level of AC, obstructing the implementation of external knowledge necessary to create innovation within a firm. According to a report by the OECD (2011), innovation and productivity increases driven by Thai SMEs were held back by their lack of technological capacity to absorb innovation from external sources and to innovate incrementally. The OECD (2011) report also identified that this is mainly caused by a low level of R&D intensity (expenditure) in Thailand. According to the report, gross domestic expenditure for R&D (GERD) in Thailand was only 0.25% of GDP (OECD, 2011), whereas the OECD average for GERD stands at 2.4% of GDP (OECD, 2013). Given that AC is primarily generated from internal R&D activity, this figure significantly reflects the poor AC of Thai SMEs.

Relying on the framework of country development, the Thai government adopted the concept of creative economy and declared it part of the national agenda in the Eleventh National Economic and Social Development Plan (2012–2016), with the aim to elevate Thailand as a hub of creative industries in Southeast Asia (Pholphirul & Bhatiasevi, 2012). It was continued in the Twelfth National Economic and Social Development Plan (2017–2021). The concept of creative economy was proposed to link economy and creativity (Howkins, 2002). It has been adopted for implementation by several countries, with a variety of applications. Thus, there is no global definition of creative economy. In Thailand, creative economy has been defined by the Office of the National Economic and Social Development Board (NESDB), employing the framework of the United Nations Conference on Trade and Development (UNCTAD), with some classification adjustments based on the United Nations Educational, Scientific and Cultural Organisation (UNESCO). The NESDB defined creative economy as ‘an economic system that mixes cultural assets, local wisdom, and the uniqueness of Thai with proper knowledge and technology in order to produce unique and diverse products and services’ (Hawkins, 2011, p. 20). In this definition of

creative economy, creative industries are ‘those industries which use Thai-ness, culture, heritage, and local wisdom, as well as technology, for economic development’ (Hawkins, 2011, p. 20). Based on the UNESCO guidelines, creative industries in Thailand are divided into four categories: cultural heritage, arts, media, and functional creation. The NESDB specifically includes Thai food and traditional Thai medicine in the cultural heritage category.

The Thai dessert industry is regarded as the dominant creative industry in Thailand. It involves the production of Thai dessert products that are represented as Thai food containing Thai-ness through their cultural heritage. The Thai dessert industry is categorised as an SME based in the LMT sector, with a R&D level of no more than 3% (Hirsch-Kreinsen, 2008). However, this does not mean that the Thai dessert industry does not engage in any innovation activities – it is a creative sector engaging in NPD activity. Some, although very few, Thai dessert SMEs have potential as exporters in the international market. The interest in the Thai dessert industry arose due to it being creative as well as from the LMT sector. This research focuses on the study of AC through the Thai dessert industry in order to elevate the economic value of this industry cluster.

According to Zahra and George (2002), AC can be categorised into potential absorptive capacity (PAC) and realised absorptive capacity (RAC). PAC enables a firm to acquire and assimilate new knowledge from external sources, while RAC ensures that the absorbed knowledge is exploited for commercial use (Zahra & George, 2002). PAC and RAC have complementary roles, being an organisational capability and a dynamic capability. AC results from learning. Consequently, viewing it at firm level, a firm’s AC is accumulatively rooted in the firm’s learning – in other words, in organisational learning. March (1991) proposed a framework of organisational learning that categorises it into two types: exploration learning and exploitation learning. Exploration learning involves a broad and general knowledge search, whereas exploitation learning involves a deep search to gain in-depth and fine-grained knowledge. Therefore, AC might involve either exploration learning or exploitation learning, or both. As a result, the differentiation of AC as two sub-sets – PAC and RAC – is beneficial, as it facilitates the further study of the links between the two distinct types of learning. However, there is still a missing connection between the two sub-sets of AC and the two types of organisational learning. To bridge this gap, this research studies PAC and RAC in connection with the concepts of exploration learning and exploitation learning, using search breadth and search depth as the respective connectors.

In this research, the AC study focuses on a non-R&D context, as it can apply in a context that does not rely on intensive R&D activity. In doing so, this research extends Zahra & George's (2002) views of AC as dynamic capability, which comprises two distinct yet complementary sub-sets of AC: PAC and RAC. The theoretical framework employed in this research includes three related theories: exploration–exploitation organisational learning, knowledge management, and dynamic capabilities. This research argues that search breadth corresponding to exploration learning and search depth corresponding to exploitation learning have different effects on PAC and RAC, while local search experience and innovation capability have separate effects on PAC and RAC, respectively.

1.2 Research Objectives

The aim of this research is to study PAC and RAC in SMEs based in the LMT sector, using Thai dessert SMEs as the case. This research has two main objectives:

1.2.1 To explore Thai dessert SMEs' motives and oriented-knowledge domains in the inbound OI access in support of NPD.

1.2.2 To understand the effect of search breadth and search depth, local search experience, and innovation capability on PAC and RAC.

The main research question is:

How do search breadth and search depth, local search experience, and innovation capability affect PAC and RAC in Thai dessert SMEs' inbound OI access, in support of NPD?

Based on the main research question, a set of five research sub-questions was generated:

RQ1: What are Thai dessert SMEs' motives in the inbound OI access in support of NPD?

RQ2: What kinds of knowledge domain do Thai dessert SMEs orient in the inbound OI access in support of NPD?

RQ3: What is the effect of local search experience on PAC?

RQ4: How do search breadth and search depth affect PAC and RAC?

RQ5: Does innovation capability have a moderating effect on the relationship between RAC and new product performance (NPP)?

1.3 Research Methodology

The current research is shaped by the paradigm of pragmatism, which holds that neither quantitative nor qualitative methods alone are sufficient to develop a complete analysis. Consequently, to address the five research questions, this research adopted a mixed methods approach. This approach refers to ‘the combination of quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study’ (Johnson & Onwuegbuzie, 2004). Based on the mixed methods approach, the research employed exploratory design. The first phase utilised a qualitative approach, which was followed by a quantitative approach in the second phase. In the first phase, interviews were used to collect data, which was analysed using thematic analysis. In the second phase, a survey was employed to collect data, with data analysis being conducted through structural equation modelling (SEM).

1.4 Organisation of the Thesis

The thesis is organised into ten chapters. Following this introduction, Chapter 2 provides a review of literature covering six major concepts: NPD, OI, AC, search, knowledge base and innovation capability. Chapter 3 presents the background of Thai SMEs and the specific context of the Thai dessert industry, which is used as the case study. Chapter 4 presents the conceptual framework and the underlying research hypotheses, discussing the rationale underlying each hypothesis. Chapter 5 discusses the methodology employed for addressing the research questions. Chapter 6 presents the qualitative findings from the interview method of data collection. The qualitative findings are represented through emerging themes and descriptions of those themes. Chapter 7 presents the development of the measures and questions used in the pilot survey. Chapter 8 presents the results of the hypothesis testing from the survey method of data collection. Chapter 9 discusses the findings of this research from the perspective of both approaches in light of literature and previous studies. Lastly, Chapter 10 provides an overall conclusion. It presents the implications, contributions and limitations of the study. In addition, it provides recommendations for future studies.

Chapter 2 : Literature Review

2.1 Introduction

In the previous chapter, the background of the problem and the research questions were discussed. This chapter will review the relevant literature in order to identify a gap in the knowledge and justify the research questions. The review covers literature in two inter-related fields: absorptive capacity (AC), and inbound open innovation (OI). The chapter is organised into 12 main sections. Section 2.2 provides a flowchart of the literature review. Section 2.3 begins with a review of the concept of new product development (NPD). Section 2.4 discusses the concept of open innovation, in relation to NPD. Section 2.5 reviews the concept of AC. Section 2.6 discusses the concept of prior-related knowledge in relation to AC. Section 2.7 discusses the concept of potential and realised absorptive capacity. Section 2.8 represents an open search strategy in relation to inbound OI and AC. Section 2.9 discusses the concept of innovation capability (IC), in connection with AC. Section 2.10 identifies the gaps in the current knowledge. Section 2.11 reviews the methods applied in previous studies of inbound OI and AC, before section 2.12 summarises the chapter.

2.2 Flowchart of the Literature Review

To determine the range of relevant concepts in the literature review, this study adopted the strategy of concept mapping. A concept map is a graphical tool used to organise and represent knowledge in a particular field and to seek answers to a focus question in a hierarchical structure (Novak and Cañas, 2008). The use of concept mapping enables an understanding of the relationships between concepts and the domain to which they belong. The standard procedure for concept mapping includes four main steps: 1) defining the topic or focus question; 2) identifying and listing the most important or general concepts associated with the topic; 3) ordering the concepts from top to bottom in the mapping field; and 4) labelling the linking phrases. Following the concept mapping procedure, research questions will be used as the focus. The main research question of this research is:

How do search breadth and search depth, local search experience and innovation capability affect PAC and RAC in Thai dessert SMEs' inbound OI access, in support of NPD?

Per the main research question above, two inter-related concepts – AC and inbound OI – are the focus areas in this study. Accordingly, both concepts are featured in the concept map in Figure 2.1

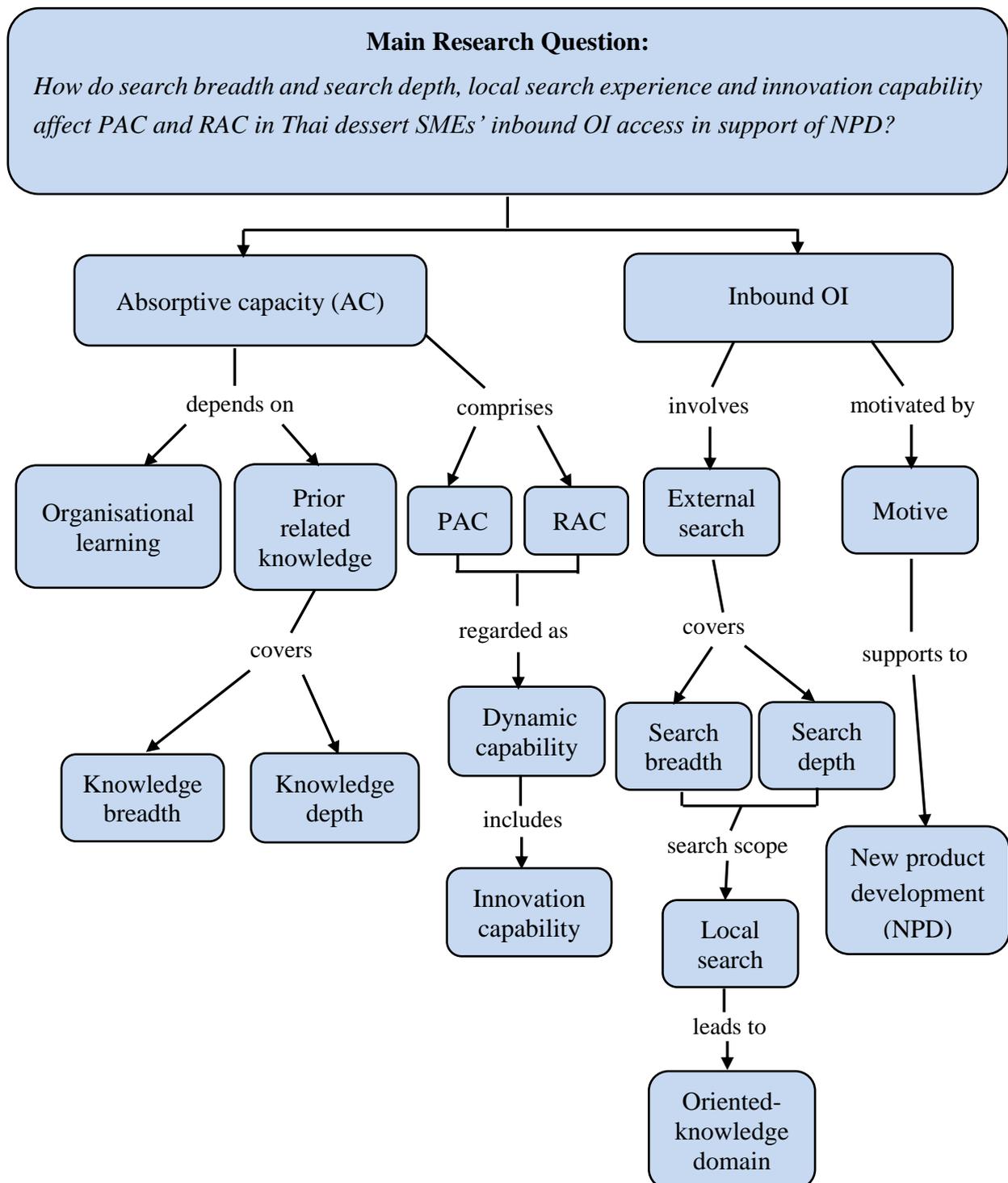


Figure 2.1. Concept mapping in the literature review.

According to Figure 2.1, AC branches into two main types of AC – PAC and RAC. As discussed in Chapter 1, PAC and RAC are the focus areas within AC in this study. Hence, PAC and RAC will be focused on in the literature review.

The PAC and the RAC are regarded as dynamic capability; thus, the concept of dynamic capability is incorporated into the literature review. Based on the definition by Cohen and Levinthal (1990, p.128), AC refers to ‘the ability to recognise the value of new, external information, assimilate it, and apply it to commercial ends, as well as being critical to innovative capability’. Thus, the concept of innovation capability is also considered for inclusion into the literature review. Continuing on the AC concept, the AC largely depends on prior knowledge and results from organisational learning. Consequently, these two concepts are embraced into, to be as relevant concepts. Focusing on prior-related knowledge, it is relevant to the firm’s knowledge base covering two key dimensions – knowledge breadth and knowledge depth. Thus, the branch of prior-related knowledge extends into these two dimensions.

Inbound OI involves external searching. However, external searching does not occur without motives. The perspective of the motive facilitates understanding in driving forces in knowledge access from external sources, and facilitates the development of the concept of AC. Consequently, the motives for external searching, or inbound OI access, are also included in the literature review.

External searching, similar to the concept of the knowledge base, covers two key dimensions – search breadth and search depth. Searching is related to the knowledge domain that is searched for, and the searched knowledge is connected with the AC. Thus, the oriented-knowledge domain is a relevant concept and is therefore included in the literature review. This is to determine which knowledge domains were previously studied in relation to searching and AC. The searched knowledge differentiates the search into two main types – a local search and a distant search. For this study, a local search will be used rather than a distant search. This is due to the nature of the case being studied, which is reliant on a low- and medium-tech (LMT) sector having a low AC, and it is therefore rare to commonly apply this for a distant search. Consequently, a local search is considered to have more involvement with AC than a distant search.

Finally, using the concept map above, the scope of relevant concepts to include in the literature review appears as a holistic view. The literature review in this research covers six major concepts:

1) NPD; 2) OI, which is an umbrella concept of inbound OI; 3) AC of two distinct types – PAC and RAC; 4) external searching, focusing on search breadth and search depth; 5) knowledge base, focusing on knowledge breadth and knowledge depth; and 6) innovation capability. These six major concepts will be reviewed below.

2.3 New Product Development

New product development (NPD) is a key contributor to a firm's survival and growth. NPD is referred to as 'the process by which an organisation uses resource and capability to create a new product or improve an existing one' (Cooper, 2003). NPD activity generally involves the coordination of various functions, such as R&D, engineering, operations and marketing (Alegre-Vidal, Lapiedra-Alcamí, & Chiva-Gómez, 2004).

2.3.1 Strategy and New Product Development

Strategy determines the configuration of resources, products, process and systems for firms to adapt to their environments (Akman & Yilmaz, 2008). Therefore, linking strategy into NPD is required for innovation management to be effective. Stobaugh and Telesio (1983) identified three types of product strategies: 1) technology-driven strategies; 2) marketing-intensive strategies; and 3) low-cost strategies. Technology-driven strategies give priority to flexibility; marketing-intensive strategies give priority to quality and delivery; while low-cost strategies emphasise cost minimisation. Terziovski (2010) argued that SMEs should not view innovation from an exclusively technological perspective, but from strategic and market-driven perspectives instead.

2.3.2 Product Innovation

The output of NPD is product innovation (Oke, Burke, & Myers, 2007). Innovation refers to 'the creation of any product, service, or process which is new to a business unit' (Tushman & Nadler, 1986). Innovation can be categorised into three main types: 1) product innovation; 2) process innovation; and 3) service innovation (Oke et al., 2007). Product innovation refers to 'new product offerings or improvements in existing products' (Oke et al., 2007); process innovation refers to 'the creation or improving of methods of production, service or administrative operations, including the development of the processes, systems and the reengineering of activity related to NPD' (Oke et al., 2007); while service innovation means 'new development of activities being undertaken in order to deliver the core product and make it more attractive to consumers' (Oke et

al., 2007). In the context of SMEs, product innovation is likely to be engaged in more than process innovation (Hoffman, Parejo, Bessant, & Perren, 1998)

As innovation is related to newness or improvement, the level of innovation depends on the newness. Innovation can be classified into two main types: incremental innovation and radical innovation. Incremental innovation refers to something being improved (Anahita, Jennifer, Sally, & Daffyd, 2012). This type of innovation involves add-ons to a previous innovation or modifications to existing platforms and products (Bessant & Tidd, 2011; Radas & Božić, 2009) – for example, changing the materials used to make a product, and improving service operations and line extensions, including ‘me-too’ products. Me-too products are the imitation of a competitor’s product that already exists on the market (Radas & Božić, 2009).

On the other hand, radical innovation refers to something new (Anahita et al., 2012). Radical innovation produces fundamental changes in the activities of an organisation or an industry, and represents clear departures from existing practices (Gopalakrishnan & Damanpour, 1997). Accordingly, radical innovation might also be called breakthrough innovation, discontinuous innovation and step-jump innovation (Bessant & Tidd, 2011; Reid & De Brentani, 2004). According to Radas and Božić (2009), radical innovation relates to products that are new to both the market and the company.

2.3.3 Categories of New Product Development

NPD results in product innovation, which refers to the newness or the improvement of products. The newness level of a product is termed as product innovativeness (Wang & Ahmed, 2004), which can vary from a minor change to something completely new. Minor changes reflect improvements and are regarded as incremental innovations. In contrast, something that is fundamentally new reflects radical innovation. In a different vein, Booz, Allen, and Hamilton (1982) argued that product innovativeness should be examined from the perspectives of the firm and the market, i.e. newness to firm and newness to market.

Subsequently, they classified NPD, on the basis of these two perspectives, into six categories: 1) new-to-the-world; 2) new product line; 3) line extension; 4) improvements in/revisions of existing products; 5) repositioning of existing products; and 6) cost reductions (Booz et al., 1982). New-to-the-world means a completely new product, and is therefore a radical innovation (Reid & De

Brentani, 2004; Wind & Mahajan, 1997). A new product line is something that is new to the company, to be delivered into a new market. A line extension means an addition to existing product lines in order to reformulate or modify an existing product (Yoon & Lilien, 1985). Table 2.1 presents the characteristics of the six categories.

Table 2.1

The Category of New Product Development

No.	Category	Description	Nature
1	New-to-the-world (really new)	New products that create an entirely new market	Entirely new
2	New product line	New products that a firm creates for the first time to enter an established market	New market entry
3	Line extension (additions to existing product lines)	New products that supplement a firm's established line	Supplements
4	Improvements in/ revisions of existing products	New products that provide improved performance or greater perceived value and replace existing products	Additional value
5	Repositioning of existing products	Existing products targeted to new markets or market segment	Into new markets
6	Cost reductions	New products that provide similar performance at lower cost	For same performance

Source: Adapted from Booz et al. (1982) and Barclay, Dann, Holroyd, and Institute of Operations (2000)

When categorising NPD, Booz et al.'s (1982) taxonomy is widely used (Danneels & Kleinschmidt, 2001; Olson, Walker, & Ruekert, 1995). Therefore, for this study, the categorisation of NPD by Booz et al. (1982) was adopted, as represented in Table 2.2.

Table 2.2

The Proportion of New Product Development

Category	Proportion (%)
1. New-to-the-world (really new)	10
2. New product line	20
3. Line extension (additions to existing product lines)	26
4. Improvements in/revisions of existing products	26
5. Repositioning of existing products	7
6. Cost reductions	11

Source: Booz et al. (1982)

As seen in Table 2.2, Booz et al. (1982) only identified a small proportion of new-to-the-world products, 10%, which is unsurprising. New-to-the-world products rely on radical innovation, which involves risks and high levels of investment. Thus, firms are often reluctant to undertake this (O'Connor & Veryzer, 2001). Line extension and improvements/revisions have the highest proportions, at 26% each. It is important to note that line extension should be distinguished from brand extension. Line extension refers to 'the use of an established brand name for a new offering in the same product category', whereas brand extension means 'the use of an established brand name to enter a new product category' (Ambler & Styles, 1997, p. 15).

Relating to the food industry, van der Valk and Wynstra (2005) identified that NPD is complex, as it has to cope with issues like capacity, functionality and the quality of production equipment, especially in hygiene aspects which are imposed by legislation. Relating to the newness level of products in the food industry, new-to-the-world products include ready-meals or convenience food, and quick-frozen products (Earle, 1997). In the case of line extension, this includes the use of new package sizes, new flavours, new ranges of fillings or new shapes of existing products (Fuller, 2005). Table 2.3 presents examples of each NPD category in the food industry.

Table 2.3

Case Examples of New Product Development in the Food Industry

No.	Category of new product development	Case example
1	New-to-the-world (really new)	Ready-meals or convenience food, quick-frozen products (Earle, 1997)
2	New product line	N/A
3	Line extension (additions to existing product lines)	The use of new package sizes, new flavours, new ranges of fillings or new shapes of existing products.
4	Improvements in/revisions of existing products	The use of new materials for packaging or extending product shelf life. Decreasing the calories in food.
5	Repositioning of existing products	Oatmeal-containing products repositioned as products that reduce cholesterol (Fuller, 2005). Soy-containing products repositioned as combating cancer; soft drinks repositioned as main meal accompaniments (Fuller, 2005).
6	Cost reductions	N/A

Sources: Adapted from Booz et al. (1982), Earle (1997) and Fuller (2005).

2.4 Open Innovation and New Product Development

OI is a concept that was suggested by Chesbrough (2003) as an alternative paradigm of innovation management. OI suggests that firms can and should use external ideas, as well as internal ideas, along with internal and external paths to market to advance the firms' technology (Bamford, Forrester, & Ismail, 2011; Chesbrough, 2003c). The core of the OI concept is the shift from closed or in-house R&D of NPD to the OI model. Although the idea of the OI concept implies that internal R&D is no longer an invaluable strategic asset (Chesbrough, 2003a; Chesbrough, 2003c), this does not mean that internal R&D has become obsolete. Indeed, the OI concept is meant to complement in-house R&D activity, to strengthen or speed up this activity, and to achieve the best results of innovation for internal R&D (Huang & Rice, 2009; Spithoven, Vanhaverbeke, & Roijakkers, 2013). This implies that internal R&D activity is still essential, especially in its role in building AC to acquire and exploit knowledge from external sources.

At an early stage, the OI concept has flourished and been applied by large firms or leading industrial firms in support of their NPD activities, including firms such as Merck (Chesbrough, 2003a), Procter & Gamble (Dodgson, Gann, & Salter, 2006) and Xerox (Chesbrough, 2003b). The

study of OI has focused more on high-technology and knowledge-intensive industries (chemicals, pharmaceuticals, semiconductors and electronics) than other sectors (Huang & Rice, 2009). When adopting OI, it is viewed as the firm's strategy to profit from innovation (Chesbrough et al., 2006). For example, Procter & Gamble adopted OI to shift from an internal R&D strategy towards a new strategy called connect and develop, using external ideas to facilitate its NPD activity (Sakkab, 2002).

2.4.1 Types and Practice of Open Innovation

OI is defined as 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation' (Chesbrough et al., 2006, p. 1). Although the definition only focuses on the inflows and outflows of knowledge, OI also covers ideas and technologies (Chesbrough, 2003c). Based on the inflow and the outflow of these, OI can be classified into three major types: 1) inbound OI; 2) outbound OI; and 3) coupled OI (Enkel et al., 2009). Inbound OI, an outside-in process, refers to the internal use of external knowledge, technologies and ideas; outbound OI, an inside-out process, refers to external exploitation of internal knowledge. In coupled OI, firms combine both inbound OI and outbound OI, by cooperating with other firms to co-develop, commercialise and co-capitalise on innovation (Gassmann & Enkel, 2004).

Technology exploration is defined as 'innovation activities to capture and benefit from external sources of knowledge to enhance current technological developments' (van de Vrande, de Jong, Vanhaverbeke, & de Rochemont, 2009, p. 424). Technology exploitation is defined as 'innovation activities to leverage existing technological capabilities outside the boundaries of the organisation' (van de Vrande et al., 2009, p. 424). Inbound OI involves technology exploration, whereas outbound OI involves technology exploitation (van de Vrande et al., 2009). When combining both technology exploration and exploitation, such a situation is known as a fully open setting (van de Vrande et al., 2009).

Ebersberger, Bloch, Herstad, and Van De Velde (2012) identified four patterns of OI practice: 1) searching; 2) sourcing; 3) commercialisation; and 4) collaboration. Searching means the 'systematic scanning of external environments' (Ebersberger et al., 2012), and is implemented through mechanisms ranging from employees' personal networks, to participation at events such as conferences or trade-fairs to tap into knowledge externalities (Ebersberger et al., 2012).

Sourcing means ‘the acquisition of knowledge or solutions on a market basis’ (Ebersberger et al., 2012) and is primarily concerned with the output of contracts, although not with the learning process during the development work. Commercialisation is a ‘form of licensing, the establishment of new enterprises and the sale of IPRs’ (Ebersberger et al., 2012). Finally, collaboration means ‘the development of knowledge through relationships with specific partner organisations, and involves mutual exchanges of knowledge’ (Ebersberger et al., 2012)

2.4.2 Open Innovation in Support of New Product Development: The Context of SMEs

According to Keizer, Dijkstra, and Halman (2002), innovation activity in SMEs depends on both internal and external factors. As described by Keizer et al. (2002), internal factors encompass the ‘characteristics and policies of SMEs’, whereas external factors are represented as ‘opportunities that the SME can seize from its environment’. Radas and Božić (2009) further classified internal factors into two main clusters. First, there are internal factors relating to firm characteristics, such as firm age, the proportion of highly educated employees and the proportion of full-time equivalent employees engaged in intramural R&D. Second, there are internal factors relating to the implementation of change, such as changes in strategy, marketing, management and organisational structure, and market orientation.

Indeed, the OI concept is not new for SMEs. SMEs generally have limited resources for investing in in-house R&D. Thus, the use of external knowledge sources is attractive, as it is less expensive and risky than formal in-house R&D (Moilanen, Østbye, & Woll, 2014). SMEs tend to rely heavily on the use of external knowledge for innovation (Ortega-Argilés, Vivarelli, & Voigt, 2009; Rammer, Czarnitzki, & Spielkamp, 2009). Inbound OI is often engaged in by SMEs (Lee, Park, Park, & Yoon, 2010). Firms monitor the environment through external searching to source technology and knowledge in addition to conducting in-house R&D (Spithoven et al., 2013). Inbound OI reflects ‘the use of innovative ideas and technologies from outside organisations such as suppliers, customers, universities and research institutions to improve enterprise operations and innovations’ (Chesbrough, 2003c).

The implementation of inbound OI in the context of SMEs is of interest in this study, with a focus on two main issues: motivation and the oriented-knowledge domain.

2.4.3 Motivation in Inbound Open Innovation Access

Motivation is a significant issue in strategic management (Locke & Latham, 2004). When firms decide to employ a certain strategy, they consider how well they can implement it. Consequently, user motivation is concerned with knowing what the user thinks about adopting a strategy. Knowing about user motivation enables contribution to achieving critical mass (Mäkipää & Antikainen, 2010). OI is a strategy at the firm level. Accordingly, when firms adopt the inbound OI concept, the issue of user motivation is relevant to knowing how users are motivated.

Relating to motivation, there are two major schools of motivational theories: one based in economics and one rooted in psychology (Carsrud & Brännback, 2011). For this study, motivation related to economics will be the focus. Motivational theories in economics are closely related to motivation in entrepreneurs. Motivation can be divided into two types: intrinsic motivation and extrinsic motivation. Individually, a person is probably motivated by either intrinsic or extrinsic factors, or both (Carsrud & Brännback, 2011). Intrinsic motivation reflects that a person is engaged in activities for personal satisfaction, not because of external factors (Eizadpanah, 2014). In contrast, extrinsic motivation reflects that a person is engaged in activities because of external environmental factors (Roberts, Hann, & Slaughter, 2006). Intrinsic motivation involves pleasure and interest-related motives, while extrinsic motivation involves instrumental motives (Legault, Green-Demers, & Pelletier, 2006).

From the perspective of entrepreneurship, intrinsic motivation reflects ‘a personal interest in the entrepreneurial task’, whereas extrinsic motivation involves ‘an external reward that follows certain behaviour’ (Carsrud & Brännback, 2011, p. 15). Internally, entrepreneurs may be motivated to succeed and accomplish a goal, whereas externally, they may be motivated to obtain wealth and status (Carsrud & Brännback, 2011). Entrepreneurship can be divided into two types: opportunistic entrepreneurship and necessity entrepreneurship (Carsrud & Brännback, 2011). These types have different driving forces based on motivation. The opportunistic entrepreneur is driven by the achievement of success through exploiting an opportunity for some form of gain, which is often economic. The necessity entrepreneur is generally driven by survival-oriented motivations and is more concerned with avoiding failure (Carsrud & Brännback, 2011).

In the context of SMEs, the study by Van de Vrande et al. (2009) revealed SMEs’ motives in adopting OI practices. They analysed survey data was collected by the Dutch Institute for Business

and Policy Research. Their findings revealed that the most important motives, which SMEs in both the manufacturing and service sectors are attracted to when adopting OI, are the motives based on a market-related perspective such as satisfying customer demand and following competitors. In the particular case of SMEs in the Thai dessert industry, a survey to explore the requirements of Thai dessert SMEs for technology was conducted by the Technology Management Center (TMC) in 2006 (ITAP, 2006, cited in Yokakul and Zawdie, 2009). In the survey, a set of four choices representing demand were provided: 1) product and research development; 2) production improvement; 3) waste management; and 4) quality and sanitary systems. The results from the survey revealed that Thai dessert SMEs needed support with product and research development, at 90%. Production improvement was the next requirement, with 65%. Waste management, as well as the quality and sanitary systems, were both at 20% (ITAP, 2006, cited in Yokakul and Zawdie, 2009).

2.4.4 Oriented-Knowledge Domain in Inbound Open Innovation Access

In order to use inbound OI, firms employ searching by scanning for new knowledge from external sources to apply within the firm. Different types of knowledge reflect specific sources of knowledge, including absorptive capacity. Thus, the knowledge domain in relation to the use of inbound OI should be examined when studying absorptive capacity.

2.4.4.1 Definition of Knowledge

Knowledge is more than simply data or information. Bierly III, Kessler, and Christensen (2000) proposed the knowledge-creating hierarchy with four levels, namely data, information, knowledge and wisdom. Data is defined as ‘raw facts’, information means ‘meaningful and useful data’, and knowledge is referred to as ‘a clear understanding of information’. This reflects that knowledge is distinguished from information by the inclusion of interpretation (Schulz, 2001). Finally, wisdom is defined as ‘using knowledge to establish and achieve goals’ (Bierly III et al., 2000).

2.4.4.2 Categorisation of the Knowledge Domain

In the literature of knowledge management, there are various taxonomies of knowledge classification. For example, Matusik and Hill (1998) proposed three types of knowledge taxonomies: 1) component versus architectural knowledge; 2) private versus public knowledge; and 3) individual and collective knowledge. In a different vein, Irma Becerra-Fernandez (2001)

argued that there are three dominant types of knowledge categorisation: 1) information versus know-how; 2) declarative versus procedural; and 3) explicit versus tacit. Table 2.4 represents the categorisation of knowledge as proposed in the literature of knowledge management.

Table 2.4

Categorisation of Knowledge

Category	Characteristic
Component versus architectural knowledge	Component knowledge is knowledge related to sub-routines or discrete aspects of an organisation's operations. In contrast, architectural knowledge is knowledge related to organisation-wide routines, including the schemas for coordinating the various components of an organisation for productive use (Matusik & Hill, 1998).
Private versus public knowledge	Private knowledge is unique to the firm. Conversely, public knowledge resides in the public domain (Matusik & Hill, 1998).
Individual versus collective knowledge	Individual knowledge refers to knowledge that is individually held. It is the sum total of an individuals' competencies, information, and knowledge. In contrast, collective knowledge refers to knowledge related to the organisation, held in common by organisational members, e.g. principles, routines and practices, top management schema and relative organisational consensus on past experiences.
Information versus know-how	Information refers to what something means. Know-how refers to knowing how to do something (Kogut & Zander, 1992).
Declarative versus procedural	Declarative knowledge refers to facts. Procedural knowledge refers to how to do something (Irma Becerra-Fernandez, 2001).
Explicit versus tacit	Explicit knowledge is knowledge that can be codified and transferred in formal, systematic methods, such as in rules and procedures. Conversely, tacit knowledge is knowledge learned through experience and is difficult to articulate, formalise, and communicate (Nonaka, 2008).

Source: Adapted from Matusik and Hill (1998) and Irma Becerra-Fernandez (2001)

Based on Table 2.4, the knowledge underpinning a firm's NPD process is known as component knowledge (Matusik & Hill, 1998). Van den Bosch, Volberda, and de Boer (1999) proposed three types of component knowledge: 1) knowledge related to products or services; 2) knowledge related to production processes; 3) knowledge related to markets. In the literature of innovation, several scholars identified market knowledge and technological knowledge as two highlighted types of knowledge domains, including Lichtenthaler (2009); Moos, Beimborn, Wagner, and Weitzel (2013); Wiklund and Shepherd (2003). Market knowledge and technological knowledge are two dominant types of procedural knowledge. Market knowledge expedites the discovery and exploitation of opportunities by increasing awareness of customer problems and needs (Lichtenthaler, 2009). On the other hand, technological knowledge is internally-oriented, and corresponds to the recognition of new technologies. Technological knowledge facilitates the discovery of opportunities and the rapid commercialisation of technological breakthroughs on a worldwide scale (Zahra, Neubaum, & Naldi, 2007).

Swink and Song (2007) argued that the marketing and manufacturing departments are the main functional areas involved in NPD activity. The marketing department focuses outwardly on customer and competitive issues, and away from technical issues. In contrast, the manufacturing department tends to focus inwardly and concentrates on issues of efficiency, capability and capacity (Swink & Song, 2007). Swink and Song (2007) found that the use of marketing-manufacturing integration (MMI) in each stage of NPD is associated with a greater competitive advantage, leading to a higher return on investment (ROI) in a project. Bogers and Lhuillery (2011) employed three functional areas – namely R&D, manufacturing and marketing – to examine the absorption of knowledge from different external sources. Their findings revealed that R&D is an absorber of knowledge on product innovation from public research organisations; manufacturing is an absorber of supplier knowledge on product innovation, and of competitor knowledge on process innovation; and marketing is an absorber of customer knowledge on product and process innovation, and of competitor knowledge on product innovation.

In LMT industries, the approach to knowledge tends to be focused on practical knowledge rather than scientific or theoretical knowledge (Hirsch-Kreinsen, 2008). Practical knowledge involves the application of new technologies based on practicability, functionality, efficiency and the failure-free use of a given technology (Hirsch-Kreinsen, 2008). In a similar vein, Santamaría, Nieto, and Barge-Gil (2009) identified that innovation in LMT firms is usually not based on the

latest scientific or technological knowledge, but often involves internally experimenting with and adapting technologies and learning that are not necessarily rooted in formal R&D components.

For this study, the notion of Bogers and Lhuillery (2011) was followed and adopted to apply the categorisation of knowledge domains in relation to inbound OI access. Consequently, three functional areas – R&D, manufacturing and marketing – will be employed as the knowledge domain frameworks in this study.

2.5 Absorptive Capacity: In Relation to Inbound Open Innovation

AC is a concept closely related to inbound OI, as it enables firms to identify and recognise knowledge from external sources. External knowledge cannot be easily transferred, just only the contact with external sources. Firms need to have an AC to successfully import knowledge from external sources. Without AC, the firm will not gain any benefits from inbound OI access, as the external knowledge will not be transferred to the firm for exploitation (Kostopoulos, Papalexandris, Papachroni, & Ioannou, 2011). Thus, AC is a critical factor for the successful implementation of inbound OI.

The influence of AC on firm performance and innovation performance has been examined in various previous studies. Stock, Greis, and Fischer (2001) revealed the inverted U-shaped relationship between AC and NPD performance, suggesting diminishing returns for AC. Similarly, Tsai (2009) revealed the positive moderating effect of AC, measured by R&D expenditure, on the relationship between vertical collaboration (supplier involvement) and product innovation performance.

2.5.1 Absorptive Capacity: Conceptual Development and Measures

The term ‘absorptive capacity’ was first used in macroeconomics by Adler (1965), who identified that AC is the ability of an economy to absorb and exploit external information and resources (Murovec & Prodan, 2009; Tu, Vonderembse, Ragu-Nathan, & Sharkey, 2006). Cohen and Levinthal (1989) adopted the AC concept to apply at an organisational level (firm level), by indicating a new role for R&D (other than innovation generation) – the role of building the firm’s learning, which they also called absorptive capacity. The definition of AC was later given by Cohen and Levinthal (1990, p. 128) to be an ‘ability to recognise the value of new, external information, assimilate it, and apply it to commercial ends, as well as [being] critical to innovative

capability'. Although AC focuses on new information, and information is not the same as knowledge (Bierly III et al., 2000), Cohen and Levinthal (1990) described AC in relation to the ability to evaluate and utilise outside knowledge in the same page as its definition in their paper (Van Den Bosch, Van Wijk, & Volberda, 2003). The AC concept was originally proposed in two papers by Cohen and Levinthal (1989, 1990), and AC is conceptualised as organisational learning and the organisation's capability to absorb external knowledge to exploit within the firm.

After Cohen and Levinthal's (1989, 1990) conceptualisation of AC, the extension of the AC concept branched into two different veins. First, scholars conceptualised AC in a way that converged with the notion of Cohen and Levinthal viewing AC as organisational learning or organisational capability. Second, scholars conceptualised AC in a way that diverged from the notion of Cohen and Levinthal, by using the proxies that were not reliant on organisational learning or organisational capability to measure the AC. The AC proxies employed can be categorised into two main clusters: R&D activity-related proxies, and human resource (HR)-related proxies (Muscio, 2007). Camisón and Forés (2010) identified the AC proxies in the first group as being R&D expenditure (Stock et al., 2001), patents (Zhang, Baden-Fuller, & Mangematin, 2007) and the number of publications (Mangematin & Nesta, 1999). An example of the second group of proxies is employee expertise based on education, skills and training (Muscio, 2007).

Among the different veins of AC conceptualisation, Lau and Lo (2015) organised the AC proxies (measures) into two main groups: direct measures and indirect measures. The AC direct measures are those reliant on organisational processes, while the indirect measures are those not reliant on organisational processes. Organisational learning and organisational capability are both organisational processes. This implies that AC that is reliant on organisational learning or organisational capability is a direct measure. Put differently, this means that indirect measures are somehow not reliant on either organisational learning or organisational capability.

In this study, the direct measure is the focus, rather than the indirect measure. The use of direct measures are beneficial, as this type of measure can be applied by large firms in hi-tech industries, or by SMEs with low R&D investment in low-tech industries (Moilanen et al., 2014; Muscio, 2007). In the context of SMEs in the LMT sector, which generally have a low level of investment in formal R&D, the use of an R&D activity-related proxy for AC might not facilitate the development of AC in terms of real-life situations. Although HR-related proxies might be

applicable, this is not the area of focus for this study. Accordingly, the direct measures that rely on organisational learning and organisational capability will be focused on and discussed instead.

2.5.2 Absorptive Capacity: Organisational Learning View

According to Cohen and Levinthal (1989), AC is a firm's learning, which is generated from the firm's internal R&D activity. Accordingly, AC might also be seen as organisational learning. According to Sun and Anderson (2010), AC can be both the antecedent and the outcome of organisational learning. Organisational learning is the process by which organisations learn. Organisational learning is defined as 'the changes of states of knowledge, and involves knowledge acquisition, dissemination, refinement, creation, and implementation' (Wang & Ahmed, 2003). A core idea of organisational learning is that organisations learn from experience, and make changes to practices, strategies and structures based on their performance (Baum & Dahlin, 2007). Organisational learning is characterised by three key features: routine, path (history)-dependent, and target-oriented (Levitt & March, 1988). By viewing AC through the lens of organisational learning, it can be seen as both path-dependent and domain specific. Path dependence means that the firm's accumulated learning is a result of the firm's history, affecting its future development (Saarenketo, Puumalainen, Kuivalainen, & Kyläheiko, 2004). Domain specific reflects that the performance of AC is best when what is being learned is relevant to what is already known. In other words, when what learning is in new domain being far from known somewhat, the performance of AC will reduce. This is because the accumulated AC is not familiar with the new field, and, therefore, the value of the information will not be recognised (Cohen & Levinthal, 1990).

2.5.2.1 Learning Capability

Learning capability is defined as 'a firm's ability to develop or acquire the new knowledge-based resources and skills needed to offer desired new products' (Covin & Hull, 2010). According to Covin and Hull (2010), although learning capability and absorptive capacity are related to a firm's ability to generate new knowledge that has commercial relevance, they have differences in at least two issues. First, AC is the capability of learning from external knowledge sources, while learning capability need not originate outside the firm. Second, AC is not defined in reference to any particular knowledge outcome, while learning capability is defined in specific reference to a firm's ability to offer new products (Covin & Hull, 2010).

2.5.2.2 Intra-Organisational and Inter-Organisational Learning

Absorptive capacity and learning are often described as co-evolving and mutually reinforcing (Lewin, Massini, & Peeters, 2011). Learning involves the dynamics of both intra-organisational and inter-organisational learning (Holmqvist, 2004). Intra-organisational learning refers to the learning of single, formal organisations, including the learning that occurs from sharing experiences among groups, departments and teams (Holmqvist, 2004). In other words, intra-organisational learning is the exchange of ideas among the organisation's members or employees (Lin, McDonough, Lin, & Lin, 2013). In contrast, inter-organisational learning refers to the collective learning of organisations in formal inter-organisational collaborations through strategic alliances or networks (Holmqvist, 2004). Thus, inter-organisational learning can be achieved by transferring existing knowledge from one organisation to another, creating new knowledge through the interaction (Larsson, Bengtsson, Henriksson, & Sparks, 1998).

AC can be conceptualised as intra-organisational or inter-organisational learning. As proposed by Cohen and Levinthal (1989), AC is a firm's learning, generated from R&D activity, to enable it to absorb knowledge from external sources (Camisón & Forés, 2010). Lane and Lubatkin (1998) suggested that AC is inter-organisational learning, which involves knowledge transfer through inter-organisational collaborations. In other words, Lane and Lubatkin (1998) conceptualised AC as relative AC or a learning dyadic construct between the student firm and the teacher firm. The student firm must possess AC to enable it to value, assimilate and apply new knowledge from a teacher firm. As identified by Lane and Lubatkin (1998), the student firm's AC depends on three key factors: 1) the specific type of new knowledge; 2) the similarity of organisational structures; and 3) the similarity of organisational problems.

Lane, Koka, and Pathak (2006) conceptualised AC as three sequential learning processes: 1) exploratory learning; 2) transformative learning; and 3) exploitative learning. Exploratory learning involves the recognition and understanding of new external knowledge. Transformative learning serves as the connector between exploratory and exploitative learning, with the function of assimilating externally-new knowledge (Lichtenthaler, 2009). Finally, exploitative learning involves the use of assimilated knowledge to create new knowledge and commercial outputs (Lane et al., 2006).

2.5.2.3 Process of Organisational Learning

Organisational learning originates from individual and group learning (Chiva & Alegre, 2008; Crossan, Lane, & White, 1999; Wang & Ahmed, 2003). However, organisational learning is not simply the sum of individual and group learning, but instead occurs through an institutionalising process, which is the action of embedding individual and group learning into an organisation's repositories such as systems, structures, procedures, strategies and routines (Crossan & Berdrow, 2003). An organisation does not have a brain in the same way as humans do. Thus, these repositories serve in place of the human brain, as a cognitive system or an organisational memory, keeping information and knowledge gained from individual and group learning for future use (Fiol & Lyles, 1985). Consequently, although the members of an organisation may leave, what has been learned is already preserved in organisational memories (Crossan et al., 1999; Fiol & Lyles, 1985). Organisational learning starts with individual learning, which involves knowledge acquisition by individuals, and progresses with the exchange and the integration of this knowledge, until a corpus of collective knowledge is created and embedded in organisational memories. Figure 2.2 represents the organisational learning process, starting from individual learning, through to group learning and organisational learning.

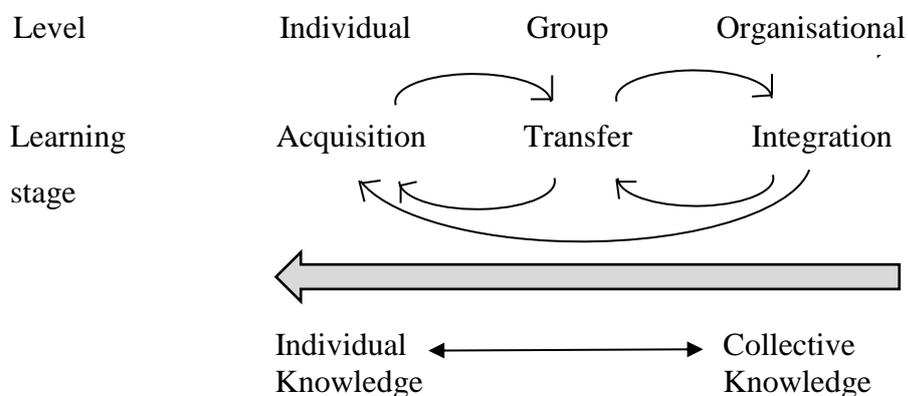


Figure 2.2. Organisational learning process.

Source: Jerez-Gomez, Céspedes-Lorente, and Valle-Cabrera (2005)

2.5.3 Absorptive Capacity: Organisational Capability View

Beyond an organisational learning view, AC can be viewed as organisational capability. As originally defined by Cohen and Levinthal (1990, p.128), AC is the 'ability to recognise the value of new, external information, assimilate it, and apply it to commercial ends, as well as [being] critical to innovative capability'. Organisational capability, which sometimes might be called

capability or competence (Day, 1994; Salvato & Rerup, 2011), is defined as ‘the ability of a firm to perform a coordinated task, utilising organisational resources, for the purpose of achieving a particular end result’ (O’Regan & Ghobadian, 2004, p. 294). Organisational capability can be categorised into two distinct types: operational capability and dynamic capability (Helfat & Peteraf, 2003). Operational capabilities are predominantly embedded in the resource-based view (RBV), being identified as ‘the ability to execute day-to-day activities, or ability to make a daily living’ (Winter, 2003, p. 992). Operational capabilities are geared towards the operational functioning of the firm, including both staff and line activities. Dynamic capabilities, in contrast, are dedicated to the modification of operational capabilities, being defined as ‘the capacity of an organisation to purposefully create, extend, or modify its resource base’ (Helfat et al., 2007, p. 4).

Thus, dynamic capability is the ability to be more advanced than operational capability (Helfat & Peteraf, 2003). Operational capability involves the basic question of ‘how you earn your living’, while dynamic capability asks more advanced questions around ‘how you change your operational routines’ (Helfat & Peteraf, 2003). Viewed through the lens of organisational capability, AC is identified as dynamic capability (Zahra & George, 2002).

2.5.3.1 Dynamic Capability

The idea of dynamic capability originated in the strategy field (Easterby-Smith & Prieto, 2008). Dynamic capabilities are an extension of the RBV, which suggests that the firm owns a set of resources and capabilities that have the potential to provide a competitive advantage (Barney, 1991; Barney & Zajac, 1994). A competitive advantage occurs when resources are deployed by capabilities (Day, 1994; Penrose, 1959; Teece, Pisano, & Shuen, 1997). In the RBV, the firm’s capability is viewed as operational capability being a static ability. When a firm faces environmental dynamism, operational capability is not a competitive advantage (Eisenhardt & Martin, 2000). Environmental dynamism is the degree of turbulence in products, technologies and demand for products in a market (Ward & Duray, 2000).

Accordingly, firms need to own the ability to be superior to operational capability in a such environmental conditions. Teece et al. (1997) first coined this superior capability by identifying it as dynamic capability, which is defined as ‘the ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments’ (Teece et al., 1997). The core of dynamic capability is that organisations must use and renew their tangible and intangible

resources and capabilities to sustain a competitive advantage in rapidly changing environments (Easterby-Smith & Prieto, 2008).

As described by Helfat and Peteraf (2003), dynamic capabilities do not directly affect the output of a firm, but indirectly contribute through an impact on operational capabilities (Helfat & Peteraf, 2003). In this vein, Zahra, Sapienza, and Davidsson (2006) identified dynamic capabilities as the processes used to reconfigure a firm's resources and operational routines in a manner envisioned and deemed appropriate by its principal decision-makers. Dynamic capability assumes that the AC is path-dependent and driven by the systems, processes and structure of the organisation (Sun & Anderson, 2010).

2.5.3.2 Capability-Based Dimension of Absorptive Capacity

Following the development of the AC concept as being reliant on organisational capability, Jiménez-Barrionuevo, García-Morales, and Molina (2011) summarised the capabilities forming AC, as theorised by various scholars. Table 2.5 summarises the organisational capabilities from previous studies on AC.

Table 2.5

The Set of Organisational Capabilities in Absorptive Capacity

Author	1st dimension	2nd dimension	3rd dimension	4th dimension
Cohen and Levinthal (1990)	Recognise	Assimilate	Commercialise	N/A
Heeley (1997)	Acquire	Disseminate	N/A	N/A
Lane and Lubatkin (1998)	Recognise	Assimilate	Commercialise	N/A
Lane, Salk, and Lyles (2001)	Understand	Assimilate	Apply	N/A
Zahra and George (2002)	Acquire	Assimilate	Transform	Exploit
Jansen, Van Den Bosch, and Volberda (2005)	Acquire	Assimilate	Transform	Exploit
Flatten, Engelen, Zahra, and Brettel (2011)	Acquire	Assimilate	Transform	Exploit

Author	1st dimension	2nd dimension	3rd dimension	4th dimension
Jiménez-Barrionuevo et al. (2011)	Acquire	Assimilate	Transform	Exploit
Todorova and Durisin (2007)	Recognise	Acquire	Assimilate or transform	Exploit
Camisón and Forés (2010)	Acquire	Assimilate	Transform	Apply
Kostopoulos et al. (2011)	Acquire	Assimilate	Transform	Apply

Source: Adapted from Jiménez-Barrionuevo et al. (2011) and Lau and Lo (2015)

2.5.4 The Linkage of Learning, Dynamic Capabilities and Knowledge Management

As previously discussed, the AC direct measure relies on organisational processes, which might be either organisational learning or organisational capability. Being as organisational capability, the AC is identified as dynamic capability rather than operational capability. Learning and dynamic capability are closely related in terms of co-evolution, although there are some arguments about these that are generated prior to the other. Some scholars have identified that dynamic capability results from learning (e.g. Eisenhardt & Martin, 2000; Lichtenhaler, 2009). However, others have argued that the relationship between dynamic capability and learning is mutual (e.g. Easterby-Smith & Prieto, 2008). Easterby-Smith and Prieto (2008) described the mechanism linking the three concepts – learning, dynamic capabilities and knowledge management – which is represented in Figure 2.3.

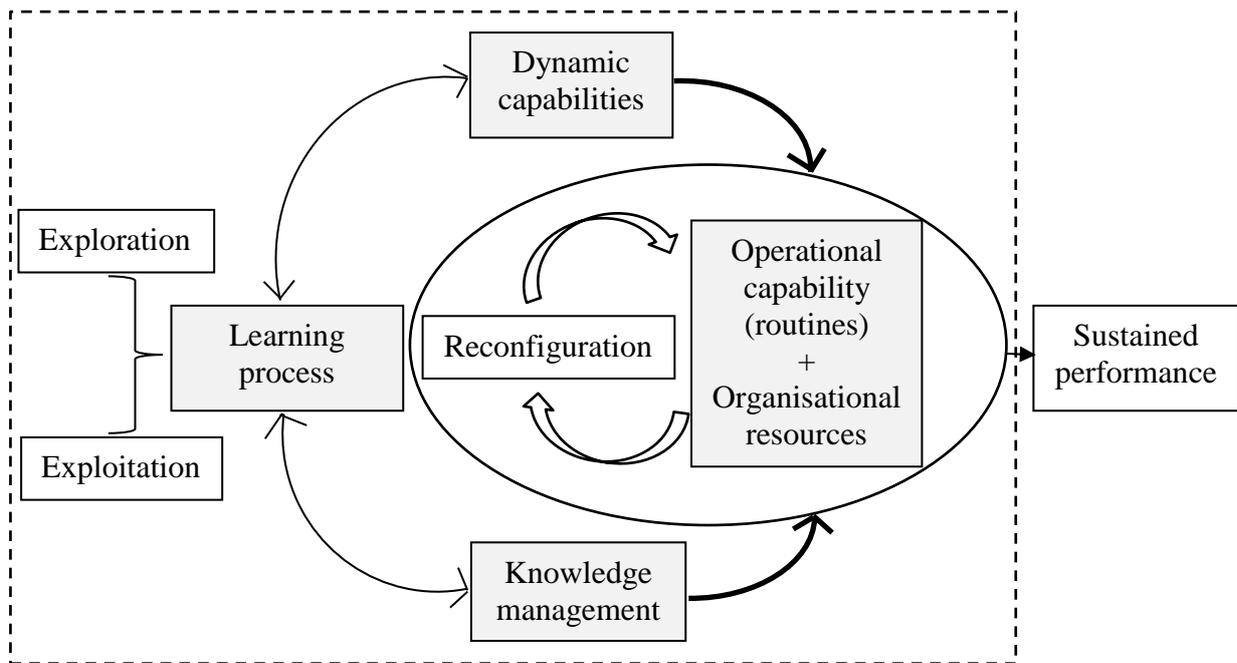


Figure 2.3. Framework of learning process, dynamic capabilities and knowledge management.

Source: Easterby-Smith and Prieto (2008)

Easterby-Smith and Prieto (2008) showed that the core of the model is to ensure that the firm has organisational resources (which includes knowledge) and operational capabilities (the firm's routine) that are appropriate to the current business context. Dynamic capabilities should use and renew the existing resources (both tangible and intangible) and operational capabilities over time, in order to sustain a competitive advantage in a dynamic environment. Knowledge management contributes to the reconfiguration of resources and operational capabilities (Easterby-Smith & Prieto, 2008). Learning serves as the mediator contributing to the evolution of both knowledge management and dynamic capabilities. However, the relationship between the learning process and dynamic capabilities, as well as the relationship between learning and knowledge management, is a mutual one (see Figure 2.3). This implies that the AC, which relies on three concepts – learning, dynamic capabilities and knowledge management – evolves through the loop of these three inter-related concepts.

2.6 Prior Related Knowledge

The firm's AC depends on the level of prior-related knowledge (Cohen & Levinthal, 1990). Prior-related knowledge enables firms to understand new knowledge, recognise the value of new information from external sources, assimilate it and apply it for commercial ends (Cohen & Levinthal, 1990; Lichtenthaler, 2009; Muscio, 2007). Without prior-related knowledge, a firm

cannot accurately determine the potential value of external knowledge (Roberts, Galluch, Dinger, & Grover, 2012). Thus, prior-related knowledge is an antecedent of AC (Valentim, Lisboa, & Franco, 2015). Prior-related knowledge might come in various forms, including basic skills, shared language or the most recent scientific or technological developments (Cohen, 1989, 1990). Employee abilities and educational backgrounds, including job-related skills, can also be prior-related knowledge (Minbaeva, Pedersen, Björkman, Fey, & Park, 2003).

2.6.1 Prior Related Knowledge: Supplementary or Complementary Knowledge?

According to Knudsen (2007), prior-related knowledge is defined as ‘the firm’s knowledge base of expertise in compatibility with external knowledge’ (Knudsen, 2007; Makri, Hitt, & Lane, 2010). Compatible knowledge refers to supplementary knowledge or similar knowledge (Shenkar & Li, 1999). This implies that prior-related knowledge means the firm’s knowledge is similar to new knowledge from external sources. Similar knowledge displays a high degree of knowledge redundancy or knowledge overlap (Knudsen, 2007). As a result, knowledge transfer can easily occur (Dyer & Singh, 1998; Gupta & Govindarajan, 2000; Mowery, Oxley, & Silverman, 1996; Schildt, Keil, & Maula, 2012). Thus, firms need to have some knowledge overlap with an external knowledge source to successfully absorb new knowledge (Lichtenthaler, 2009). This means that similar knowledge between two sources – the firm and the external knowledge sources – facilitates the AC.

In contrast to similar knowledge, complementary knowledge is ‘knowledge which is apart from the firm’s existing expertise’ (Makri et al., 2010). Thus, complementary knowledge displays a low degree of knowledge redundancy or knowledge overlap (Knudsen, 2007). The AC concept is served by similar knowledge rather than complementary knowledge. This is because similar knowledge can induce knowledge transfer more easily than complementary knowledge.

The difference between similar knowledge and complementary knowledge influences not only the AC, but also the innovative outcome between incremental and radical innovation. Incremental innovation requires external knowledge that is similar to the existing knowledge base. In contrast, radical innovation requires external knowledge that is different from the firm’s existing knowledge base or expertise. This means that similar knowledge from two sources facilitates incremental innovation, whereas complementary knowledge brings about radical innovation. Following this

logic, the implication is that AC is likely to correspond to incremental innovation rather than radical innovation (Ritala & Hurmelinna-Laukkanen, 2013; Wang & Han, 2011). This is because the AC requires similar knowledge rather than complementary knowledge. Supporting this implication, Jantunen (2005) suggested that in a case where a firm expects to achieve radical innovation, the firm should deviate from the focus on its absorptive capacities, and focus on knowledge-processing capabilities instead.

2.6.2 Knowledge Breadth and Knowledge Depth

According to the knowledge-based view (KBV) theory, knowledge is the most important strategic resource for achieving a competitive advantage (Grant, 1996; Kogut & Zander, 1992). The KBV theory emphasises a firm's creation and accumulation of knowledge-based competencies in order to yield long-term survival (Mazloomi Khamseh & Jolly, 2008). Knowledge retained within the firm is regarded as the firm's knowledge stock or knowledge base. The knowledge stock or knowledge base, therefore, serves as a firm's existing knowledge base and as prior-related knowledge to influence the AC. The knowledge stock or knowledge base might have both knowledge breadth and knowledge depth. Thus, knowledge breadth and knowledge depth can be regarded as prior-related knowledge bases (SubbaNarasimha, 2001; Wu & Shanley, 2009).

2.6.2.1 Knowledge Breadth and Knowledge Depth: Perspective of Knowledge Base

A knowledge base within a firm influences the firm's AC to identify and recognise new knowledge from external sources. When new knowledge from external sources is recognised and absorbed, this absorbed knowledge becomes a part of the knowledge stock (Smith, Collins, & Clark, 2005). The knowledge stock refers to 'the amount of knowledge elements accumulated over time and embedded in organisational routines, technologies, employees, and other types of resources' (Wu & Shanley, 2009). In return, the accumulated knowledge stock as the firm's knowledge base leads to the elevation of AC (Valentim et al., 2015).

Knowledge breadth and knowledge depth are two distinct dimensions of the knowledge base or knowledge stock (SubbaNarasimha, 2001). Knowledge breadth refers to 'the extent to which the firm's knowledge repository contains distinct and multiple domains'; and knowledge depth refers to 'the level of sophistication and complexity of knowledge in key fields' (Bierly & Chakrabarti, 1996). Knowledge breadth captures the horizontal dimension of knowledge and heterogeneous

knowledge content. Thus, knowledge breadth can also be called knowledge diversity. On the other hand, knowledge depth reflects the mastery of a subject. It reflects the vertical dimension of unique and complex knowledge within a field (De Luca & Atuahene-Gima, 2007). According to Xu (2014), knowledge breadth and knowledge depth display their effects on innovation in different ways. In general, knowledge breadth has a positive impact on radical innovation, while knowledge depth has a positive impact on incremental innovation.

Different definitions of knowledge breadth and knowledge depth can be given in different contexts. For example, Wu and Shanley (2009) defined knowledge breadth and knowledge depth in the context of scientific and technological knowledge domains. According to them, knowledge breadth is ‘the scope of scientific and technological domains in which a firm has expertise’; and knowledge depth is ‘the extent to which a firm is familiar with a particular technological or application domain’ (Wu & Shanley, 2009, p. 476). Zhou and Li (2012) defined knowledge breadth and knowledge depth in the context of marketing and technological knowledge domains. They defined knowledge breadth as ‘the diversification of a firm’s knowledge of customer portfolios, market segments, and technological background’ and knowledge depth as ‘the thoroughness of a firm’s knowledge and technical expertise within its specialised fields’ (Zhou & Li, 2012, p. 1094).

2.6.2.2 Knowledge Breadth and Knowledge Depth: Perspective of Absorptive Capacity

Cohen and Levinthal (1990) identified two types of absorptive capacity: outward-looking AC and inward-looking AC. The former is represented as the firm’s points of contact with external knowledge sources, whereas the latter refers to the efficiency of internal communication (Volberda, Foss, & Lyles, 2010). Extending this concept Carlo, Lyytinen, and Rose (2012) identified these two types of AC as an epistemic dimension of AC, which refers to what a firm knows, or its knowledge base. According to Carlo et al. (2012), outward-looking AC means the AC interfacing between organisation and environment to import external knowledge. On the other hand, inward-looking AC refers to the AC involved in internal communication among the firm’s sub-units, to assimilate and exploit information from external sources (Carlo et al., 2012, p. 870).

Outward-looking AC is conceptualised as knowledge linkage and defined as ‘the breadth, reach, and intensity of channels through which knowledge can be externally identified and assimilated’

(Carlo et al., 2012, p. 870). On the basis of this definition, outward-looking AC is likely to be external searching, as conceptualised by Laursen and Salter (2006). External searching includes two main dimensions of search strategy: search breadth and search depth. Search breadth is defined as ‘the number of external sources or search channels that firms rely upon in their innovative activities’, while search depth is defined as ‘the extent to which firms draw deeply from the different external sources’ (Laursen & Salter, 2006, p. 134). Connecting Carlo et al.’s (2012) concept of outward-looking AC with Laursen and Salter’s (2006) external search concept implies that outward-looking AC reflects external searching. To be more specific, the breadth of channel reflects search breadth, the intensity of channel reflects search depth, and the reach of channel means the access of the external search.

Carlo et al. (2012) categorised inward-looking AC into two elements: knowledge diversity and knowledge depth. This implies that knowledge breadth and knowledge depth can be conceptualised as inward-looking AC. Based on Carlo et al. (2012), knowledge diversity and knowledge depth were defined in the context of software firms, which was their case study. Knowledge diversity refers to ‘the heterogeneity of technologies and application domains in which software firms have gained experience’ (Carlo et al., 2012, p. 870). In contrast, knowledge depth is defined as ‘the quality or experience of on-hand expertise for its distinct knowledge elements, which is measured comparatively against typical expertise found in the marketplace’ (Carlo et al., 2012, p. 870).

Integrating these arguments implies that the epistemic dimension of AC includes both external searching and a knowledge base. Put differently, this means that both external searching and a knowledge base are the same dimension: the epistemic dimension of AC. In the external searching context, the epistemic dimension of AC reflects outward-looking AC, including both search breadth and search depth. In the knowledge base context, the epistemic dimension of AC reflects inward-looking AC, covering both knowledge breadth and knowledge depth.

2.7 Potential and Realised Absorptive Capacity

The concept of absorptive capacity has been reviewed, as represented above. However, Zahra and George’s (2002) AC concept, distinguishing between PAC and RAC, is the focus of this study. Thus, this section discusses the concept of PAC and RAC.

2.7.1 Concept of Potential and Realised Absorptive Capacity

According to Zahra and George (2002), AC is ‘a set of organisational routine and processes, by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organisational capability’. From this definition, AC was identified as a set of four abilities in knowledge management – acquisition, assimilation, transformation and exploitation – rather than the set of three abilities proposed by Cohen and Levinthal (1990). All four abilities create the organisational process that produces dynamic capability. Zahra and George (2002) categorised these four abilities into two sub-sets of AC: potential absorptive capacity and realised absorptive capacity. PAC includes acquisition and assimilation, and RAC includes transformation and exploitation. In essence, Zahra and George’s (2002) notion of differentiating between PAC and RAC suggests that they are two separate units of AC, but have complementary roles in the organisational process to produce dynamic capability. PAC serves as a firm’s receptiveness to external knowledge. It captures a firm’s capability to value and acquire external knowledge, but does not guarantee the exploitation of that external knowledge (Zahra & George, 2002). The exploitation of external knowledge is served by RAC, which is a firm’s capacity to leverage absorbed knowledge and transform it into an innovative outcome (Fosfuri & Tribó, 2008).

PAC refers to ‘the firm’s capability to acquire and assimilate external knowledge’, whereas RAC is ‘the firm’s capability to transform and exploit the absorbed external knowledge for commercial purposes’ (Gebauer, Worch, & Truffer, 2012; Zahra & George, 2002). PAC operates at the interface between the firm and its environment, serving the function of external knowledge transfer into the firm (Fosfuri & Tribó, 2008). In contrast, RAC operates within the firm, serving the function of external knowledge application to yield performance (Fosfuri & Tribó, 2008), by applying absorbed knowledge into the development or refinement of products and processes (Bierly Iii, Damanpour, & Santoro, 2009).

Interestingly, Carlo et al. (2012) distinguished between organisational processes and prior-related knowledge. In doing so, they categorised AC as having two distinct dimensions: a behavioural dimension and an epistemic dimension. The behavioural dimension involves what the firm does (routine) and is related to organisational processes, while the epistemic dimension involves what a firm knows and is related to prior-related knowledge.

PAC and RAC are both behavioural dimensions (Carlo et al., 2012). Carlo et al. (2012) categorised behavioural dimension into two routines: a sensing routine and an experimentation routine. PAC serves as a sensing routine whereas RAC serves as an experimentation routine.

2.7.2 Model of Potential and Realised Absorptive Capacity

Based on the given concept of PAC and RAC, Zahra and George (2002) proposed a model of PAC and RAC with the inclusion of three ‘contingent factors’: activation triggers, social integration mechanisms, and appropriability regimes, serving as the moderators to the antecedent, the component, and the outcome of AC, respectively (Vega-Jurado, Gutiérrez-Gracia, & Fernández-de-Lucio, 2008). In addition, Zahra and George (2002) identified two determinants of AC: 1) knowledge sources and complementarity of knowledge; and 2) experience or prior knowledge. Figure 2.4 represents Zahra and George’s (2002) model of PAC and RAC.

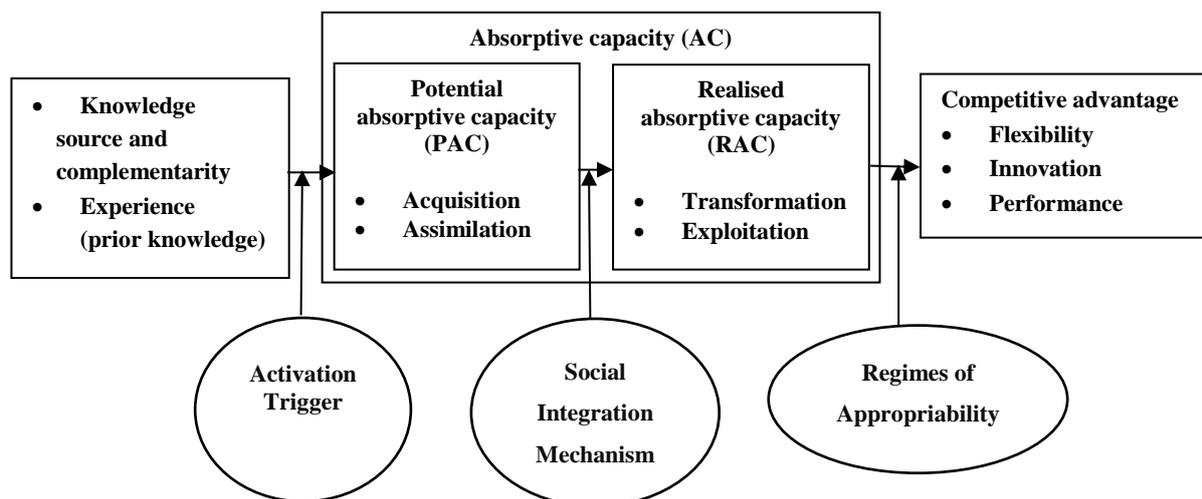


Figure 2.4. Zahra and George’s (2002) model of absorptive capacity.

Source: Todorova and Durisin (2007)

As proposed by Zahra and George (2002), PAC and RAC are conceptualised as two separate units of AC that play complementary roles. PAC enables the firm to explore new sources of knowledge, and imports the new knowledge from external sources to increase the knowledge base in the knowledge stock. RAC, conversely, ensures that the new knowledge absorbed from external sources is exploited for commercial use (Zahra & George, 2002). If firms demonstrate a high level of PAC, this does not imply that they have a high level of RAC (Fei, Chen, & Liao, 2007; Zahra & George, 2002). Given this description of the concepts, Zahra and George (2002) proposed the ‘efficiency factor’, a method of representing the ratio of RAC to PAC through measuring the

ability of the firm to create value from its knowledge base (Fosfuri & Tribó, 2008). A high 'efficiency factor' indicates that RAC approaches PAC, and reflects that the firm has a high ability to create value from its knowledge base. Firms achieving a high efficiency factor are likely to perform well (Zahra & George, 2002). To enhance the efficiency factor, Zahra and George (2002) formulated the 'social integration mechanism', which serves to moderate the relationship between PAC and RAC. The social mechanism, or socialisation, is defined as 'the level of interaction between, and communication of, various actors within and between the firms, which leads to the building of personal familiarity, improved communication, and problem solving' (Gupta & Govindarajan, 2000). The social integration mechanism enhances the efficiency factor through facilitating knowledge sharing.

It thereby provides an opportunity to build mutual understanding among members of the firm, and consequently empowering the firm to transform and exploit the assimilated knowledge (Wang & Ahmed, 2003; Zahra & George, 2002). This implies that knowledge sharing (or knowledge dissemination) can facilitate the elevation of the efficiency factor. Knowledge dissemination involves the communication of generated knowledge to all relevant departments and individuals (Liao, Welsch, & Stoica, 2003). According to He, Gallear, and Ghobadian (2011), the optimum conditions for knowledge transfer in supply-chain partnerships must include a degree of trust, commitment, interdependence, shared meaning, and balanced power. As a result, knowledge dissemination provides an opportunity to build mutual comprehension among employees. Firms consequently benefit from the exploitation of that assimilated knowledge.

Zahra and George (2002) identified that PAC and RAC should be developed in a balanced way. The firms which predominately focus on PAC are able to continuously renew their knowledge base or knowledge stock, but they might suffer from the costs of acquisition without reaping the benefits of exploitation (Volberda et al., 2010). In contrast, the firms which focus on RAC may achieve short-term profits through exploitation before falling into a competence trap (Volberda et al., 2010). Evidently, firms should strive to achieve a balance between PAC and RAC.

2.7.3 Debate on Potential and Realised Absorptive Capacity Model

Regarding Zahra and George's (2002) AC model, although Todorova and Durisin (2007) agreed that AC is a set of organisational routines that rely on dynamic capabilities, they disputed four main issues (Jiménez-Barrionuevo et al., 2011). First, they disagreed with Zahra and George's

(2002) claim that ‘acquisition’ is the first dimension of PAC. Instead, they argued that the ‘ability to recognise the value’, as identified by Cohen and Levinthal (1990), should be considered the first dimension of PAC because acquisition can only occur after the value of the new knowledge is attained (Sun & Anderson, 2010). Second, they argued that ‘transformation’ should be regarded as an alternative path to ‘assimilation’. When external knowledge fits with the firm’s cognitive schemas, assimilation of knowledge occurs, leading directly to its exploitation or application (Camisón & Forés, 2010). However, when the acquired knowledge from external sources is too new to be assimilated, it must undergo a transformation (Jiménez-Barrionuevo et al., 2011). In such a case, the firm’s cognitive structures will be modified to adapt knowledge or ideas they cannot assimilate (Camisón & Forés, 2010).

Third, Todorova and Durisin (2007) argued that if AC is indeed a set of organisational routines, the social integration mechanism must influence all elements of AC; it is insufficient for it to simply impact transformation capability. Finally, Todorova and Durisin (2007) proposed ‘power relationships’ as a new contingency factor to influence both recognition and exploitation capability (Jiménez-Barrionuevo et al., 2011). Figure 2.5 represents Todorova and Durisin’s (2007) AC model.

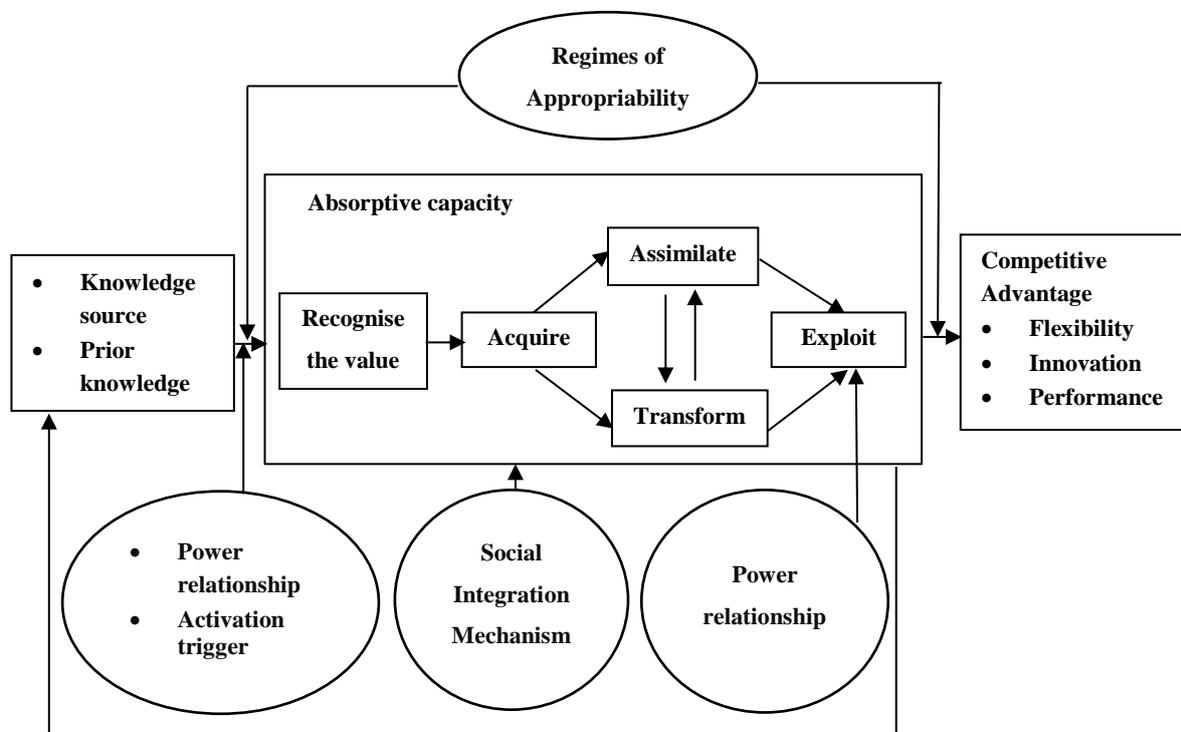


Figure 2.5. Todorova and Durisin’s (2007) model of absorptive capacity.

Source: Adopted from Todorova and Durisin (2007)

Several scholars have scrutinised Todorova and Durisin's (2007) notion. Through studying their assessments, two main arguments are revealed. First, with regard to the issue of AC's first dimension, Sun and Anderson (2010) stated that Zahra and George (2002) had already combined the recognition and valuation of new knowledge into the acquisition dimension. They argued that Zahra and George (2002) mentioned prior investment in knowledge building and the rigidity of an organisation's current capabilities to influence the acquisition dimension. Prior investment in building prior knowledge is useful in identifying and valuing new external knowledge. Hence, this means that the acquisition dimension, as proposed by Zahra and George (2002), combines both the recognition and the valuing of new external knowledge into this dimension (Sun & Anderson, 2010).

Second, on the assumption that transformation can serve as an alternative path to assimilation, Camisón and Forés (2010) argued that when a firm decides to acquire external knowledge – regardless of whether such knowledge relates to the structure of the firm's existing knowledge – the knowledge must be understood, comprehended, analysed, and codified, because it may have been drawn from different organisational cultures, systems, and practices (Camisón & Forés, 2010). This step occurs before the acquired knowledge can be diffused and integrated into the firm's existing internal routines, processes and knowledge (Camisón & Forés, 2010). Inspired by this argument, Dasgupt and D'Souza (2013) revealed empirical findings that demonstrated no relationship between acquisition and transformation, including to assimilation and exploitation. The assumption of transformation as an alternative path to assimilation was, therefore, not supported. Furthermore, their findings confirmed the relationships between acquisition and assimilation, and assimilation and transformation, including to transformation and exploitation.

2.7.4 Dimension of Potential and Realised Absorptive Capacity

Guided by this research, Zahra and George's (2002) perception of PAC and RAC was adopted for application in the study; PAC includes acquisition and assimilation, and RAC includes transformation and exploitation.

2.7.4.1 Acquisition

According to Zahra and George (2002), acquisition is the first dimension of PAC. Acquisition is defined as the 'firm's capability to identify and acquire externally generated knowledge that is critical to its operations' (Zahra & George, 2002, p. 189). Arbussa and Coenders (2007) regard

acquisition to be the ability to identify external knowledge. They claim that while it requires a user level knowledge of technology in relation to business trends, it does not involve complex scientific or technological knowledge. Acquisition relates to the process of ‘knowledge capturing’ (Szulanski,1996) or might be also conceptualised as the ‘active search’ for knowledge (Zellmer-Bruhn,2003). As searching is ‘active listening’ (Liao, Welsch, & Stoica, 2008) and active listening refers to ‘acquisition’ (Liao et al., 2003), when firms search for knowledge, they engage in active listening to scan the environment. This results in the acquisition of new knowledge from a diverse spectrum of sources (Fosfuri & Tribó, 2008). Acquisition depends on several factors such as prior R&D investment, prior-related knowledge, the willingness to develop new connections, the speed of firms’ efforts to acquire external knowledge, and the strategic direction of acquisition activities (Daghfous, 2004).

2.7.4.2 Assimilation

Zahra and George (2002) identified assimilation as the second dimension of PAC following the acquisition phase. Once the value of external knowledge is recognised by acquisition, ‘assimilation’ denotes the process of absorbing that knowledge (Daghfous, 2004). Zahra and George (2002) define assimilation as a ‘firm’s routines and processes that allow it to analyse, process, interpret, and understand the information obtained from external sources’ (Zahra & George, 2002, p. 189). In other words, assimilation is the capability to ‘interpret’ and ‘comprehend’ new knowledge (Todorova & Durisin, 2007). The firm can assimilate external knowledge when it is compatible with an existing knowledge base (Jiménez-Barrionuevo et al., 2011). However, if the external knowledge is too radical for the firm to effectively assimilate – in other words, if it is incompatible with the firm’s existing knowledge base – Todorova and Durisin (2007) argued that transformation will usurp the role of assimilation.

2.7.4.3 Transformation

According to Zahra and George (2002), after external knowledge is acquired by firms through the PAC process, the next function is served by RAC, the second sub-set of AC. The function of RAC is to deal with the knowledge imported into the firm in order to exploit (Zahra & George, 2002). Zahra and George (2002) identified transformation as the first dimension of RAC and defined transformation as a ‘firm’s capability to develop and refine the routines that facilitate combining existing knowledge with newly acquired and assimilated knowledge’ (Zahra & George, 2002, p. 190). Transformation is the capability to ‘reframe’ and ‘change’ existing knowledge structures to

be compatible with newly acquired knowledge (Todorova & Durisin, 2007). Transformation can be achieved through a process of addition or deletion, reinterpretation, and, finally, application (Camisón & Forés, 2010; Daghfous, 2004).

2.7.4.4 Exploitation

Exploitation involves the application of new knowledge commercially in order to achieve organisational objectives and gain a competitive advantage (Daghfous, 2004; Fosfuri & Tribó, 2008). Following the work of Zahra and George (2002), exploitation was identified as the second dimension of RAC, after transformation. Exploitation refers to ‘a firm’s ability to exploit existing and transformed knowledge into its operations’ (Lau & Lo, 2015). The focus of exploitation is on the conversion of knowledge into new products that suit the market (Lau & Lo, 2015). As defined by Zahra and George (2002), exploitation refers to ‘an organisational capability based on the routines that allow firms to refine, extend, and leverage existing competencies or to create new ones by incorporating acquired and transformed knowledge into its operations’.

2.7.5 Exploration-Exploitation Organisational Learning

March’s (1991) framework of exploration-exploitation organisational learning was also built upon the idea that AC should be viewed as organisational learning. March (1991) suggested that learning takes two distinct forms: exploration learning and exploitation learning. Exploration learning refers to the acquisition of external knowledge, whereas exploitation learning refers to the application of acquired knowledge. Following March’s (1991) notion, PAC corresponds to exploration learning, whereas RAC corresponds to exploitation learning (Ferrerás-Méndez, Fernández-Mesa, & Alegre, 2016; Gebauer et al., 2012). The following section represents the exploration-exploitation framework.

2.7.5.1 Exploration-Exploitation Framework

The framework of exploration and exploitation has been widely used in various studies, e.g. organisational learning, strategic renewal, and technological innovation (Li, Vanhaverbeke, & Schoenmakers, 2008). With regard to innovation, Benner and Tushman (2002) suggested that exploratory innovation involves a shift to a different technological trajectory, whereas exploitative innovation involves improvements in existing components and builds upon the existing technological trajectory. He and Wong (2004) defined exploratory innovation as technological innovation aimed at entering a new product-market domain. Exploitative innovation, conversely,

centres upon technological innovation activities which strive to improve existing product-market domains. In terms of learning, Baum, Li, and Usher (2000) suggested that exploration refers to learning achieved through processes of concerted variation, planned experimentation, and play. In their view, exploitation refers to knowledge gained via local searches, experiential refinement, and the selection and reuse of existing routines. Among these various interpretations of exploration and exploitation, Li et al. (2008) claimed that exploration can be characterised by terms such as search, variation, risk-taking, experimentation, flexibility, discovery, and innovation, whereas exploitation encompasses the following features: refinement, choice, production, efficiency, selection, implementation, and execution. According to Gupta, Smith, and Shalley (2006), exploration and exploitation are associated with learning and innovation, although they are different forms. Table 2.6 presents a variety of scholarly definitions of exploration and exploitation.

Table 2.6

Definitions of Exploration and Exploitation

Perspective	Scholars	Definition/Interpretation
Innovation	Atuahene-Gima (2005)	Exploration is to invest resources towards acquiring entirely new knowledge, skills, and processes. Exploitation is to invest resources to refining and extending its existing product innovation knowledge, skills and processes.
	Bierly and Daly (2007)	Exploration is experimenting with radical new ideas or ways of doing things. Exploitation involves refining and leveraging existing knowledge and focuses on the efficiency of current practices.
Technology/ Market	Argyres (1996)	Exploration is technological capability broadening, while exploitation is technological capability deepening.
	Lee and Ryu (2002)	Investment in unknown technological opportunities is exploration, and investment in existing technology is exploitation.
	Danneels (2002) and Danneels (2007)	Exploration and exploitation are defined by two dimensions of competence used in product innovation: technology and market. Exploration is developing new technology to serve new customers, and exploitation is to strengthen existing technology to serve existing customers.

Perspective	Scholars	Definition/Interpretation
	He and Wong (2004)	Technological innovation activities aimed at an emerging new product market is exploration, and those aimed at improving an existing product market is exploitation.
	Nerkar and Roberts (2004)	Exploration and exploitation are defined with respect to search technology and market. Distal experience in technology and market is exploration, and proximate experience in technology and market is exploitation.
Collaboration	Faems, Van Looy, and Debackere (2005)	Exploratory collaboration is associated with creating new competences such as those with universities and research institutes, while exploitative collaboration focuses on complementarities between technologies and products, such as those with customers and suppliers.
	Dittrich and Duysters (2007)	Exploration is non-equity alliances with new partners, who have different technologies. Exploitation is equity alliances with existing partners who have similar technologies.
Search	Jayanthi and Sinha (1998)	Exploration is the technology search that aims at meeting future market demand; exploitation is the technology search that aims at meeting the current market demand.
	Vermeulen and Barkema (2001)	Exploration is the search for new knowledge, whereas exploitation is the ongoing use of a firm's knowledge base.
	Benner and Tushman (2002)	Defines exploration and exploitation in terms of technology search activities. Local search is exploitation; distant search is exploration.
	Katila and Ahuja (2002)	Exploration is operationalised as 'search scope', which is how firms search for broad knowledge. In contrast, exploitation is operationalised as 'search depth', which describes how deeply a firm reuses its existing knowledge.
	Gilsing and Nooteboom (2006)	Exploration is searching and recombining technology and science; exploitation is the search for market knowledge.
	Jansen, Van Den Bosch, and Volberda (2006)	Exploration and exploitation are defined with respect to searching for new or existing knowledge among the customers/markets.

Perspective	Scholars	Definition/Interpretation
	Li et al. (2008)	Exploration is associated with terms such as variation-seeking, risk-taking and experimentation-oriented, whereas exploitation is associated with variety-reducing and efficiency-oriented.

Source: Adapted from Li et al. (2008)

2.7.5.2 Exploration-Exploitation Organisational Learning

March (1991) holds the view that exploration and exploitation are two distinct forms of learning. According to March (1991), exploration learning is defined as ‘experimentation with new alternatives having returns that are uncertain, distant, and often negative’, whereas exploitation learning is ‘the refinement and extension of existing competencies, technologies, and paradigms exhibiting returns that are positive, proximate, and predictable’. Levinthal and March (1993) refined the earlier work by March (1991) by defining exploration learning as ‘the pursuit of new knowledge of things that might come to be known’, while stating that exploitation learning was ‘the use and development of things already known’. Chiang and Hung (2010) attempted to capture the meaning of the two learning types through the lens of customer values: exploration learning is the pursuit of new knowledge leading to more variations and may create new customer values; exploitation learning is the refining and deepening of existing knowledge to enrich existing customer values. According to Rothaermel and Deeds (2004), the exploration-exploitation model takes a sequential form; that is, exploitation cannot take place without prior exploration.

With relation to the search concept, exploration learning involves a broad and general knowledge search. In contrast, exploitation learning involves a deep search (Chiang & Hung, 2010). Exploration learning is associated with the creation of new knowledge, skills, and processes. Exploration learning enables the firm to increase and update its knowledge stock, enabling it to keep up with – and respond to – the times; that is, it contains many elements that are new to the organisation (Schulz, 2001). Thus, exploration learning produces new products that differ significantly from existing ones. In other words, it is a process of radical innovation. In contrast, exploitation learning is the deployment of existing knowledge, skills, and processes (Cegarra-Navarro, Sánchez-Vidal, & Cegarra-Leiva, 2011). Exploitation learning involves a deep search, which aims to unearth in-depth and fine-grained knowledge, thereby allowing firms to concoct well-defined solutions by matching new knowledge with market opportunities (Chiang & Hung, 2010). Extensive searching requires strong and frequent contact with external sources with a

limited number of external channels (Chiang & Hung, 2010). Lichtenthaler (2009) suggested that exploration and exploitation learning are connected by transformative learning. Transformative learning is represented as ‘internal routines which facilitate the combining existing knowledge with newly acquired or assimilated knowledge’ (Camisón & Forés, 2010; Lichtenthaler, 2009), and it serves the function of ‘maintaining and reactivating knowledge over time’ (Lichtenthaler, 2009).

Despite the differences between exploration and exploitation learning, scholars believe that achieving a well-balanced combination of the two is essential for long-term organisational success (Raisch & Birkinshaw, 2008). The relationship between exploration learning, exploitation learning, and firm performance has been examined in various studies. For example, Li and Yang (2011) revealed the result of their study on the relationship between exploration learning, exploitation learning, and firm performance to form a ‘curvilinear’ (inverted U-shaped) pattern, suggesting that exploration and exploitation learning have the potential to yield the firm’s highest performance and that after this point, the firm’s performance begins to drop.

2.8 Search: Practice of Inbound Open Innovation

When a firm implements inbound OI, it will employ the search as a practice of inbound OI access. From the OI literature, search is defined as ‘the systematic scanning of external environments, using mechanisms ranging from the personal networks of employees and partners to participation and to the establishment of subsidiaries as listening posts to tap into knowledge externalities’ (Ebersberger et al., 2012). In other words, firms employ a ‘search’ as a practice to scan the knowledge from external sources in inbound OI access.

2.8.1 Search Space

When a firm conducts a search, it searches over a ‘knowledge space’, which might also be called a ‘search space’ (Katila, 2002). A ‘search space’ can be divided into three main types: internal space, competitor space, and external space (Katila, 2002). Internal space means ‘the search of the firm’s own knowledge base’; competitor space refers to ‘the search of competitors’ knowledge within the industry’; external space means ‘the search of knowledge outside industry’ (Katila, 2002, p. 997). From these three types of knowledge space, the search can be divided into two main types: internal and external. An internal search refers to an assessment of *internal space*; external

search refers to the examination of either *competitor space* (intra-industry knowledge) or *external space* (extra-industry knowledge).

An external search is an endeavour that requires a degree of openness – an open search strategy and open innovation (Hervas-Oliver, Albors-Garrigos, & Baixauli, 2012; Laursen & Salter, 2006). External searches apply to situations in which required knowledge is not inherent to the organisation's existing knowledge base (Katila & Chen, 2008). According to Katila (2002), firms tend to focus their resources on probing and examining competitor space rather than external space. This is because each industry possesses prior industry-specific knowledge, and therefore competitor space (with its intra-industry knowledge base) is likely to be easier to grasp.

2.8.2 Search Breadth and Search Depth

With regard to the strategic application of these theories, search strategy is defined as 'an organisation's problem-solving activities that involve the creation and recombination of technological ideas' (Katila, 2002, p. 1184). Search strategy usually refers to external searching, which involves contact with external knowledge sources (innovation inputs) such as customers, suppliers, competitors, or universities, (Grimpe & Sofka, 2009). The absorptive capacity of a firm is likely to impact the effectiveness of an external knowledge search in shaping innovation performance (Ferrerias-Méndez, Newell, Fernández-Mesa, & Alegre, 2015; Laursen & Salter, 2006). These two concepts are, therefore, closely related. When conducting an external search, the firm might search broadly or deeply. The work of Laursen and Salter (2006) has contributed to the conceptualisation of these two distinct dimensions of searching. According to Laursen and Salter (2006), search breadth and search depth are identified as two key dimensions of search strategy.

Search breadth is measured by the diversity of external inputs, and is therefore defined as 'the number of external sources or search channels that firms rely upon in their innovative activities' (Laursen & Salter, 2006, p. 134). In contrast, search depth is measured by how thoroughly firms draw on external sources for innovation inputs, and is thus defined as 'the extent to which firms draw deeply from the different external sources' (Laursen & Salter, 2006, p. 134). Together, these two dimensions represent the openness of a firm's external search strategy (Laursen & Salter, 2006).

Drawing on Laursen and Salter's (2006) definitions of search breadth and search depth, Chiang and Hung (2010) posited that search breadth involves the access of knowledge with 'a large number of external sources' in 'diverse' knowledge domains. Conversely, search depth involves the access of knowledge within 'a limited number of external channels' in 'particular' knowledge sources. Following Chiang and Hung (2010), search breadth denotes a broader and more general knowledge search. Search breadth offers organisations the flexibility to adapt to unpredictable changes and to expand their knowledge pool. Thus, search breadth forms an intrinsic part of 'exploration learning' and its ability to lead to 'radical innovation' (Chiang & Hung, 2010; Ferreras-Méndez et al., 2015).

In contrast, search depth involves an in-depth search that requires strong and frequent contact with the knowledge source to excavate ideas from a given knowledge channel (Chiang & Hung, 2010). Deeper search results enable firms to develop a degree of experience and competence in the particular knowledge domain (Schilling & Green, 2011). Search depth brings about the transfer of in-depth and fine-grained knowledge for well-defined solutions from the particular channel into the firms (Chiang & Hung, 2010). Integrating fine-grained and in-depth external knowledge results in exploitative learning (Schulz, 2001). Thus, search depth is related to exploitative learning and its ability to provoke 'incremental innovation' (Chiang & Hung, 2010; Ferreras-Méndez et al., 2015).

As evidenced by empirical study, the relationship between search breadth, search depth, and firm performance tends to take a curvilinear form (inverted U-shaped) (e.g. Laursen & Salter, 2006; Leiponen & Helfat, 2009; Rothaermel & Alexandre, 2009; Rothaermel & Deeds, 2006). However, the outcomes of some studies have refuted this claim. Other patterns can be also found, such as a linear pattern (e.g. Katila & Ahuja, 2002) or a U-shaped pattern (e.g. Atuahene-Gima & Murray, 2007). The curvilinear (inverted U-shaped) relationship of search and firm performance exists with the explanation of the 'over-search' phenomenon (Grimpe & Sofka, 2009). After the point of diminishing returns, there are potential risks including the costs associated with the search, which may sometimes outweigh the advantages. Rothaermel and Deeds (2006) indicate that the point of diminishing returns reflects the maximum level of a firm's specific capability at a certain point in time. Furthermore, Chiang and Hung (2010) examined the effect of search breadth and search depth to innovation performance. Their findings revealed that search breadth is positively related

to radical innovation performance, while search depth is positively related to incremental innovation performance.

2.8.3 Local Search Experience

Local and distant searches are two distinct types of external search. ‘Local search’ refers to ‘the search in [the] neighbourhood of [a firm’s] current expertise or knowledge’. In contrast, a distant search means ‘the search in the way moving far away from current organisational routine and existing knowledge base’ (Katila & Ahuja, 2002, p. 1184). Because of the distinct nature of searching for knowledge, local and distant searches result in different types of innovation output. In this sense, local searches result in ‘incremental innovation’, while distant searches result in ‘radical innovation’ (Nerkar & Roberts, 2004). Although AC can absorb external knowledge through either local searches or distant searches, this can be more easily achieved with a local search (Suzuki & MethÉ, 2014). This is because a local search will scan external knowledge that is similar to the firm’s existing knowledge base, meaning that the firm can readily acquire and exploit said knowledge. A local search generally involves the search for solutions (Schilling & Green, 2011). Searching is a cognitive, cumulative, idiosyncratic and path-dependent process. To undertake a search, therefore, is to increase one’s cognitive abilities, thus leading to an enhanced capacity to absorb knowledge (Caloghirou, Kastelli, & Tsakanikas, 2004; George, 2005). As asserted by Zahra & George (2002), search experience influences PAC. Experience might be defined as ‘displaying a relatively high degree of familiarity with a certain subject area, which is obtained through some type of exposure’ (Braunsberger & Munch, 1998). Experience affects both the locus of a search and the ability to identify and assimilate new knowledge (Szulanski, 1996). For example, as explained by Fosfuri and Tribó (2008), it is possible that R&D employees – who are unlikely to have published their work in scientific journals – may ignore knowledge sources such as specialised journals. Fosfuri and Tribó (2008) employed a firm’s stock of non-expired patents as their indicator of knowledge search experience.

Experience in knowledge searching results in ‘experiential learning’. Levitt and March (1988) identified that experiential learning does not only describe organisational change, but it is also an important instrument of organisational intelligence. An organisation accumulates experiential learning through the interaction with external knowledge sources (Zahra & George, 2002). Liao, Welsch, et al. (2008) posited that a range of searching or scanning might be represented through the ‘frequency’ of information search or the ‘extent’ of internal and external search. Thus, search

experience might be measured through the lens of these two perspectives. Ebers and Maurer (2014) identified that frequent interactions enhance boundary spanners' opportunities for acquiring knowledge from their external partners. Firms that engage in frequent interactions with external knowledge sources are likely to be more adept at accumulating experiential learning when dealing with external information (Fosfuri & Tribó, 2008).

2.9 Innovation Capability

Innovation capability, in relation to AC, was originally defined by Cohen and Levinthal (1990). Their work defines AC as the 'ability to recognise the value of new, external information, assimilate it, and apply it to commercial ends, as well as [being] critical to innovative capability' (p. 128). This definition of AC implies that it is a major determinant of innovation capability (Fei et al., 2007). This notion is supported by several scholars. For example, Knudsen and Roman (2004), concurred that AC is an important factor in predicting an organisation's innovation capability. Assink (2006) identified the enhancement of AC as a sure-fire way for a firm to improve its innovation capability. Kianto (2008) agrees, arguing that AC is a construct of innovation capability. However, in a different vein, Lin, Chen, and Chiu (2010) defined innovation capability in the same way as absorptive capacity: 'innovation capability is the ability of firms to assimilate and utilise external information for transfer into new knowledge' (Lin et al., 2010, p. 113). To further discuss the relationship between innovation capability and AC, it is important to determine the definition of innovation capability.

2.9.1 Definition of Innovation Capability

Innovation capability is an organisation's ability to transform knowledge into new products, services, and systems that benefit the company and its stakeholders (Konsti-Laakso, Pihkala, & Kraus, 2012). Innovation capability can be described and defined from different perspectives. Saunila, Pekkola, and Ukko (2014), postulate that although innovation capability has various definitions, the following four features can be widely agreed upon: 1) a potential or ability to produce innovation; 2) an internal capability; 3) the requirement for continuous improvement; and 4) the aim of adding value. Scholarly definitions of innovation capacity have been gathered from the topic's existing literature and categorised into perspectives, as shown in Table 2.7.

Table 2.7

Definitions of Innovation Capability

Perspective	Definition	Author
1. Type of innovation	A firm's innovation capability includes product innovation, process innovation, and managerial innovation.	Tsai, Huang, and Kao (2001)
	Innovation capability has been divided into radical and incremental innovation capabilities.	Sen and Egelhoff (2000)
2. Skills and knowledge/ Competency	Innovative capability relates to <i>organisational knowledge</i> and other <i>competencies</i> that are needed to improve current products and processes, and to develop new products.	Romijn and Albaladejo (2002).
3. Innovation activity input	Innovation capability is an important <i>factor</i> facilitating an innovative organisational culture, characteristics of internal promoting activities and capability of understanding, and responding appropriately to the external environment.	Akman and Yilmaz (2008)
4. Performance	Innovation capability is the <i>performance</i> of the enterprise going through various types of innovation to achieve an overall improvement of its innovation capability.	Tsui, Liao, Hu, and Wu (2010)
5. Potential	Innovation capability refers to the <i>potential</i> to generate innovative outputs.	Neely, Filippini, Forza, Vinelli, and Hii (2001)
	Innovation capability refers to the <i>potential</i> to create innovations.	Saunila and Ukko (2014)
6. Ability	Innovation capability is defined as the <i>ability</i> to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders.	Lawson and Samson (2001)
	Innovation capability consists of a <i>firm's ability</i> to generate knowledge in the form of intellectual property, such as a patent.	Zhao, Tong, Wong and Zhu (2005)

Perspective	Definition	Author
	Innovation capability refers to a <i>firm's ability</i> to develop new products and/or markets, through aligning strategic innovative orientation with innovative behaviours and processes.	Wang and Ahmed (2007)
	Innovation capability is the <i>ability</i> to develop innovations continuously as a response to a changing environment.	Olsson et al. (2010)
	Innovation capabilities is the <i>ability</i> to generate and create new knowledge in a collective recreation of value	Le Masson, Weil, and Hatchuel (2010)
7. Determinants influencing an organisation's capability	Innovation capability is defined as consisting of the <i>determinants</i> which influence an organisation's capability to manage innovation.	Saunila et al. (2014)

Source: Author

2.9.2 Innovation Capability: Perspective of Dynamic Capability

Innovation capability can be distinguished from innovation capacity by highlighting the basic disparity between the terms ‘capacity’ and ‘capability’. Capacity means *assets*; capability refers to *ability*, relating to organisational capability or competence (Day, 1994; Salvato & Rerup, 2011). Consequently, it should be argued that innovation capacity refers to ‘intermediate transformative assets’ which produce innovation capability, whereas innovation capability refers to ‘an intermediate transformation ability between resources (inputs) and objectives’ (O'Connor, Roos, & Vickers-Willis, 2007, p. 536). Innovation capacity addresses the internal potential to enable outcomes, while innovation capability places an emphasis on the outcomes themselves (O'Connor et al., 2007).

The distinction between innovation capability and innovation capacity is best understood through studying the hierarchy of capability. As proposed by Wang and Ahmed (2007), the hierarchy of capability is composed of four levels: 1) resource, 2) capability, 3) core capability, and 4) dynamic capability. Resource is viewed as a firm's foundation to lead to capabilities, and therefore it is identified as a ‘zero-order’ hierarchy of capability. Capability, as the next hierarchy, is of greater importance than resource. This is because capability deploys resources to transform, and therefore

improve, performance. Thus, capability is denoted as a ‘first-order’ hierarchy of capability. Core capability is the next hierarchy, at a higher level than capability. This is because core capability encompasses a wide range of a firm’s resources and capabilities, enabling it to gain a strategically significant competitive advantage. Consequently, core capability is denoted as a ‘second-order’ hierarchy of capability. However, core capability might become ‘core rigidity’ in the environmental contextual changes (Leonard-Barton, 1992). Dynamic capability is proposed as the next capability, at a higher level than core capability. It is a term that emphasises a firm’s constant pursuit of renewal, reconfiguration and the re-creation with reference to resources, capability, and core capability. Concisely, it is crucial to a firm which wishes to address environmental changes and remain competitive against an evolving backdrop (Wang & Ahmed, 2007). As a result, dynamic capability is identified as a ‘third-order’ hierarchy, and is therefore considered to be the highest level of capability (Wang & Ahmed, 2007). From this hierarchy we can infer that innovation capability is regarded as a resource, or an asset, occupying the floor level of hierarchy. Innovation capability, on the other hand, is identified as dynamic capability, and is considered to be of paramount importance (Wang & Ahmed, 2007).

In the same vein, Lawson and Samson (2001) highlighted the relationship between innovation capability and dynamic capability. They also proposed that innovation capability serves as the connector between mainstream and ‘new stream’. Mainstream is the process of converting raw materials into the product; new stream is represented as ‘innovation stream’, the process of creating new products, markets, technologies, and businesses (Lawson & Samson, 2001). Innovation capability serves the function of facilitating the new stream to develop potential innovations which are then transferred into the mainstream.

2.9.3 Innovation Capability and Absorptive Capacity

As discussed above, innovation capability is essentially a synonym for dynamic capabilities. Thus, in the same way, innovation capability and absorptive capacity are reliant on dynamic capabilities (Wang & Ahmed, 2007). Innovation capability is a result of a continuous learning process (Breznik & D. Hisrich, 2014). A firm can improve innovation capability through the identification of opportunities via scanning, searching and exploring different technologies and markets to address the rapidly changing environment and respond to market changes (Eisenhardt & Martin, 2000; Kogut & Zander, 1992; Teece, 2007).

Wang and Ahmed (2007) identified three types of capabilities reliant on dynamic capabilities: adaptive capability, absorptive capability, and innovative capability. These three types serve three different functions. Adaptive capability is ‘a firm’s ability to adapt itself through the flexibility of resources and aligning resources and capabilities with environmental changes’ (Wang & Ahmed, 2007). Absorptive capability means ‘the taking [of] external knowledge, combining it with internal knowledge and absorbing it for internal use’ (Wang & Ahmed, 2007). Innovative capability refers to ‘the effective link of a firm’s inherent innovativeness to marketplace-based advantage in terms of new products and/or markets’ (Wang & Ahmed, 2007).

Interestingly, Wang and Ahmed (2007) employed the term ‘absorptive capability’, rather than absorptive capacity, as was originally coined by Cohen & Levinthal (1989). This may be the result of Wang and Ahmed’s (2007) attempt to distinguish between capacity and capability. Cohen and Levinthal (1989) defined absorptive capacity as the ‘ability to recognise the value of new, external information, assimilate it, and apply it to commercial ends, as well as it being critical to innovative capability’ (Cohen & Levinthal, 1990, p. 128). According to Cohen and Levinthal’s (1989) definition, absorptive capacity (AC) relates to ability, and therefore the term ‘capability’ should be used, rather than ‘capacity’, which refers to resources and assets. Thus, the term ‘absorptive capability’, as applied by Wang and Ahmed (2007), is a more appropriate term as it highlights the difference between capacity and capability.

The relationship between AC and innovation capability has been examined by several scholars. For example, Tsui et al. (2010) found that the relationship between knowledge acquisition and innovation capability is mediated by absorptive capacity – which is measured by using know-how and experience within the organisation. Fei et al. (2007) found that AC can be measured by the ability and motivation levels of a firm’s employees and is a mediating variable between knowledge sharing and innovation capability – which is measured through product innovation, process innovation, and management innovation. These studies reflect Cohen and Levinthal’s (1990) notion that AC is the determinant of innovation capability.

In a different vein, new insight was provided when Camisón and Forés (2010) asserted that the exploitation capacity of the AC and innovation capacity refer to different contents, and that distinctions must be made. They stated that the two forms of capacity (exploitation capacity and innovation capacity) are widely misunderstood, and that they should be considered broadly the

same despite their differences. Further, although AC can affect performance and competitive advantage through the exploitation of external knowledge, these effects require additional resources and capacities such as innovation capacity (Camisón & Forés, 2010). The conversion of external knowledge, by exploitation capacity, into new products is the basis of superior performance. However, the creation of knowledge is a further step, suggesting that both external learning capacity (absorptive capacity) and internal learning capacity (internal knowledge creation capacity) influence innovation capacity, which is the primary determinant of innovative performance.

In their study on innovation capacity, Prajogo and Ahmed (2006) found a positive relationship between innovation capability and innovation performance, while Quintás and Urgal (2013) revealed that innovation capability plays the role of mediator between knowledge resources and innovation performance.

2.9.4 Dimension of Innovation Capability: Dynamic Capability Approach

As already discussed, innovation capability can be described from several different perspectives (Saunila et al., 2014). However, this research project has elected to view innovation capacity through the lens of dynamic capability. Through assessing innovation capability in relation to dynamic capability, Lawson and Samson (2001) were able to define innovation capability as ‘the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders’. From this definition, Flatten et al. (2011) argued that innovation capability takes the form of ‘knowledge transformation ability’ and ‘knowledge exploitation ability’, which are two key elements of realised absorptive capacity (RAC). However, as described by Wang and Ahmed (2007), innovation capability is not the same as absorptive capacity.

There is no clear agreement for the real elements of innovation capability (Lawson & Samson, 2001). However, the categorisation process of the different facets of innovation capability is still crucial to the innovation framework as it facilitates analysis. Lawson and Samson (2001) drew seven dimensions of innovation capability from the literature. These are: 1) vision and strategy; 2) harnessing the competence base; 3) organisational intelligence; 4) creativity and idea management; 5) structure and system; 6) culture and climate; and 7) management of technology. All seven

dimensions, to differing degrees, take a holistic approach to innovation capability within innovative firms, and they should always be regarded as actions that make innovation activities more effective, regardless of the industry or firm (Lawson & Samson, 2001).

The seven dimensions of innovation capability, as proposed by Lawson and Samson (2001), have been adopted in this study of AC. However, as these seven dimensions are reliant on the theoretical framework of innovation capability (Saunila & Ukko, 2014) – and some dimensions cover several different concepts in the same dimension – this might be problematic when defining the domain of construct (dimension). Consequently, some dimensions are refined. Table 2.8 summarises the concept of each dimension as Lawson and Samson (2001) described, and delineates how they will be applied to this research.

Table 2.8

Dimension of Innovation Capability

Dimension	Domain of dimension as described by Lawson and Samson (2001)	Adapted dimension in this research
Vision and strategy	The link of vision, strategy and innovation is important for effective innovation management. A vision is ‘a target in creating products that outperform and provide a distinct market position’. Innovation strategy determines the configuration of resources, products, processes and systems that firms adopt to deal with the uncertainty in their environment.	Strategic orientation
Harnessing the competence base	Harnessing the competence base is ‘the ability to correctly and effectively direct resources to where they are required’. Four important variables are proposed to be included in this dimension: resource management, the availability of funding channels, innovation champions, and the adoption of e-business principles.	Resource management
Organisational intelligence	The concept of organisational intelligence has been adopted by Glynn (1996), who defined organisational intelligence as ‘the ability to process, interpret, encode, manipulate and access information in a purposeful, goal-directed manner,	Organisational intelligence

Dimension	Domain of dimension as described by Lawson and Samson (2001)	Adapted dimension in this research
	so that it can increase its adaptive potential in the environment in which it operates’.	
Creativity and idea management	Creativity is regarded as ‘the process of generating ideas’. It requires divergent thinking of what may be unrealised, unproven or untested.	Creativity
Structure and system	Structure and system covers three key elements: organisational structure, reward systems, and stretch goals for innovation.	Structure and system
Culture and climate	Culture and climate covers four key elements: tolerance of ambiguity, empowered employees, creative time, and communication.	Culture and climate
Management of technology	Management of technology relates to the firm’s technological capabilities.	Management of technology

Source: Lawson and Samson (2001)

As seen in Table 2.8, three of Lawson and Samson’s (2001) proposed dimensions of innovation capability are refined in this research: vision and strategy, harnessing and competence base, and creativity and idea management. In terms of their application to this research, the seven dimensions are: 1) strategic orientation; 2) resource management; 3) organisational intelligence; 4) creativity; 5) structure and system; 6) culture and climate; and 7) management of technology. Each of these dimensions are further reviewed against the conclusions of the literature review, as follows.

2.9.4.1 Strategic Orientation

Strategic orientation is the direction a firm takes and the way it behaves in order to perform better. Strategic orientation might refer to ‘the set of activities and behaviours that are implemented for achieving its innovation goals’ (Jeong, Pae, & Zhou, 2006, p. 350). Thus, strategic orientation plays a key role in how an organisation defines and structures its activities and initiatives (Kickul & Walters, 2002) and therefore influences the strength and direction of an outward-looking focus (Huizingh, 2011). It defines the broad outlines for the firm’s strategy without the details of strategy content and strategy implementation to be completed (Slater, Olson, & Hult, 2006). Strategic orientation is comprised of three main elements: 1) customer orientation; 2) competitor orientation; and 3) technology orientation (Qualls & Spanjol, 2011). Customer orientation is defined as ‘the ability and the will to identify, analyse, understand, and answer user needs’ (Gatignon & Xuereb,

1997, p. 78). Competitor orientation refers to ‘the ability and the will to identify, analyse, and respond to competitors’ actions’ (Gatignon & Xuereb, 1997, p. 78). Technology orientation refers to ‘the ability and will to acquire a substantial technological background and use it in the development of new products’ (Gatignon & Xuereb, 1997, p. 78).

Customer orientation and competitor orientation can be combined to form of composite construct which we can call ‘market orientation’ (Qualls & Spanjol, 2011). Market orientation can be divided into two main conceptual parts: 1) a set of behaviours and processes; and 2) an aspect of culture (Keskin, 2006). With regard to behaviour and process, Kohli and Jaworski (1990) adopted this approach by using the term ‘market orientation’, meaning the implementation of a marketing concept through market intelligence generation, intelligence dissemination and responsiveness (Keskin, 2006). In this case, market orientation is defined as the ‘organisation-wide *generation* of market intelligence pertaining to current and future customer needs, *dissemination* of the intelligence across departments, and the organisation-wide *responsiveness* to it’ (Kohli & Jaworski, 1990, p. 6). Taking a cultural approach, Slater and Narver (1995) conceptualised market orientation by incorporating the development of information about competitors, and inter-functional coordination into the definition (Keskin, 2006). Combining these two aspects, Radas and Božić (2009) concluded that market orientation is the implementation of the marketing concept, or the process of generating and disseminating market intelligence for the purpose of creating superior value in the eye of the customer. When an organisation focuses on market orientation (both customer and competitor oriented), it collects intelligence about its customers and market environment. It is consequently able to disseminate this newfound knowledge across its functions, and to collectively respond to market information and satisfy customer needs (Wei, Frankwick, & Nguyen, 2012).

2.9.4.2 Resource Management

Resource management involves management capability. Management capability is defined as ‘the ability to assemble, integrate, and deploy various firm-specific resources, in particular human, organisational and relational resources, to fulfil diverse client-related business requirements’ (Lahiri, Kedia, & Mukherjee, 2012, p. 145). Resource management can therefore be explained as the comprehensive process of managing a firm’s resources in a dynamic environment. It can be perceived to encompass three different stages: 1) structuring the resource portfolio (acquiring, accumulating, and divesting); 2) bundling resources to build capabilities (stabilising, enriching,

and pioneering); and 3) leveraging capabilities in the marketplace (mobilising, coordinating, and deploying) to create value (Sirmon, Hitt, & Ireland, 2007). Structuring refers to how a firm adjusts its resource configuration according to the firm's innovation development phase (Huang, Chou, & Lee, 2010). Bundling is related to how a firm develops its innovation capability by combining resources, and/or integrating capabilities to build new capabilities (Huang et al., 2010). Leveraging involves seizing market opportunities and creating value for customers via the clear application of a firm's capabilities to a particular market context (Huang et al., 2010).

2.9.4.3 Organisational Intelligence

Glynn (1996) defined organisational intelligence as 'the capability to process, interpret, encode, manipulate and access information in a purposeful, goal-directed manner, so it can increase its adaptive potential in the environment in which it operates'. Organisational intelligence is primarily about learning from customers and learning about competitors (Lawson & Samson, 2001).

2.9.4.4 Creativity

Creativity can be defined in several ways. In a broad sense, creativity may be defined as 'the generation of novel and potentially useful ideas' (Amabile, 1988). Creativity is the ability to create work that is both novel (i.e. original and unexpected) and applicable (i.e. useful and adaptive concerning task constraints) (Blauth, Mauer, & Brettel, 2014; Mäkipää & Antikainen, 2010). In other words, creativity is not only about the conception of novel ideas; it must also add value and fit with the system or process of the organisation (Zhang & Zhou, 2014). Creativity requires divergent thinking of what may be unrealised, unproven or untested. Amabile (1998) argued that the level of creativity in each individual depends upon a mixture of the following three elements: 1) expertise, 2) creative thinking, and 3) motivation. Expertise refers to the technical and intellectual knowledge that an individual possesses, and the manner in which that organisation manages its collective knowledge. Creative thinking refers to the ability of an individual to partake in imaginative problem solving. Motivation refers to the intrinsic and extrinsic factors which determine whether or not an individual can be creative (Flynn, Dooley, O'Sullivan, & Cormican, 2003).

Creativity and innovation often tend to be used interchangeably (Martins & Terblanche, 2003). They should be considered, however, to be two distinct terms with disparate meanings (Sarri, Bakouros, & Petridou, 2010). Creativity is the generation of new and useful ideas by individual

employees. Innovation involves the successful implementation of creative ideas by organisations (Zhou & George, 2001). Thus, the creative output of an organisation is dependent on employees, and employee creativity is the starting point for innovation in an organisation. At an organisational level, organisational creativity is the output of its human resources' collective imagination, i.e. its employees (Cumming et al., 2010).

2.9.4.5 Structure and System

Organisational structure can be viewed through various perspectives, such as formalisation, centralisation and organisational size (Auh & Menguc, 2010). Systems are defined as the rules, procedures, guidelines and instruments with which an organisation functions (uit Beijerse, 2000). There are two distinct types of organisational structure: 1) mechanistic structure and 2) organic structure (Cormican & O'Sullivan, 2004). The former, the mechanistic organisational structure, is reliant on a centralised structure. It creates a fragmented structure that struggles to create an atmosphere of independence and creativity. In contrast, an organic organisational structure is one that relies on a decentralised structure. It therefore enables faster and more effective decision-making (Cormican & O'Sullivan, 2004; Flynn et al., 2003). To identify which type of organisational structure is conducive to optimum innovation, one might need to consider which stage of innovation is being focused on. In the stage of idea development, an organic structure might be required. By contrast, in the stage of implementation, a mechanistic structure might be better (Damanpour, 1991). Organic organisational structures are characterised by a degree of flexibility (Flynn et al., 2003). Ahmed (1998) argues that innovation thrives in this environment. An organic structure is reliant on various features, such as freedom from rules, participative and informal, face to face communication, inter-disciplinary teams, the breaking down of departmental barriers, being outward looking and willing to take on external ideas, flexibility with respect to changing needs, non-hierarchical, and having dynamic flow of information.

2.9.4.6 Culture and Climate

Organisational culture and climate are represented values common to all innovative firms (Nystrom, 1990). However, distinctions must be made between the two terms. Organisational culture is 'the set of values and beliefs that provide norms for behaviour in the organisation' (Prieto, Revilla, & Rodríguez-Prado, 2009; Slater & Narver, 1995). Organisational culture facilitates the communications interface between external environments and a firm's constituent units. It therefore helps to boost absorptive capacity (Noblet, Simon, & Parent, 2011). Furthermore,

organisational culture also influences ‘organisational structure’ and ‘creativity’ (Martins & Terblanche, 2003). A culture supporting innovation must value creativity, risk-taking, freedom, teamwork, value seeking, solution oriented, communication, trust and respect, and a quick uptake when making decisions (Dobni, 2008). On the other hand, an ‘organisational climate’ is defined as ‘the collective attitudes and beliefs of employees about the manner in which they perform their daily jobs’ (Smith et al., 2005, p. 349). A supportive climate and openness can greatly improve employees’ ability to learn, which leads to the effective implementation of new ideas (Tu et al., 2006).

2.9.4.7 Management of Technology

Technology management is concerned with the development, planning, implementation, and assessment of technological capabilities to shape and accomplish the strategic and operational objectives of an organisation (Krishnan & Loch, 2005). Technology management can be defined as ‘the capability to stimulate the effective use of technical knowledge and skills to develop new products and processes, the improvement of existing technology, and the generation of new knowledge and skills’ (Oerlemans, Knobens, & Pretorius, 2013, p. 236). According to Prajogo and Ahmed (2006), technology management manifests itself through four key activities: 1) forecasting or anticipating technological trends; 2) identifying and selecting new or additional technologies that the firm seeks to master; 3) determining the means for acquiring the given technology; and 4) selecting the ways for implementing the technology and exploiting its benefits. In addition to Prajogo and Ahmed (2006), Cetindamar, Phaal, and Probert (2009) identified the protection of knowledge and expertise as a key activity of technology management.

2.10 Gap in Knowledge

Although a wealth of research regarding to the study of OI has been conducted, the proportion of the OI study in the context of SMEs and low-tech industries are still poorly represented in the literature review. This scarcity is particularly potent when compared to the OI studies of large firms or the high-tech industry sector (Coras & Tantau, 2013). More specifically, the motives surrounding inbound OI access is hardly mentioned in the topic’s literature. The issue of motive is significant as it reveals how inbound OI can be successfully applied. Furthermore, the SME and the low-tech industry’s domain of knowledge is underrepresented in the existing literature. This is a missing link of the knowledge body regarding to inbound OI application, in the context of SMEs or low-tech industry.

Based on this literature review, the AC study through the view of knowledge transfer seems to be relatively well researched. Yet, the AC study in the perspective of organisational learning through the search process, which is closely related to inbound OI, does not enjoy the same level of attention. As proposed by March (1991), organisational learning can be placed into two categories: exploration and exploitation. Exploration organisational learning denotes search breadth, while exploitation organisational learning relates to the depth of a search. However, empirical studies linking PAC and RAC to exploration learning and exploitation learning, through search breadth and search depth, seem too few in number. The literature is also deprived of an understanding the differences in how exploration organisational learning and exploitation organisational learning affect PAC and RAC. This research aims to fill this knowledge gap. In addition, local search experience and innovation capability will be included into the framework in order to complement the maintain dynamic capabilities of PAC and RAC.

Through filling gaps in knowledge surrounding both AC and inbound OI, this research will study both the motives and the knowledge domain relating to a local search, thereby forming a link to the concept of PAC and RAC. Consequently, the SMEs in the Thai dessert industry, or ‘Thai dessert SMEs’ have been selected as a case study. A mixture of the five following sub-research questions will be addressed in this research:

- RQ1: What are Thai dessert SMEs’ motives in the inbound OI access in support of NPD?
- RQ2: What kinds of knowledge domain do Thai dessert SMEs orient in the inbound OI access in support of NPD?
- RQ3: What is the effect of local search experience on PAC?
- RQ4: How do search breadth and search depth affect PAC and RAC?
- RQ5: Does innovation capability have a moderating effect on the relationship between RAC and new product performance (NPP)?

2.11 Applied Methods in Previous Studies of Inbound Open Innovation and Absorptive Capacity

Methodological reviews focus on the strengths and weaknesses of a method of research relevant to the study. Based on the literature review, studies relating to open innovation tend to be qualitative by nature (Wynarczyk & Piperopoulos, 2013). Furthermore, existing studies of OI tend to assess the successful and early adopters within the case studies, and are descriptive by nature (Huizingh, 2011). For example, in the work of Chesbrough (2006), both the concept of open innovation and absorptive capacity were studied as case studies in large, R&D intensive companies such as Xerox. Case study research supports the understanding and highlights the significant concepts and phenomena – e.g. effective OI practices. Huizingh (2011) proposed that the case study should be used as an example in other quantitative studies, as it supports the quantification of important factors, to build path models (including mediators) to understand the larger chain of effects, and to estimate more complex models (also including moderators) to ascertain context dependencies. Initial studies of OI also tend to be descriptive under the assumption that they observe a relatively high frequency, which reflects its importance (Huizingh, 2011).

2.12 Summary

This chapter took the form of a literature review. As a result of this, gaps in the knowledge have been identified, and the research questions have thus been justified. The literature review surrounds two inter-related fields: absorptive capacity (AC), and inbound open innovation (inbound OI). The purpose of this was to delineate the relationship between AC and inbound OI. Based on the literature review, it has been found that there are few studies of AC and inbound OI in the context of SMEs, while those in large firms or industries in the high-tech sector are rather abundant. Although there are some studies of those in the context of SMEs, most of them focus on high-tech industries, while those in low-tech and low-medium-tech industries are still scarce in number.

The literature review in this research revealed that AC's relationship to knowledge transfer seems to be a relatively well researched area. Yet, the study of AC under the lens of organisational learning through the search process — which is closely related to inbound OI — is rather under-researched. Moreover, studies that assess the effect innovation capability has on AC were also lacking. These knowledge gaps will be filled in this research. As a result, a conceptual framework has been developed and will be further discussed in Chapter 4. The following chapter presents the background of 'Thai SMEs' with specific reference to the 'Thai dessert industry', which is used as the industrial case in this research.

Chapter 3 : Background of Thai SMEs and Context of Thai Dessert Industry

3.1 Introduction

The aim of the current research is to study PAC and RAC in the LMT sector-based SMEs using the Thai dessert industry as the industrial case, namely, Thai dessert SMEs. To provide insights, this chapter presents the background of Thai SMEs and the specific context of Thai dessert industry. The chapter is organised into five main sections. Following this section, section 3.2 starts with the definition of SMEs in Thailand. Section 3.3 describes the significant contributions of SME to the Thai economy. Section 3.4 presents the specific context of the Thai dessert industry. Four key perspectives are included in the presentation: 1) the feature of Thai dessert products; 2) the nature of Thai dessert industry; 3) the significance of Thai dessert industry; and 4) the population size of Thai dessert SMEs. Finally, section 3.5 outlines a summary of the chapter.

3.2 Definition of SMEs in Thailand

The definition of SMEs varies among various countries (Peres & Stumpo, 2000). As identified by the World Bank, there are over 60 definitions of SMEs used in 75 countries (Eze, Gerald Guan Gan, Goh, & Tan, 2013). According to the European Commission (2005), firms with 10–250 employees and an annual turnover not exceeding 50 million Euros are considered SMEs (Durst & Runar Edvardsson, 2012).

In Thailand, the formal definition of an SME has been determined by the Office of Small and Medium Enterprises Promotion (OSMEP) in the Ministry of Industry. According to OSMEP, the definition of SMEs relies on two main criteria – the number of employees and the fixed assets excluding land. SMEs are defined under three sectors of business: 1) production sector, 2) service sector, and 3) trading sector. Table 3.1 presents the definition of SMEs in Thailand.

Table 3.1

Definition of SMEs in Thailand

Business sector	Number of employees		Fixed assets	
	(persons)		(THB millions)	
	Small	Medium	Small	Medium
Production sector	Not over 50	51-200	Not over 50	> 50-200
Service sector	Not over 50	51-200	Not over 50	> 50-200
Trading sector (whole sale)	Not over 25	26-50	Not over 50	> 50-100
Trading sector (retail)	Not over 15	16-30	Not over 30	> 30-60

Source: OSMEP (2002)

As represented in Table 3.1, the definition of SME in Thailand is the same for the production sector and the service sector, while the definition for the trading sector (both wholesale and retail) has fewer employees and fixed assets.

It is vital to note that the definition of a micro-enterprise in Thailand is not provided, but it is incorporated as part of small enterprises (OECD, 2011). This is different from the UK, where a micro-sized firm is defined separately from SMEs (Commission, 2003) – a micro-sized firm has fewer than 9 employees, a small-sized firm has fewer than 49 employees, and a medium-sized enterprise has between 50 to 249 employees (Commission, 2003).

3.3 Contributions of SMEs in Thailand

SMEs in Thailand significantly contribute to the Thai economy in four main ways: 1) proportion of SMEs to total enterprises; 2) contribution to the gross domestic product (GDP); 3) contribution to employment; and 4) contribution to the export market.

3.3.1 Proportion of SMEs to Total Enterprises

In Thailand, SMEs account for a large proportion of total enterprises in various sectors. In 2016, Thailand had about 3.0 million SMEs, which was 99.7% of total enterprises (OSMEP, 2017). Figure 3.1 shows the number of SMEs in Thailand from 2004 to 2016.

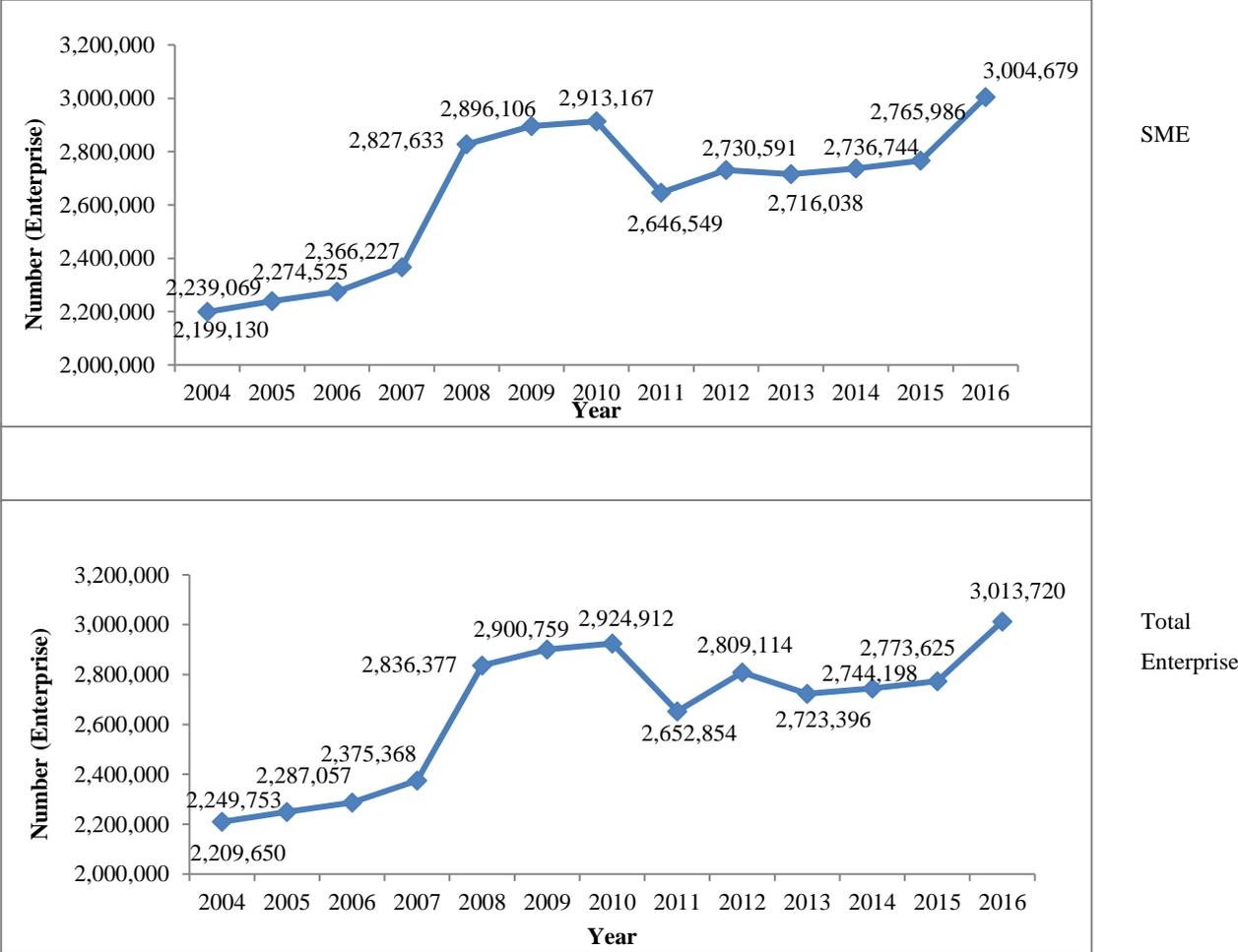


Figure 3.1. The number of SMEs and total enterprises in Thailand.

Source: OSMEP (2016)

According to Figure 3.1, the number of SMEs continuously increased from 2,199,130 in 2004 to 2,913,167 in 2010. In 2011, the number of SMEs dropped at by ~9.15%. However, after 2011, the number of SMEs displayed an increasing trend. In 2016, there were approximately 3,004,679 SMEs.

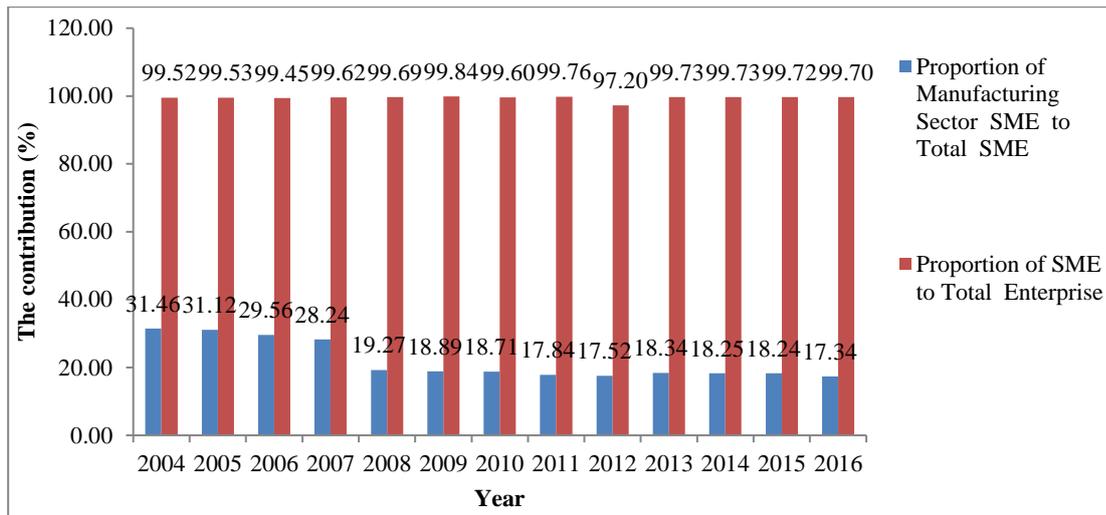


Figure 3.2. The proportion of SMEs to total enterprises and proportion of manufacturing-based SMEs to total SMEs.

Source: OSMEP (2016)

Figure 3.2 presents the proportion of SMEs to total enterprises as well as the proportion of manufacturing-sector SMEs to total SMEs, from 2004 to 2016. In 2016, the proportion of SMEs to total enterprises was 99.7%, while the proportion of manufacturing-sector SMEs to total SMEs was 17.34%.

3.3.2 Contribution of SMEs to GDP

According to the OSMEP, the contribution of SMEs to GDP has been reported under two main categories – agriculture and non-agriculture. The non-agriculture sector covers three sub-sectors – SMEs, large enterprises, and other enterprises. Figure 3.3 presents the contribution of SMEs to GDP in four sectors, namely agriculture, SMEs, large enterprises, and other enterprises, from 2004 to 2016.

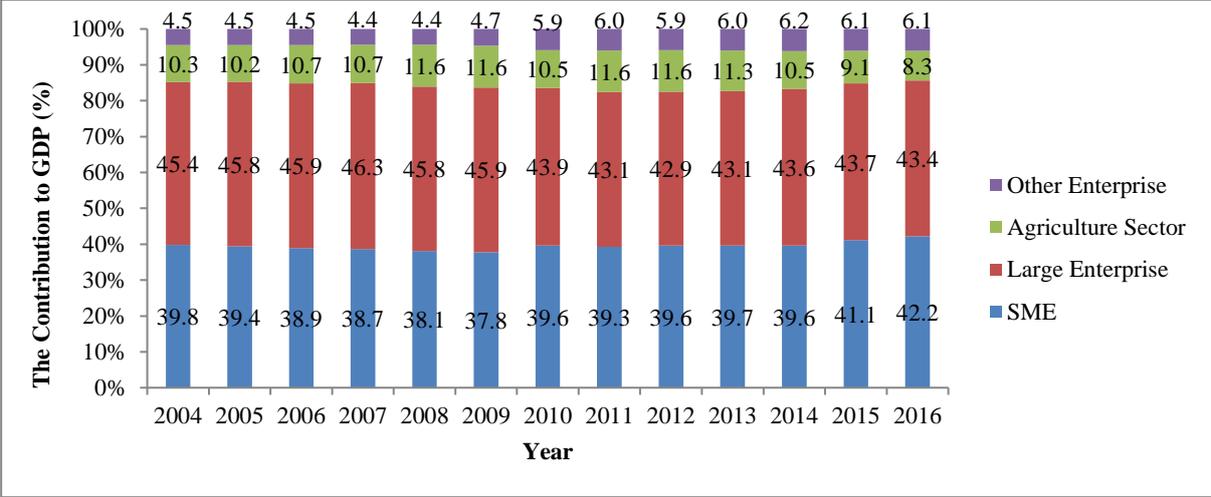


Figure 3.3. The contribution of SMEs to GDP in Thailand.

Source: OSMEP (2016)

As shown in Figure 3.3, the contribution of SMEs to GDP decreased from 39.8% in 2004 to 37.8% in 2009. However, in 2010, the contribution of SMEs to GDP increased to 39.6%. In 2016, the contribution of SMEs to GDP was 42.2%.

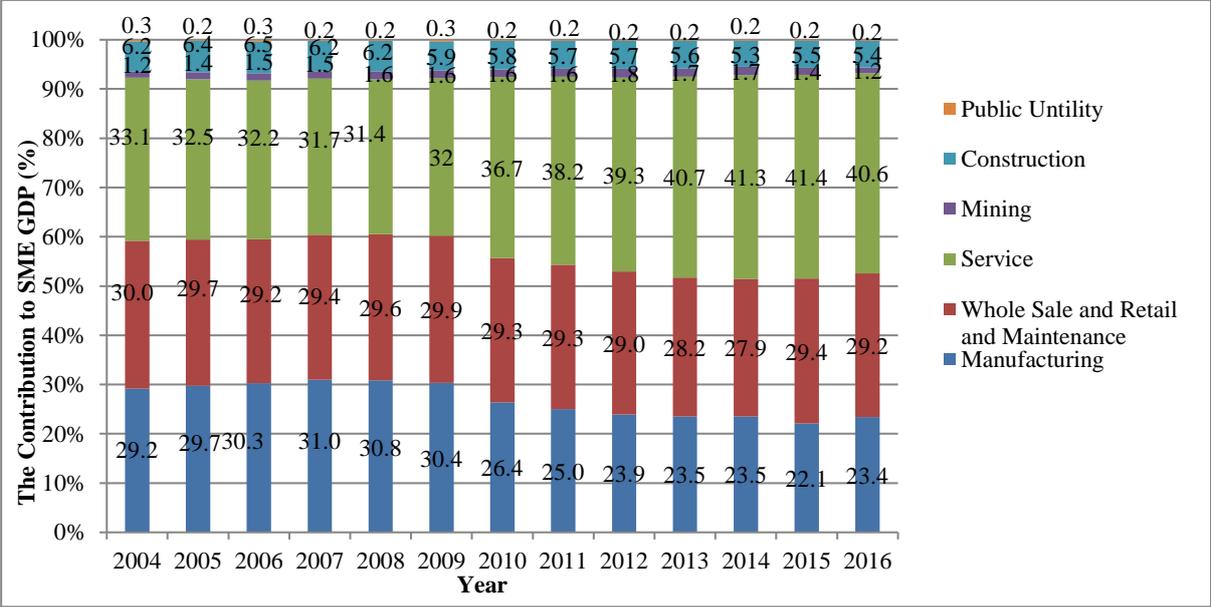


Figure 3.4. The economic activity by SMEs

Source: OSMEP (2016)

According to Figure 3.4, the contribution of SMEs to GDP SMEs in manufacturing decreased from 2008 to 2015. In 2016, the contribution of SMEs to GDP in manufacturing increased slightly at 23.4%.

3.3.3 Contribution of SMEs to Employment

Table 3.2 presents the contributions of SMEs to employment from 2010 to 2016. From 2010 to 2016, the contribution of SMEs to employment was between 77.86% and 83.89%. In 2016, the contribution of SMEs to employment was ~79.48% of the total employment. Manufacturing SMEs contributed to ~21.86% of the total contribution of SMEs to employment in the same year.

Table 3.2

Contributions of SMEs to Employment

Contribution (%)	2010	2011	2012	2013	2014	2015	2016
SME employment to total employment	77.86	83.89	80.96	80.08	80.30	80.44	79.48
Manufacturing SME employment to total SME employment	33.25	29.57	23.92	23.36	23.09	22.81	21.86

Source: OSMEP (2016)

3.3.4 Contribution of SMEs to Exports

Figure 3.5 represents the contributions of SMEs to the total value of exports from 2010 to 2016. From 2010 to 2016, the contribution of SMEs to the total value of exports was between 25.65% and 29.39%. In 2016, the contribution of SMEs to the total value of exports was 29.01%.

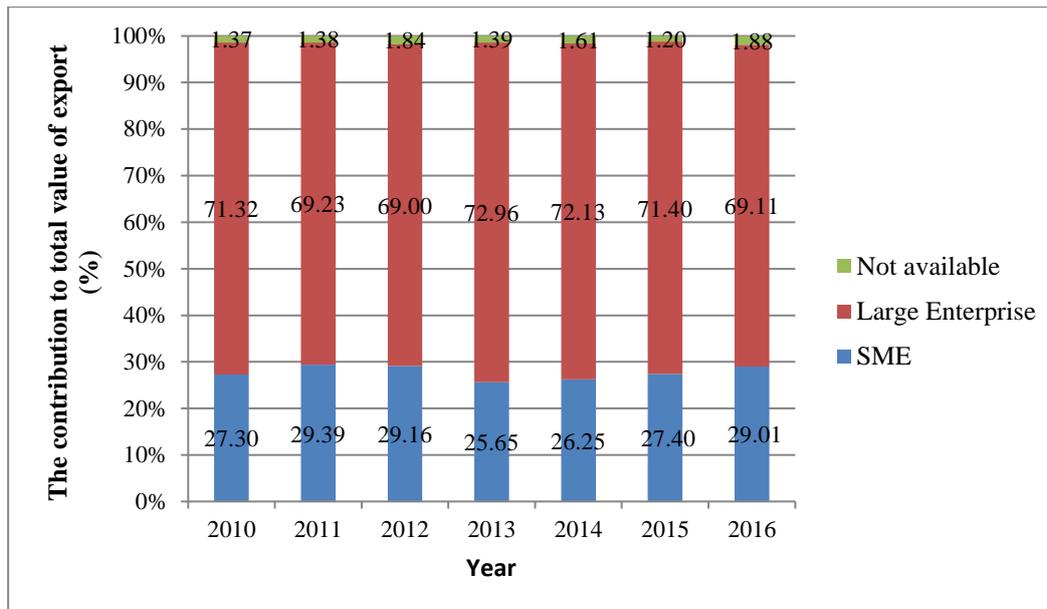


Figure 3.5. The contribution of SMEs to export.

Source: OSMEP (2015)

3.4 Context of Thai Dessert Industry

The Thai dessert industry is considered as a suitable case for this research due to three main reasons. First, the Thai dessert industry is creative as well as from the LMT sector relies. Second, the Thai dessert industry is identified as an indigenous knowledge-based sector, emphasising the context of the LMT sector. Finally, most firms in the Thai dessert industry rely on SMEs (Yokakul & Zawdie, 2011). More discussion about the context of the Thai dessert industry is represented in the following subsections, starting with the features of Thai dessert products.

3.4.1 Features of Thai Dessert Products

Thai desserts, or *Khanom Thai* in the Thai language, are characterised as Thai sweet dishes. Thai desserts have unique characteristics of being sweet in flavour, scented in odour, and beautiful in appearance. The main ingredients of Thai desserts are typically flour, eggs, beans, sugar, and coconut milk (Kitsawad, 2017). Traditional Thai desserts tend to have a unique aroma as they are processed with the smoke of *Tian Op* – a traditional Thai scented candle. Additionally, most Thai desserts tend to use natural materials, such as pandan leaves, jasmine blossoms, and ylang-ylang flowers for colour and odour.

Thai desserts vary depending on the main ingredients and processing techniques. Based on the main ingredients, Thai desserts can be classified into four principal categories – flour-based, egg-based, bean-based, and fruit-based (Kitsawad, 2017). Of these, flour-based appear to be the largest cluster and can be further divided into six categories on the basis of the type of flour – rice flour, glutinous rice flour, cassava starch, mungbean starch, arrowroot starch, and wheat flour (Kitsawad, 2017). Using different processing techniques but for the same type of flour also differentiates one Thai dessert from another. Common processing techniques for cooking Thai desserts include baking, steaming, boiling, frying, and grilling.

As Thai desserts have different production processes and complexity, the contribution of different Thai desserts to the volume in the market is different. In the past, Thai desserts would be cooked only on special occasions or during celebrations, including ceremonies that are auspicious to the Thai people's way of life, such as Buddhist rituals, weddings, or house-warmings. There are nine types of traditional Thai desserts that are well-known and typically used in auspicious ceremonies: Thong yib (golden flower), Thong yod (golden egg yolk drop), Foy thong (sweet shredded egg York) Thong-ake (wheat flour dumplings with egg yolks), Khanomchan (steamed layer cake), Medkhanoon (golden jackfruit seeds), Ja-mongkut, Tuay-foo (fermented rice cake), and Saneyjund. However, nowadays, Thai desserts are commonly cooked for sale in various locations, such as local markets, supermarkets, and Thai dessert shops of specific brands. Thai desserts can be found across all the regions of Thailand. However, each region has a type of Thai dessert particular to that region. Most Thai dessert entrepreneurs tend to have their own brands, with their shops serving local customers and international tourists. Currently, buying Thai desserts as gifts on special occasions has gained popularity. Some types of Thai desserts are served to local customers and international tourists in various locations such as hotels, restaurants, and flights. Thai desserts, such as Khanommorkang (baked egg custard), Look choop (crushed mungbean dipped in jelly), Khanomkalamae (Thai caramel), Khanom tan (toddy palm cake), Sangkayafak thong (pumpkin custard), and Tong Muan (crispy coconut crepe), are becoming popular among international customers and for export.

Based on this research, any specific type of Thai dessert does not be focused; all SMEs in the Thai dessert industry irrespective of the type of dessert are covered as the case study.

3.4.2 Nature of Thai Dessert Industry

The Thai dessert industry has been a traditional industry, existing in the Thai lifestyle for a long time as a generation-to-generation business. Being a traditional industry, it uses indigenous knowledge—traditional or local knowledge—in the production process. Most raw materials used in the production of Thai desserts are from local sources or local markets.

In general, the food industry is a relatively mature and slow-growing sector that includes a low level of R&D investment (Costa & Jongen, 2006) – this is also true for the Thai dessert industry. According to R&D intensity, Hirsch-Kreinsen (2008) classified industrial sectors into four main types: 1) high-tech, 2) medium-high-tech, 3) medium-low-tech, and 4) low-tech. R&D intensity is characterised as more than 5.0% for the high-tech sector, 3–5% for the medium-high-tech sector, 0.9–3% for the medium-low-tech sector, and less than 0.9% for the low-tech sector. Table 3.3 presents the classification of industry sectors based on R&D intensity.

Table 3.3

Categorisation of Industrial Sectors Based on R&D Intensity

Industrial sector	R&D intensity
High-tech	> 5.0%
Medium-high-tech	3.0 – 5.0 %
Medium-low-tech	0.9 – 3.0 %
Low-tech	< 0.9%

Source: Hirsch-Kreinsen (2008)

According to the OECD definition, these four industrial sectors are grouped under two main clusters: 1) high-tech industry and 2) low-tech industry. The high-tech industry encompasses both the high-tech and medium-high-tech sectors. On the other hand, low-tech industry encompasses both the low-tech and the medium-low-tech sectors (Hall, Lotti, & Mairesse, 2009), commonly known as the LMT sector (Grimpe & Sofka, 2009). The Thai dessert industry is classified under the LMT sector and is therefore generally a non-research-intensive sector. The LMT sector generally includes mostly traditional industries, e.g., food industry, household appliances industry, paper industry, publishing and print industry, wood and furniture industry, and foundry industry (Hirsch-Kreinsen, 2008).

It is important to emphasise that although the Thai dessert industry is a traditional sector and considered an LMT sector industry, it does not mean that the Thai dessert industry has no NPD activity or no innovative products. In contrast, the Thai dessert industry is a creative sector. Entrepreneurs in this industry try to develop Thai dessert products according to the demands of the market, e.g. features, quality, taste, and packaging. Furthermore, they try to scan technology to help solve the problem relating to quality. The main problem of Thai dessert products is their short shelf life, which limits their export potential. Consequently, entrepreneurs in the Thai dessert industry search for technologies facilitating solutions to this problem and improvement of quality, e.g. freezing and packaging technology to extend the shelf life of Thai dessert products.

3.4.3 Significance of Thai Dessert Industry

The Thai dessert industry has a significant role in Thailand's economic growth, especially at the local, regional, and national levels (Yokakul & Zawdie, 2010). In 2003, the Thai dessert industry gained significance as it was formally promoted by the Thai government through the establishment of the Thai Confection Industry (TCI), under the OSMEP in the Ministry of Industry. The TCI was established with the mission to raise the quality of Thai dessert products to export standards to strengthen the competitiveness of the industry and to enable it to exploit export opportunities (Yokakul & Zawdie, 2009). The TCI started by opening a pilot outlet named *Sawasdee*, which means 'Hello', at the Don Mueang Airport. The establishment of the TCI pilot outlet was to promote the sales of Thai dessert products; it also included a survey of the consumption of Thai desserts among international visitors. However, unfortunately, the TCI pilot shop was closed in 2007 because the Thai International Airport was moved to Suvarnabhumi Airport, the new official international airport of Thailand, and the TCI could not reserve any area in this new airport. In 2009, the TCI operations ceased completely due to the new government's restructuring of intervention strategies for industrial development.

Today, the popularity of Thai desserts is not only limited to local markets, but also finds a place in international markets, especially in the Asia-Pacific region, such as Hong Kong, Singapore, Japan, China, and Australia. Thus, entrepreneurs in the Thai dessert industry try to adopt new ideas and technology facilitating the production process and quality to export standards.

3.4.4 Population Size of Thai Dessert SMEs

In Thailand, there is no central national database or central registration of all businesses or entrepreneurs. However, such information is available from various sources for registered business (OECD, 2011). Basically, a business wishing to have a legal status must register with the Department of Business Development (DBD). Furthermore, registration might be available for different purposes. For example, local or provincial authorities might require registration for health and sanitation reasons, while registration with the Ministry of Labour is required for social security or employee compensation (OECD, 2011). However, there are many enterprises which might not register, functioning as informal SMEs. According to the OECD, around one million SMEs have not been registered (OECD, 2011).

Since there is no formal database of Thai dessert SMEs and entrepreneurs, four data sources were used to gather a list of Thai dessert SMEs: 1) the Office of SMEs Promotion (OSMEP); 2) the website of the Department of Industrial Work (DIP) (www.diw.go.th); 3) the Thaitambon.com website (www.thaitambon.com); 4) the Thaitrade.com website (www.thaitrade.com). Table 3.4 presents data from these sources and the reason for their use.

Table 3.4

Sources of Thai Dessert SMEs

Source	Use of data provided	Reason for using the source
The Office of SMEs Promotion (OSMEP)	The OSMEP used to administer the Thai Confection Industry (TCI) Company in 2003 to support and help the Thai dessert sector to achieve sustainable growth.	The OSMEP can provide a list of Thai dessert SMEs registered with the Thai Confection Industry (TCI) company.
The website of the Department of Industrial Work (DIP), Ministry of Industry	The DIP provides online data access for registered factories in all industries in Thailand.	The DIP website can provide a list of Thai entrepreneurs registered with the DIP regarding the machines used in the production process.
Thaitambon.com website	Thaitambon.com website (http://www.thaitambon.com) was established to highlight	Thaitambon.com is the main website with data about Thai SME entrepreneurs, with emphasis on products relying

Source	Use of data provided	Reason for using the source
	‘One Tambon One Product’ ¹ (OTOP).	on OTOP. Most Thai SMEs tend to use this website as a channel for their online business.
Thaitrade.com website	Thaitrade.com website (http://www.thaitrade.com) is the official website of the Thailand B2B e-marketplace. It was established by the Department of International Trade Promotion (DITP) and the Ministry of Commerce (MOC).	Thaitrade.com is the main source of data for Thai exporters.

Source: Author

Remark: ¹The One Tambon One Product (OTOP) scheme was launched by the Thai government in 2001 to stimulate the economy at the sub-district level (called *tambon* in Thai).

The registration of OTOP products is the responsibility of the Community Development Department (CDD) under the Ministry of Interior.

According to Table 3.4, the TCI database provided by the OSMEP is rather outdated, with the last update in 2009, the final year of the existence of the TCI. The status of being an entrepreneur in the Thai dessert industry might have changed since then. However, the three other databases—the website of the DIP, the Thaitambon.com website, and the Thaitrade.com website—are frequently updated. These four databases are expected to provide up-to-date information on the Thai dessert SMEs in Thailand. As there are chances of overlaps in these four databases, the researcher screened the lists from these four databases and removed any repetitions; 844 Thai dessert SMEs were employed as the population size for this study. Table 3.5 presents a breakdown of Thai dessert SMEs obtained from these four databases.

Table 3.5

Population Size of Thai Dessert SMEs in Study

Source of data	Number
The Office of SMEs Promotion (OSMEP)	204
The website of the Department of Industrial Work (DIP) (http://www.diw.go.th)	210
Thaitambon.com website (http://www.thaitambon.com)	388
Thaitrade.com website (http://www.thaitrade.com)	42
Total	<u>844</u>

Source: Author

3.5 Summary

This chapter provides a background of the Thai SMEs and the context of the Thai dessert industry. In Thailand, SMEs contribute significantly to the economy in four main ways: 1) the proportion of SMEs to total enterprises; 2) the contribution to GDP; 3) the contribution to employment; and 4) the contribution to export markets. The Thai dessert industry is regarded as a traditional industry in the LMT sector, but yet it is a creative sector relying on active NPD activities. Thai dessert products are unique, beautiful, and varied. In this research, all SMEs in the Thai dessert industry irrespective of the type of dessert are covered as the case study.

There is no formal database of Thai dessert SMEs and entrepreneurs in this sector. Thus, this research uses four sources of data to access the lists of the Thai dessert SMEs: the Office of SMEs Promotion (OSMEP), the website of the Department of Industrial Work (DIP) (www.diw.go.th), the Thaitambon.com website (www.thaitambon.com), and the Thaitrade.com website (www.thaitrade.com). Finally, this leads to the population size of 844 Thai dessert SMEs for this study; this will be used as the basic figure for the collection and the analysis of data. Further discussion on research methodology—covering the methods of data collection and data analysis—are presented in Chapter 5.

Next, Chapter 4 presents the conceptual framework and the formulation of hypotheses.

Chapter 4 : Conceptual Framework and Research Hypothesis

4.1 Introduction

In the previous chapter, the background of Thai SMEs and the specific context of Thai dessert industry was provided, to shed the insight of *Thai dessert SME* being as the case of study in this research. This chapter presents a conceptual framework developed in this research, on the basis of literature review, and underlying hypotheses. Following this section, the next section, 4.2, presents the conceptual framework and the related theories. Section 4.3 presents the formulation of hypothesis underlying the conceptual framework. Finally, section 4.4 outlines the summary of chapter.

4.2 Conceptual Framework and Related Theories

Based on the literature review, as presented in Chapter 2, a conceptual framework was developed in this research. Extending the Zahra and George (2002) absorptive capacity (AC) concept, the conceptual framework of this research proposed that PAC and RAC are distinguished resulted from different learning between exploration organisational learning and exploitation organisational learning, respectively. It further suggests that search breadth (SB) related to exploration learning corresponds to PAC, whereas search depth (SD) associated with exploitation learning corresponds to RAC. Furthermore, in the relationship between SB, SD and PAC, RAC, knowledge base that is based on knowledge breadth (KB) and knowledge depth (KD) is involved in the relationship. To be more specific, it proposes that the relationship between SB and PAC is moderated by KB, whereas that between SD and RAC is mediated by KD. Additionally, the conceptual framework suggests that local search experience (LSE) has a positive effect on PAC, while innovation capability (IC) serves as a moderator on the relationship between RAC and new product performance (NPP). Besides, with the relationship between PAC and RAC, it is moderated by knowledge dissemination ability (KDA). Figure 4.1 presents the conceptual framework of this research.

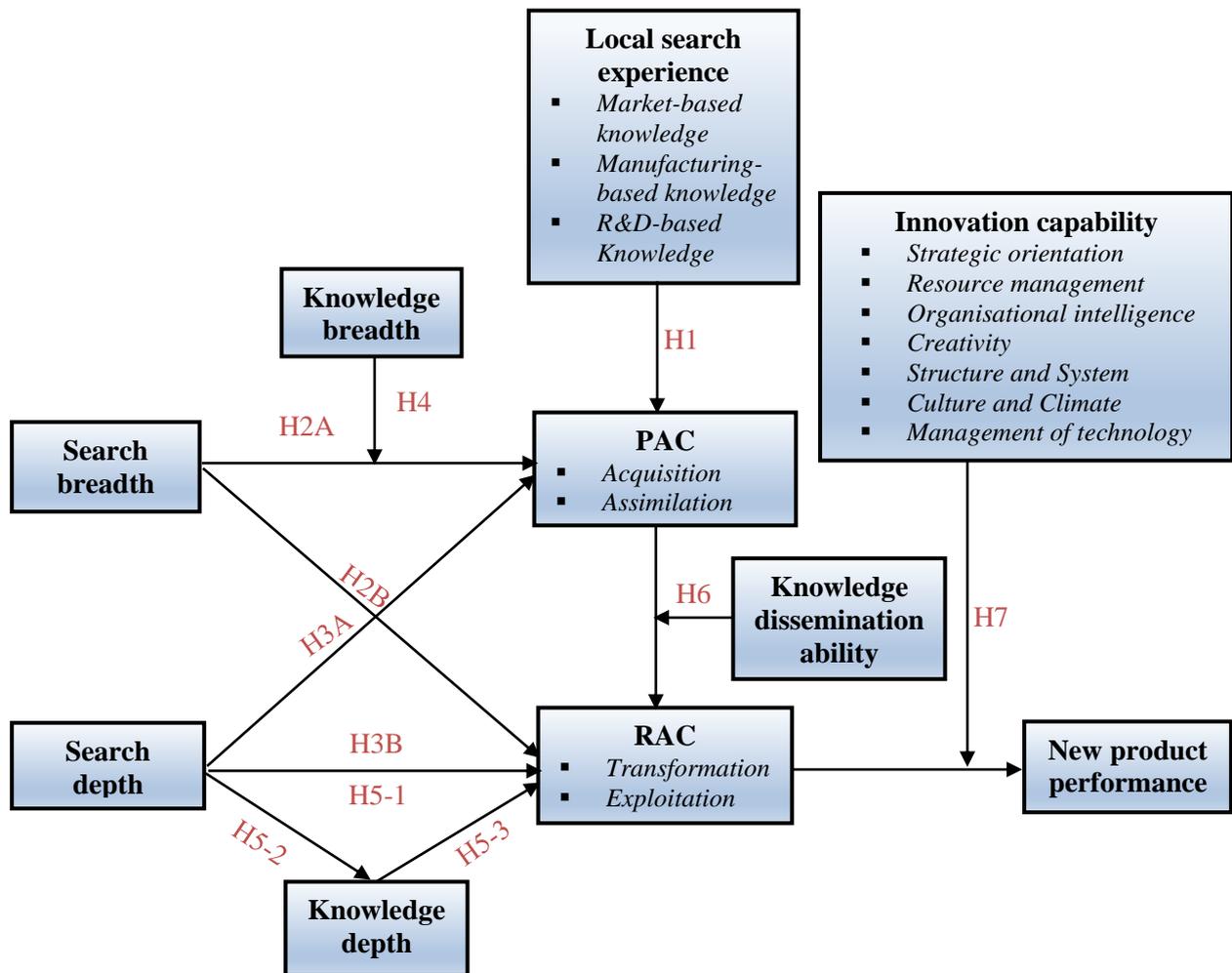


Figure 4.1. Conceptual framework.

Relying on Figure 4.1, the conceptual framework proposed in this research is supported by three related theories — exploration and exploitation organisational learning, knowledge-based view, and dynamic capabilities. These three theories are closely related in support to the AC concept. Organisational learning theory suggests that the generation of new knowledge is maximised in the domains close to the domain of existing knowledge (Autio, Sapienza, & Almeida, 2000). Thus, AC resulted from organisational learning have the best performance when what is being learned is closely relevant to what is already known. Focusing on knowledge base, knowledge-based view (KBV) theory suggests that knowledge is regarded as the organisational asset for gaining and sustaining competitive advantage (Grant, 1996; Kogut & Zander, 1992). In other words, performance differences between organisations is due to their different stocks of knowledge base, and different capabilities of use and development. The firm’s existing knowledge base delimits the firm’s scope and capacity to comprehend and apply new knowledge (Hill & Rothaermel, 2003). In other words, it delimits AC. Relying on knowledge base, knowledge breadth and knowledge

depth are regarded as two distinct dimensions revealing both the structure and content of the knowledge which a firm holds (Zhou & Li, 2012). When the firms have a stock of knowledge base in both breadth and depth, this facilitates AC to identify external knowledge to import into the firms for utilisation through the process of knowledge management. As a result, knowledge management through the AC leads to dynamic capabilities, enabling the firms to respond to changes in the business environment by avoiding a competency trap (Gebauer et al., 2012; Teece, 2007).

March (1991) proposed two distinct dimensions of organisational learning: exploration and exploitation organisational learning. Exploration learning involves a search in broad and general knowledge, while exploitation learning involves a search in deep knowledge. Thus, exploration learning and exploitation learning is resulted from broad search and deep search, respectively. As PAC and RAC are associated with exploration and exploitation organisational learning. Thus, this implies that SB and SD correspond to PAC and RAC, respectively.

Drawing on the linkage of three theories: exploration and exploitation organisational learning, knowledge-based view, and dynamic capabilities, as explained above, this leads to the basis of explanation on the conceptual framework proposed in this research.

4.3 Hypothesis Development

Relying on the conceptual framework in Figure 4.1, the formulated hypotheses are represented as follows:

4.3.1 Local Search Experience and Potential Absorptive Capacity

Organisational learning theory focuses on the role of search behaviour within firms to explain innovation (George, Kotha, & Zheng, 2008). Search is uncertain, costly, and guided by prior experience (Dosi, 1988; Phelps, 2010). As a result, feedback from past search efforts becomes embodied in organisational routines, which efficiently guide current search efforts (Nelson & Winter, 1982). Local search and distant search are two distinct types of searches, and they are the core of most theoretical approaches to the study of firm-level innovation (George et al., 2008). Local search refers to search for solutions in the neighbourhood of its current expertise or knowledge (Stuart & Podolny, 1996). Distant search, in contrast, it signifies a search as moving far away from current organisational routine and existing knowledge base (Katila & Ahuja, 2002).

At the organisational level, search is likely to be more local than distant as the firms have a higher likelihood of successful technology development in domains which they have prior experience (Stuart & Podolny, 1996). Likewise, AC relies on organisational learning, that requires what is being learned is closely relevant to what is already known. Thus, in relation to search, the AC is likely to be more easily achieved with a local search (Suzuki & MethÉ, 2014).

Experience is closely related to the cognitive perspective, which is cumulative, idiosyncratic and path-dependent on the past. Thus, accumulated experience facilitates the capability of firms to absorb knowledge (Caloghirou et al., 2004; Cohen & Levinthal, 1990). Relying on local search, it is generated by the functioning of organisational routines (Stuart & Podolny, 1996), which is defined as a pattern of activity that is repeatedly invoked (Nelson and Winter (1982: 96). Following this logic, local search experience (LSE) helps increase the cognitive perspective, thereby leading to an increase in the capability to absorb knowledge through PAC, which is as the capability to acquire and assimilate external knowledge. Following these arguments, the following hypothesis is proposed:

Hypothesis 1: Local search experience has a positive effect on PAC.

4.3.2 Search Breadth and Search Depth in Relation to Potential and Realised Absorptive Capacity

March (1991) suggested two distinct types of organisational learning: exploration learning and exploitation learning. Exploration learning is defined as experimentation with new alternatives that have returns that are uncertain, distant and often negative (March, 1991, p. 85). In contrast, exploitation learning is defined as the refinement and extension of existing competencies, technologies and paradigms (March, 1991, p. 85).

The AC is the firm's learning (Cohen & Levinthal, 1989). As suggested by Zahra and George (2002), AC is classified as two distinct units but complementary roles: potential absorptive capacity (PAC) and realised absorptive capacity (RAC). The PAC is a firm's capability to acquire and assimilate external knowledge (Zahra & George, 2002). In contrast, the RAC is the firm's capability to transform and exploit the absorbed external knowledge for commercial purposes (Gebauer et al., 2012; Zahra & George, 2002). In linking these two types of AC with organisational learning, PAC relates to exploration learning, while RAC is identified as exploitation learning. Linking March (1991) concept with PAC and RAC, exploration learning thus becomes the pursuit

of knowledge which does not exist in the firm so as to create new customer value, or as replacing a firm's existing knowledge to enrich current customer value (Kang, Morris, & Snell, 2007). A firm's focus on exploration learning scans the environment continuously to collect industry information, observe technological trends and identify sources of new knowledge (Tzokas, Kim, Akbar, & Al-Dajani, 2015). Exploration learning requires an exploration search, enabling firms to expand their horizon and acquire new knowledge from external sources (Tzokas et al., 2015). Accordingly, exploration learning requires a broad and general knowledge search (Chiang & Hung, 2010; Ferreras-Méndez et al., 2015). Search breadth refers to 'the number of external sources or search channels that firms rely upon in their innovative activities' (Laursen & Salter, 2006, p. 134). Search breadth facilitates exploration learning or the firm's ability to acquire and assimilate external knowledge, i.e., its potential absorptive capacity. On the other hand, it hinders the firm's ability to transform and exploit the external knowledge, i.e., its realised absorptive capacity. In accordance with these considerations, the following hypotheses are presented:

Hypothesis 2A: Search breadth is positively related to PAC.

Hypothesis 2B: Search breadth is negatively related to RAC.

In contrast to exploration learning, exploitation learning involves refining and deepening existing knowledge (Kang et al., 2007). In exploitation learning, a firm creates value by refining existing knowledge stocks and improving how they are used (Kang et al., 2007). In relation to search process, exploitation learning is the search for and use of solutions to customer problems in the neighborhood of the firm's current experience (March 1991). Exploitation learning generally involves the continuous improvement and incremental innovation (Kang et al., 2007). Rothaermel and Deeds (2004) asserted that exploitation is connected with fewer partners, less knowledge diversity and stronger integration among the partners. Thus, exploitation learning involves in-depth search, which requires a narrow range of knowledge domains in order to pursue well-defined solutions in the existing knowledge bases of the firm (Kang et al., 2007). Following these arguments, the following hypotheses are proposed:

Hypothesis 3A: Search depth is negatively related to PAC.

Hypothesis 3B: Search depth is positively related to RAC.

4.3.3 Knowledge Breadth and Knowledge Depth: In the Relation between Search Breadth, Search Depth to Potential and Realised Absorptive Capacity

The AC depends on the level of the prior related knowledge base. In exploration learning, firms require exploration search to expand their horizon and acquire new knowledge from external sources (Tzokas et al., 2015). In exploration search, the firm needs to have knowledge breadth to capture knowledge from the varied sources of external knowledge. Knowledge breadth facilitates a greater potential to recombine different elements of knowledge and improve opportunities for recognition and creative potential (Kogut & Zander, 1992). Thus, diverse knowledge structures facilitate PAC in acquiring and assimilating knowledge from external sources (Eriksson & Chetty, 2003; Jansen et al., 2005; Kang et al., 2007). In the study of Jansen et al. (2005), they found that job rotation of employees enhancing the diversity of backgrounds and problem-solving skills is positively related to PAC. Following these arguments, a hypothesis can be proposed:

Hypothesis 4: Knowledge breadth positively moderates the relationship between search breadth and PAC.

In contrast to exploration learning, exploitation learning involves search depth (Chiang & Hung, 2010). Search depth involves accessing knowledge within a limited number of external channels in a particular knowledge source (Chiang & Hung, 2010). Search depth facilitates the transfer of in-depth and fine-grained knowledge, allowing a firm to create well-defined solutions (Chiang & Hung, 2010). A firm's depth of technology expertise enables it to build the AC to understand new information generated within and outside firm boundaries (Cohen & Levinthal, 1990; Zahra & George, 2002). A greater knowledge depth provides a firm with greater AC, by which to better recognise the value of new information and technology, to better assimilate it, and to integrate it with the current knowledge base (Xu, 2014). Deep knowledge supports recombination and increases innovative performance (Fleming, 2001; Fleming & Sorenson, 2001). SubbaNarasimha (2001) observed that knowledge depth enables firms to better understand external knowledge, to organise it and to exploit it. Knowledge depth in a specific field facilitates the capability to interpret externally acquired information (Yang, Jin, & Sheng, 2017). Furthermore, knowledge depth enables a firm to better understand new information, transform it into understandable terms and facilitate the assimilation into existing knowledge (De Luca & Atuahene-Gima, 2007). Following these arguments, the hypothesis is proposed as follows:

Hypothesis 5: Knowledge depth positively mediates the relationship between search depth and RAC.

Following Baron and Kenny (1986) for mediation test, to demonstrate a mediation effect, the hypothesis must be supported under the following three conditions (sub-hypotheses):

Hypothesis 5-1: Search depth is positively related to RAC.

Hypothesis 5-2: Search depth is positively related to knowledge depth.

Hypothesis 5-3: Knowledge depth is positively related to RAC.

4.3.4 Potential Absorptive Capacity and Realised Absorptive Capacity: Moderating Effect of Knowledge Dissemination Ability

According to Zahra and George (2002), PAC and RAC have complementary roles. PAC represents acquiring and assimilating knowledge from external sources, while RAC represents transforming and exploiting that absorbed knowledge for commercial purposes (Gebauer et al., 2012, p. 59). Given this complementary role of PAC and RAC, knowledge exploitation might not be possible if firms do not previously acquire and assimilate the knowledge. Likewise, while firms might acquire and assimilate external knowledge, if they lack the capability to transform and exploit this knowledge, they will be unable to create value (Leal-Rodríguez, Ariza-Montes, Roldán, & Leal-Millán, 2014). Consequently, the roles of PAC and RAC and their effects are complementary, rather than independent from one another (Leal-Rodríguez et al., 2014). Knowledge absorbed from external sources from the function of PAC needs to be transferred to RAC for exploiting. This transfer needs to use a knowledge-sharing mechanism to facilitate the opportunity to build mutual comprehension among members of the firm, thus allowing the firm to transform and exploit the assimilated knowledge. According to Fei et al. (2007), knowledge sharing is an antecedent of AC and innovation capability. Thus, knowledge dissemination capability (KDA) is likely to be a facilitator of knowledge sharing: in other words, knowledge transfer from PAC to RAC. Following this logic, a hypothesis is proposed:

Hypothesis 6: Knowledge dissemination ability positively moderates the relationship between PAC and RAC.

4.3.5 Realised Absorptive Capacity and New Product Performance: Moderating Effect of Innovation Capability

Both innovation capability (IC) and AC are regarded as dynamic capabilities. Covin and Hull (2010) proposed that AC is an external learning capacity which is needed to co-function with the internal learning capacity, or internal creation capacity, to influence innovation capacity, which is finally returned as innovative performance. Thus, the capacity for innovation is a factor influencing performance through support from AC. Thus, the following hypothesis is proposed:

Hypothesis 7: Innovation capability positively moderates the relationship between RAC and new product performance (NPP).

4.4 Summary

This chapter presented the conceptual framework developed in this research and underlying hypothesis. Via this conceptual framework, this research employs three related theories: exploration-exploitation organisational learning, knowledge-based view, and dynamic capabilities. These three theories are closely related to the AC. Organisation learning results in newly accumulated knowledge. However, these knowledge is still in the domains close to the domain of existing knowledge. In return, accumulated knowledge base facilitates to organisational learning. Thus, organisational learning theory and knowledge base view (KBV) are inter-related theory and support to the AC. March (1991) suggested two distinct types of organisational learning: exploration learning and exploitation learning. These two types of organisational learning need to be balanced to lead to dynamic capabilities. The framework of exploration learning and exploitation learning is employed as the focal framework linking the concept of search breadth-search depth, and PAC-RAC. Consequently, the relationship between search breadth-search depth and PAC-RAC was connected.

Relying on the developed conceptual framework, the set of seven hypotheses was generated. These hypotheses will be tested and represented in the Chapter 8. The following chapter discusses the research methodology to be undertaken for addressing the research questions in this research.

Chapter 5 : Research Methodology

5.1 Introduction

To answer the research questions, an appropriate research methodology should be employed. This chapter discusses the research methodology adopted in this study. The chapter is organised into 12 main sections. Section 5.2 starts with an overview of the research questions in this study. Section 5.3 describes the research philosophy and justifies the research paradigm adopted in this study. Section 5.4 explains the research methodology in alignment with the research paradigm chosen. Section 5.5 discusses the research design. Section 5.6 describes the population of the study and the sampling techniques used to obtain a representative population. Section 5.7 explains the investigation process in this research, covering two phases of approach: qualitative and quantitative. Section 5.8 presents the data collection method and the data analysis with a qualitative approach, followed by section 5.9 explaining the quantitative phase. Section 5.10 explains the statistical analysis of the quantitative data approach. Section 5.11 describes the methodological remarks in this research. Finally, section 5.12 summarises the chapter.

5.2 Overview of Research Questions

Research questions can be answered via a quantitative or qualitative study. The types of research questions influence the research paradigm, dictating the research methodology (Ates & Bititci, 2008). Accordingly, the research questions in this research will be re-stated in this section. There are five research questions to be addressed:

- RQ1: What are Thai dessert SMEs' motives in the inbound OI access in support of NPD?
- RQ2: What kinds of knowledge domain do Thai dessert SMEs orient in the inbound OI access in support of NPD?
- RQ3: What is the effect of local search experience on PAC?
- RQ4: How do search breadth and search depth affect PAC and RAC?
- RQ5: Does innovation capability have a moderating effect on the relationship between RAC and new product performance (NPP)?

5.3 Research Philosophy

Methodology is determined by the research philosophy, an overarching term regarding the development of knowledge and its nature (Saunders, Lewis, & Thornhill, 2012). A research philosophy may be represented through the research onion, as represented in Figure 5.1.

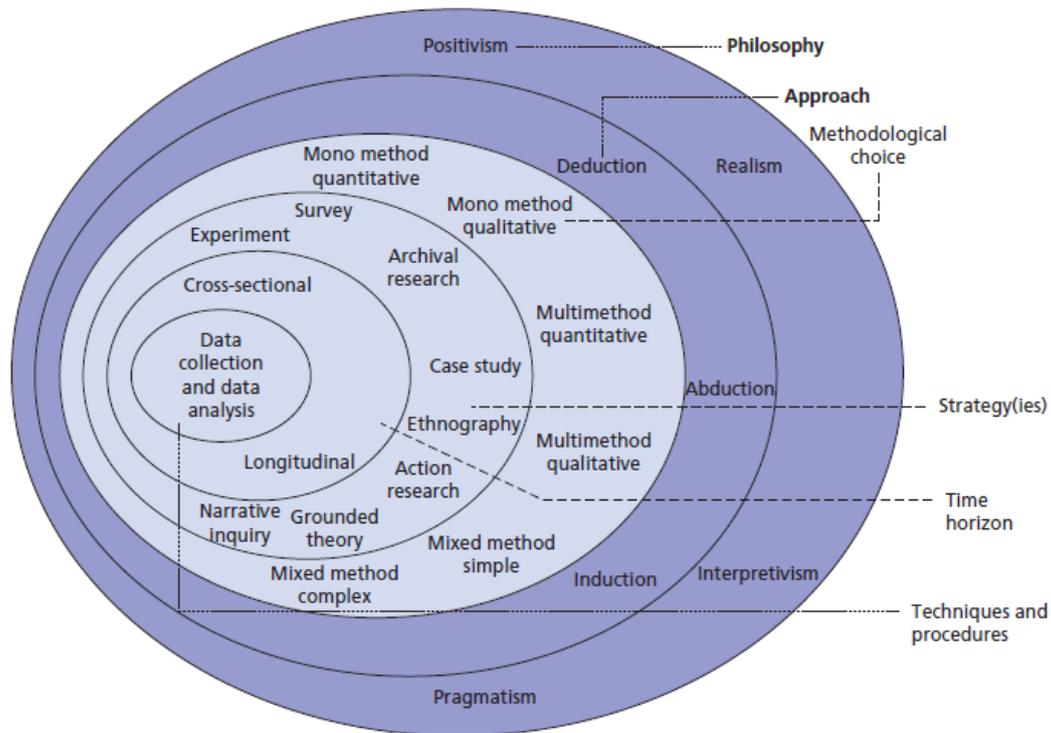


Figure 5.1. Research philosophy in the ‘research onion’ (Saunders et al., 2012).

As seen in Figure 5.1, the research onion represents a hierarchy, comprising six layers: 1) philosophy; 2) approach; 3) methodological choice; 4) strategy; 5) time horizon; 6) techniques and procedures. Research philosophy is positioned at the outermost layer of the research onion, as the starting point dictating the methodology to approach. A research philosophy is the researcher’s philosophical assumptions or worldview. Accordingly, the philosophical assumptions will be discussed in the following section.

5.3.1 Philosophical Assumption

To answer the research questions, the logic of inquiry flows from philosophical assumptions to specific questions, and then on to the methods used to address the research questions (Creswell & Creswell, 2005; Easterby-Smith, Thorpe, & Jackson, 2012). Denzin and Lincoln (2005) proposed four sets of philosophical assumptions: ontology, epistemology, axiology, and methodology. Ontology refers to the nature of reality. Epistemology refers to the nature of knowledge or, in other words, the relationship between the knower and what would be known. Axiology refers to philosophical assumptions of value for ethics and aesthetics. Finally, methodology refers to the strategy, plan of action, process or design. Moving through these four philosophical assumptions leads to the selection of the research paradigm.

5.3.2 Research Paradigm

A research paradigm is a way of describing a worldview, informed by philosophical assumptions (Patton, 2002). A research paradigm can be defined as a ‘set of interrelated assumptions about the social world, which provides a philosophical and conceptual framework for the organised study of that world’ (Filstead, 1979, p.34). According to Guba and Lincoln (1994), a research paradigm is a ‘basic belief system based on ontological, epistemological, and methodological assumptions’, leaving out axiology. A research paradigm reflects the researcher’s philosophical assumptions and guides the methodology employed in the study (Denzin & Lincoln, 2011). Traditionally, researchers are largely influenced by two opposing research paradigms: positivism and interpretivism (Johnson & Onwuegbuzie, 2004). These two paradigms will be discussed in the following section.

Positivism and interpretivism

Positivism, which might be called naïve realism (Teddle & Tashakkori, 2009), asserts that reality is objective and single. Accordingly, positivism generally seeks out facts in terms of relationships among variables, focusing on quantitative methods to test and verify hypotheses (Swanson, 2005, p. 19). Positivism focuses on value-free study and uses rhetorical neutrality, leading to the discovery of social laws from context-free generalisation (Onwuegbuzie & Leech, 2005). On the other hand, interpretivism, which can also be called constructivism (Johnson & Onwuegbuzie, 2004), absolutely denies the view of positivism. Interpretivism asserts that social reality is constructed; therefore, reality is subjective and multiple (Onwuegbuzie & Leech, 2005). Interpretivism assumes that knowledge and meaning are an individual’s interpretations (Swanson,

2005, p. 19). Thus, there are multiple realities constructed from an individual's different meanings; therefore, interpretations depend on the researcher's views (Onwuegbuzie & Leech, 2005). Due to these irreconcilable natures, positivism and interpretivism are viewed as an incompatibility thesis (Johnson & Onwuegbuzie, 2004). Table 5.1 represents the contrast between positivism and interpretivism.

Table 5.1

Comparison of Positivism and Interpretivism

Dimension of contrast	Positivism (naïve realism)	Interpretivism (constructivism)
1. Ontology (nature of reality)	Reality is single, tangible and fragmentable.	Reality is multiple, constructed and holistic.
2. Epistemology (relationship of the knower to the known)	Knower and known are independent, a dualism.	Knower and known are interactive, inseparable.
3. Axiology (role of values in inquiry)	Inquiry is value-free.	Inquiry is value-bound.
4. The possibility of causal linkages	There are real causes, temporally precedent to, or simultaneous with, their effects.	All entities are in a state of mutual, simultaneous shaping, so it is impossible to distinguish causes from effects.
5. The possibility of generalisation	Time- and context-free generalisations are possible.	Only time- and context-bound working hypotheses are possible.

Source: Lincoln and Guba (1985, p. 37)

Post-positivism, transformative and pragmatism

Beyond positivism and interpretivism, three alternative paradigms can be explored: post-positivism (critical realism), transformative, and pragmatism (Teddlie & Tashakkori, 2009). The five research paradigms are represented in Table 5.2.

Table 5.2

Comparison of Research Paradigms

Dimensions of contrast	Positivism (naïve realism)	Interpretivism (constructivism)	Post-positivism (critical realism)	Transformative	Pragmatism
1. Ontology (nature of reality)	Naïve realism (an objective, external reality that can be understood)	Relativism (multiple, constructed realities)	Critical realism (external reality that is understood imperfectly and probabilistically)	Diverse viewpoints regarding social realities; explanations that promote justice	Diverse viewpoints regarding social realities; best explanations within personal value system
2. Epistemology (relationship of the knower to the known)	Objective point of view (dualism)	Subjective point of view; reality co-constructed with participants is valued by researchers	Modified dualism	Both objectivity and interaction with participants are valued by researchers	Both objective and subjective points of view, depending on stage of research cycle
3. Axiology (role of values in inquiry)	Value-free inquiry	Value-bound inquiry	Values in inquiry, but their influence may be controlled	All aspects of research guided by social injustice	Values important in interpreting results
4. The possibility of causal linkages	Real causes temporally precedent to, or simultaneous with, effects	Impossible to distinguish causes from effects, credibility of descriptions important	Causes identifiable in a probabilistic sense that change over time; internal validity important	Causal relationships that should be understood within the framework of social justice	Causal relationships, but they are transitory and hard to identify; both internal validity and credibility important

Dimensions of contrast	Positivism (naïve realism)	Interpretivism (constructivism)	Post-positivism (critical realism)	Transformative	Pragmatism
5. The possibility of generalisation	Nomothetic statements possible	Only ideographic statements possible; transferability issues important	Modified nomothetic positions' external validity important	Ideographic statements emphasised; results linked to issues of social inequality and justice	Ideographic statements emphasised; both external validity and transferability issues important
6. Method	Quantitative method	Quantitative method	Primarily quantitative methods	Both qualitative and quantitative methods; community of participants involved in method decision	Both qualitative and quantitative methods; researchers answer questions using best method
7. Logic of inquiry	Hypothetico-deductive	Inductive	Hypothetico-deductive	Both inductive and hypothetico-deductive	Both inductive and hypothetico-deductive

Source: Adapted from Teddlie and Tashakkori (2009)

As seen in Table 5.2, the gist of each paradigm can be described in the following ways. First, positivism relies on the scientific method; therefore, it posits that science is the only foundation for true knowledge. Positivism asserts that the scientific method is the only way to establish truth and describe objective reality. Thus, positivism reflects a philosophy regarding the causes that determine effects or outcomes (Creswell, 2003, p. 7). Positivism is applied with the assumption that the social world can be studied in the same way as the natural world, and there is a method for studying the social world as value-free, including the explanations of a causal nature (Martens, 2005, p. 8). Second, interpretivism (constructivism) believes that reality is socially constructed. Thus, reality is mind-dependent and a personal or social construct. Third, post-positivism, or critical realism, suggests a compromise of the two contrasting paradigms of positivism and interpretivism. Critical realism asserts that there are levels of objective truths that can be distinguished, but determining absolute truths about social phenomena is impossible. Thus, the assumption of critical realism is that there are different levels of reality, ranging from objective (being independent of human understanding) to subjective, in the process of meaning making (Christ, 2013). Critical realism tends to emphasise the importance of the scientific method in general and methodological appropriateness in particular (Onwuegbuzie & Leech, 2005). Fourth, transformative paradigm believes that interpretivism (constructivism) does not adequately address issues of social justice and marginalised peoples (Creswell, 2003, p. 9). Thus, transformative researchers pursue an action agenda to change the lives of participants, the institutions in which individuals work or live and the researcher's life (Creswell, 2003). Finally, pragmatism places the research problem in the centre and applies all approaches to understand the problem (Creswell, 2003, p. 11). Thus, pragmatism tries to find out the processes and do what works best to achieve desired goals. Pragmatism uses a combination of methods and ideas that will help the researcher to best frame, address and provide tentative answers to research questions, by mixing approaches and methods (Johnson, Onwuegbuzie, & Turner, 2007).

5.3.3 Adopted Research Paradigm: Pragmatism

For this study, the researcher believes that the reality is its observable practical consequences rather than anything metaphysical, and whatever works is likely true. Thus, based on the five choices for a research paradigm, the researcher has decided that pragmatism holds the most promise for this study. Pragmatism asserts that reality is changeable, depending on what works, and no one can claim to possess any final or ultimate truths. Morgan (2007) identified three

logics of pragmatism: 1) abductive reasoning; 2) intersubjective relationships; and 3) transferability. Abductive reasoning moves back and forth between inductive reasoning and deductive reasoning (Morgan, 2007). Inductive reasoning is a theory-building process, which begins with observations of specific instances and seeks to establish generalisations about the phenomenon under investigation. Deductive reasoning is a theory-testing process, which starts with an established theory or generalisation and seeks to see if the theory applies to specific instances (Hyde, 2000). In other words, with abductive reasoning, one can convert observations into theories and then assess those theories through action (Morgan, 2007). An intersubjective relationship is the relationship and exchange between the researcher and the environment for a mutual understanding. Transferability indicates that the findings or knowledge gained is neither context-bound nor generalisable; rather, they are viewed as transferable to other contexts and settings (Morgan, 2007). Table 5.3 summarises the logic of pragmatism.

Table 5.3
Logic of Pragmatism

Issue	Quantitative approach	Qualitative approach	Pragmatism
Connection of theory and data	Deduction (deductive)	Induction (inductive)	Abduction (abductive)
Relationship to research process	Objectivity	Subjectivity	Intersubjectivity
Inference from data	Universal (generalisability)	Context-bound (specific)	Transferability

Source: Adapted from Morgan (2007)

It is important to note that the connection of theory and data, between deductive and inductive, as presented in Table 5.3, is not always the case. Further discussion will be presented in the following section.

5.3.4 Research Approach

A research approach can be categorised into two main methods: deductive and inductive. As discussed in section 5.3.3, the deductive approach starts with a theory and the inductive approach starts with data collection to build a theory (Bryman, 2008). Thus, the deductive approach tends to subscribe for quantitative research, and the inductive approach often draws

upon qualitative research. However, this is not always the case. According to Patton (1991), the qualitative researcher can adopt both inductive and deductive processes. Table 5.4 presents the differences between deductive and inductive approaches.

Table 5.4
Differences between Deductive and Inductive Research Approaches

Topic	Deductive	Inductive
Theory	Testing theory and hypothesis	Generating theory/Discovery of patterns
Logic	When the premises are true, the conclusion must also be true	Known premises are used to generate untested conclusions
Generalisability	From general to specific	From specific to general
Use of data	Data collected to evaluate propositions or hypotheses related to an existing theory	Data collected to explore a phenomenon, identify themes and patterns and create a conceptual framework
Relationship between researcher and what is being researched	Researcher is independent from what is being researched	Researcher is part of what is being researched

Source: Adapted from Saunders et al. (2012)

Relying on pragmatism, it was inserted that research questions will fall somewhere within the inductive-deductive cycle. Some researchers might start from a theory or conceptual framework, while others might start from observations or facts. Consequently, pragmatism is supported by the logic of abductive reasoning (see Section 5.3.3). However, this is not always the case. As identified by Yvonne Feilzer (2010), pragmatism can be used as a guide, not only for the abductive approach, but also for the inductive or deductive approaches.

Relying on this research, it is vital to clarify here that pragmatism was selected for the principal reasoning of the deductive approach, rather than the abductive or inductive approaches. In other words, this study starts with an established theory, followed by data collection to test the theory.

5.4 Research Methodology

Research methodology is guided by the research paradigm and dictates the methods of collecting and analysing data (Creswell, 2009). Methodology refers to ‘the strategy, plan of action, process or design’, whereas method refers to ‘the techniques or procedures used to gather and analyse data’ (Crotty, 1998). Initially, methodology was largely influenced and determined by two contrasting paradigms, positivism and constructivism, resulting in two distinct methodology approaches, quantitative and qualitative. The quantitative approach relates to positivism, while the qualitative approach is related to interpretivism (McEvoy & Richards, 2006). Table 5.5 presents the different perspectives.

Table 5.5

Different Issues of the Quantitative and Qualitative Approaches

Issue	Quantitative approach	Qualitative approach
Ontology	Tangible reality	Intangible reality
Epistemology	Regularities established via empirical research and deductive/inductive reasoning	Knowledge constructed via social interaction/hermeneutic understanding
Methodology	Hypothesis testing	In-depth fieldwork
Data Analysis	Verification/falsification	Interpretation of meaning

Source: McEvoy and Richards (2006)

The pragmatism paradigm is a philosophical partner of the mixed-method approach (Denscombe, 2008). Thus, the mixed-method approach is employed as the research methodology in this study. To emphasise, the mixed method is not the mixture of two paradigms, because it is not possible to combine these two. Rather, the mixed method is the mixture of methods, involving levels of research, sampling, data collection and data analysis (Sandelowski, 2000). Consequently, a mixed-method approach has been defined as ‘a type of research design in which quantitative and qualitative approaches are used in types of questions, research methods, data collection and analysis procedures, and/or inferences’ (Teddlie & Tashakkori, 2009, p. 7).

5.5 Research Design

A research design is ‘the plan of actions which connect the philosophical assumption and the methodological assumptions of the research approach to its research methods, in order to provide answers to research questions’ (Gelo, Braakmann, & Benetka, 2008). Research designs can be classified into three types: quantitative, qualitative, and mixed (Zandvavian & Daryapoor, 2013). Because the bottom line of pragmatism is to mix quantitative and qualitative research to answer research questions (Johnson & Onwuegbuzie, 2004), a mixed-method design is employed in this research. The mixed-method design is discussed further in the following section.

5.5.1 Types of Mixed Method Designs

Creswell and Plano Clark (2007) proposed three criteria for designing mixed methods: timing, weighting or priority, and data mixing. Timing might be concurrent or sequential. For a concurrent design, the quantitative and qualitative methods are implemented in a single phase. In a sequential design, quantitative and qualitative methods are implemented in two distinct phases. Regarding weighting or priority, the design might be of equal or unequal weight. With an equal-weight design, quantitative and qualitative methods play equally important roles in addressing the research questions. In contrast, in an unequal-weight design, one method plays a more significant role than the other. Finally, there are three ways of mixing data: merging, connecting, and embedding. When merging data, the researcher explicitly integrates two data sets. When connecting data, the researcher may gain quantitative results, leading to the subsequent collection and analysis of qualitative data, or vice versa. When embedding data, one type of data is embedded within the design of the major type. Figure 5.2 presents the mixed-method design.

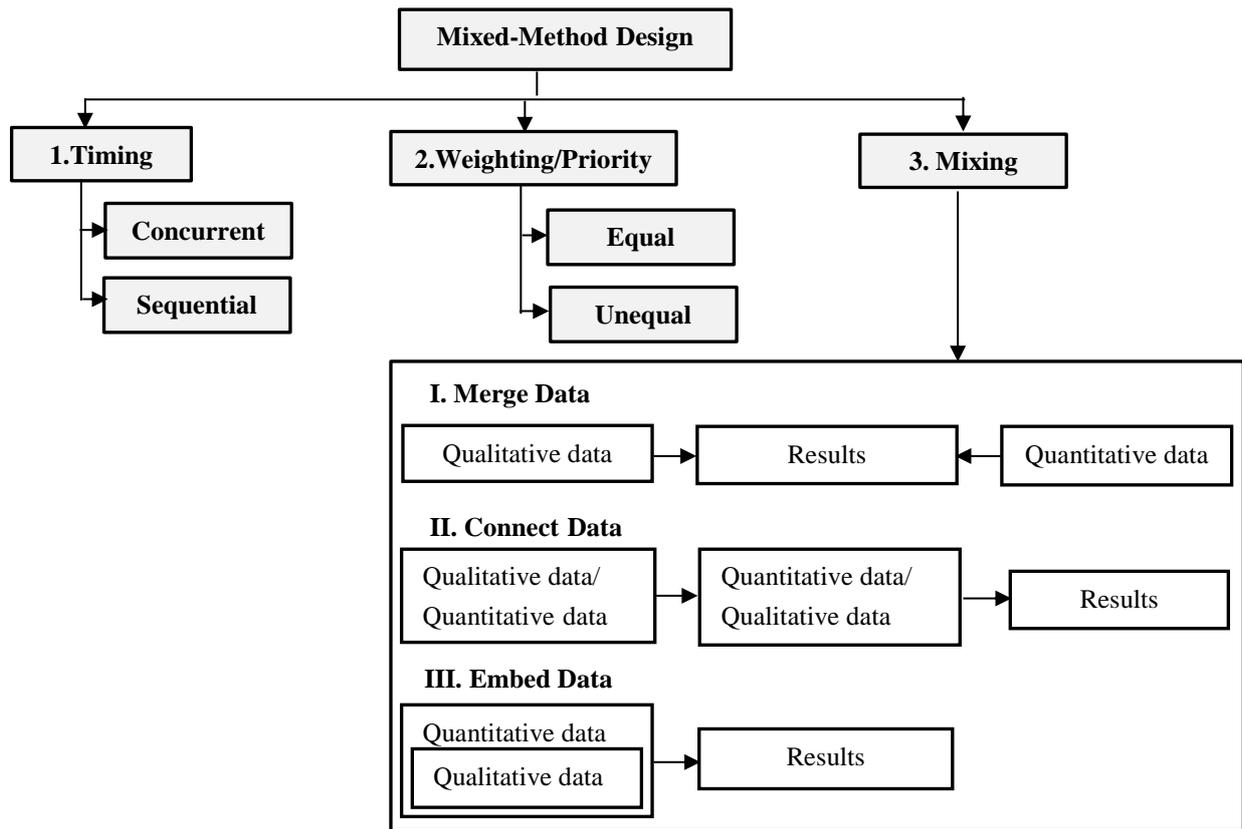


Figure 5.2. Design of mixed methods.

Source: Adapted from Creswell and Plano Clark (2007).

The use of three criteria when designing a mixed method leads to four types of mixed-method designs: concurrent (triangulation), embedded, explanatory, and exploratory. Table 5.6 describes the features of these four types of mixed-method designs.

Table 5.6

Types of Mixed-Method Designs

Design Type	Variant	Timing	Weighting	Mixing	Procedural Notation System
<ul style="list-style-type: none"> ▪ Concurrent (Triangulation) 	<ul style="list-style-type: none"> ▪ Convergence 	<ul style="list-style-type: none"> ▪ Concurrent: Quantitative and qualitative at the same time 	<ul style="list-style-type: none"> ▪ Usually equal 	<ul style="list-style-type: none"> ▪ Merging data during the interpretation or analysis 	<ul style="list-style-type: none"> ▪ QUAN+QUAL
<ul style="list-style-type: none"> ▪ Embedded 	<ul style="list-style-type: none"> ▪ Embedded experimental ▪ Embedded correlation 	<ul style="list-style-type: none"> ▪ Concurrent or sequential 	<ul style="list-style-type: none"> ▪ Unequal 	<ul style="list-style-type: none"> ▪ Embed one type of data within a larger design using the other type of data 	<ul style="list-style-type: none"> ▪ QUAN (qual) or QUAL (quan)
<ul style="list-style-type: none"> ▪ Explanatory 	<ul style="list-style-type: none"> ▪ Follow-up explanation ▪ Participant selection models 	<ul style="list-style-type: none"> ▪ Sequential: Quantitative followed by qualitative 	<ul style="list-style-type: none"> ▪ Usually quantitative 	<ul style="list-style-type: none"> ▪ Connect the data between two phases 	<ul style="list-style-type: none"> ▪ QUAN → qual
<ul style="list-style-type: none"> ▪ Exploratory 	<ul style="list-style-type: none"> ▪ Instrument development ▪ Theory development 	<ul style="list-style-type: none"> ▪ Sequential: Qualitative followed by quantitative 	<ul style="list-style-type: none"> ▪ Usually qualitative 	<ul style="list-style-type: none"> ▪ Connect the data between two phases 	<ul style="list-style-type: none"> ▪ QUAL → quan

Source: Adapted from Creswell & Plano Clark (2007; 2011)

Note: Capital letters (QUAN, QUAL) are used to indicate high priority. Lower case (quan, qual) indicates low priority. The plus symbol (+) represents a simultaneous design. The arrow (→) denotes a sequential design (Morse, 1991; 1993).

5.5.2 Purpose of Mixed-Method Design

Greene, Caracelli, and Graham (1989) identified five main purposes or rationales behind using mixed methods: 1) triangulation; 2) complementarity; 3) initiation; 4) development; 5) expansion. Triangulation is based on seeking convergence and corroboration of results from different methods and designs studying the same phenomenon. Complementarity reflects the elaboration, enhancement, illustration and clarification of the results from one method with the results from another method. Initiation involves seeking paradoxes and contradictions, leading to a reframing of the research question. Development involves employing findings from one method to inform another method. Finally, expansion seeks to expand the breadth and range of research by using different methods for different inquiry components.

Davis, Golicic, and Boerstler (2011) used two mixed-method design criteria, timing and weighting/priority, to create a matrix of purposes for multiple methods research (MMR) design, covering the mixed-method design. According to Davis et al. (2011), there are four purposes of MMR design: development, initiation, complementarity, and interpretation. Figure 5.3 illustrates the purposes of the MMR design, as proposed by Davis et al. (2011).

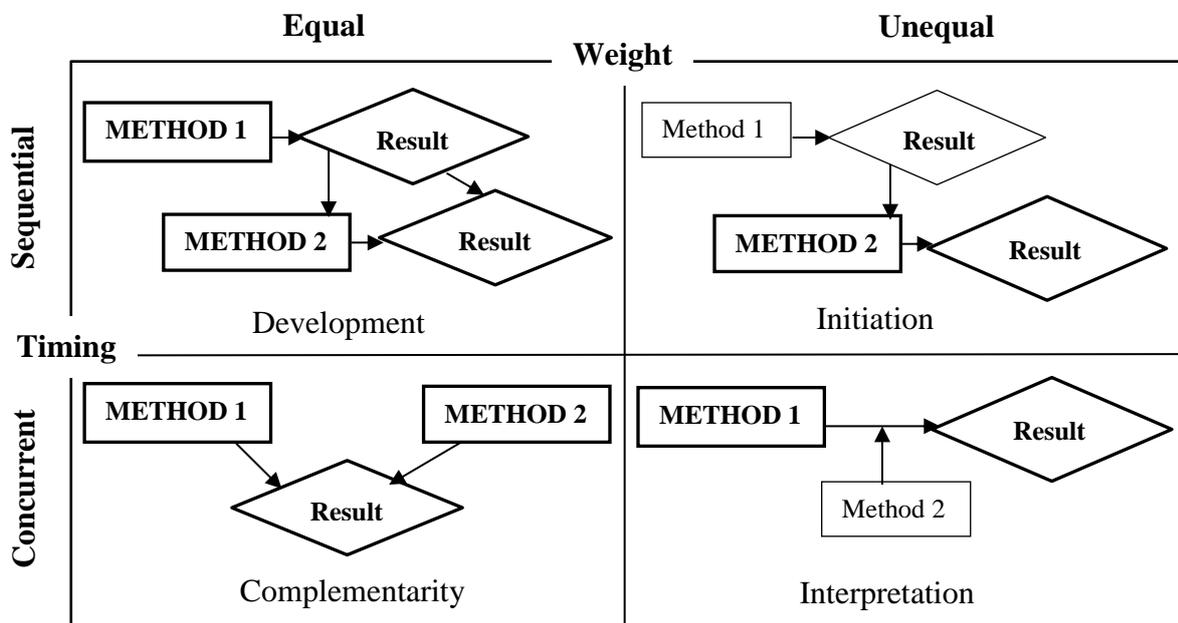


Figure 5.3. Purposes of multiple-methods design.

Source: Adapted from Davis et al. (2011)

According to Figure 5.3, development is a design based on the use of one study to inform a subsequent study. The results of each phase are reported separately, followed by a discussion that binds them together by comparing and contrasting findings. Initiation is similar to the development design, in that the results from an initial study are employed to inform a second study using a different method. However, the difference is that the initiation design places more emphasis on the second method. Thus, the results from the two methods are reported separately, but the discussion mainly focuses on the second method. Complementarity examines the different aspects of the same phenomenon, which is complementary. Thus, two methods are equally weighted in a one-phase design. Interpretation uses the first method as the main method, which is confirmed by a secondary method that interprets the results (Davis et al., 2011).

5.5.3 Research Design in Current Research

As discussed in Sections 5.5.1 and 5.5.2, this study adopted an exploratory design with a development purpose. An exploratory design is created using sequential time starting with the qualitative method, followed by the quantitative method and data connection. An exploratory design is typically applied when developing quantitative instruments in cases where the variables are not known, or to explore preliminary qualitative findings from a randomised sample of people within a larger population (Creswell & Creswell, 2005). An exploratory design is appropriate for this research, as the qualitative findings are intended to be used to inform or develop the measures of a local search experience construct in the quantitative phase. In other words, the purpose of the mixed method in this research is development. The exploratory design offers the best opportunities for answering the research questions posed in this study. The qualitative method was employed to answer two research questions, RQ1 and RQ2, while the quantitative method was applied to answer questions RQ3 to RQ5.

Focusing on the weight of approach, this research gives equal weight to both the quantitative and qualitative approaches. This might be different from the nature of exploratory design, which usually gives the qualitative approach more weight (see Table 5.6). However, equal weight between the quantitative and qualitative approaches can be applied legitimately when the design is based on a development purpose (Davis et al., 2011). According to Davis et al. (2011), the findings of the two phases (qualitative and quantitative) are reported separately, followed by a discussion binding them together, by comparing and contrasting the findings. Figure 5.4 presents the mixed-method design applied in this research.

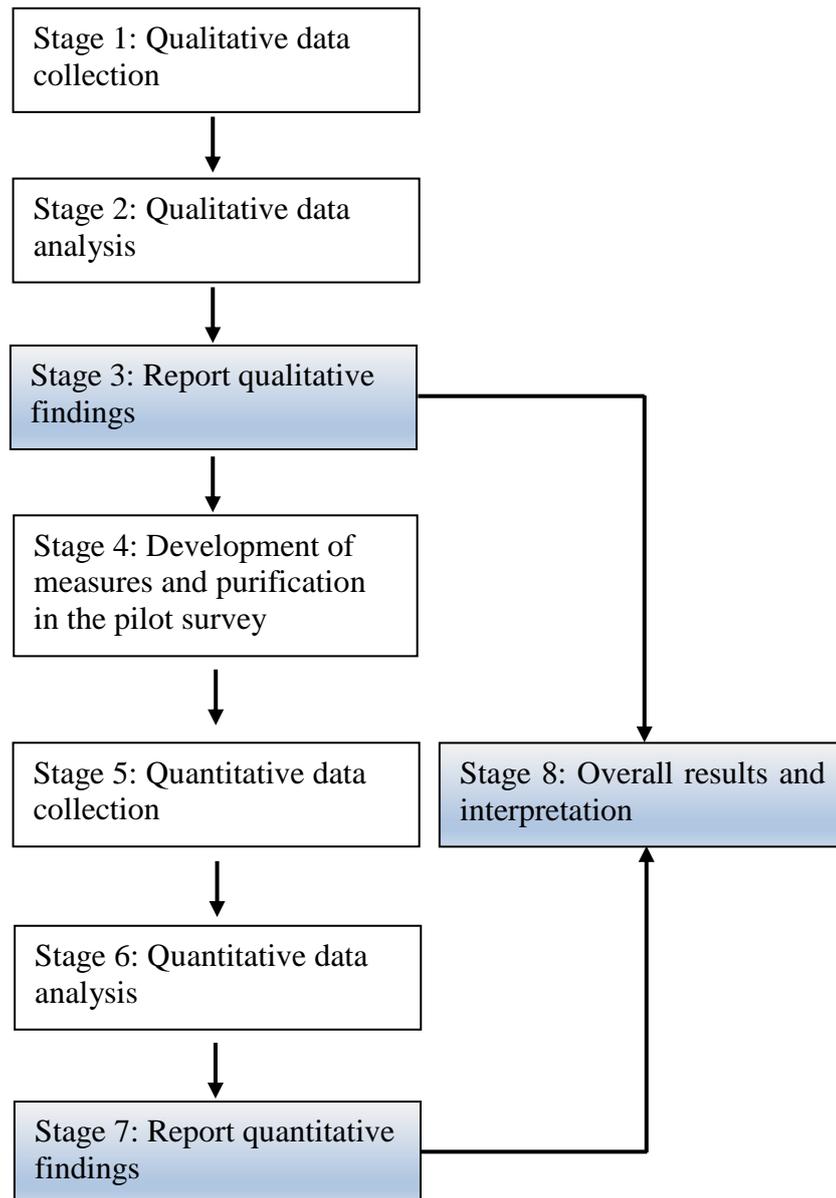


Figure 5.4. Research design in the current study.

Source: Adapted from Creswell and Plano Clark (2007) and Davis et al. (2011)

As shown in Figure 5.4, the research design in this study covers eight main stages of data access. It starts with a qualitative approach, by collecting data, analysing the data and reporting the findings (stages 1 to 3). Significantly, after the qualitative phase, this research adds an additional stage (stage 4), with a pilot survey to develop measures and questionnaires prior to the quantitative phase. At this stage, developing measures for all constructs is necessary for use in the quantitative stage. Particularly with a local search experience construct, the findings from the qualitative phase were informed for developing the set of items for this construct. After the pilot survey phase, the

quantitative approach follows, with data collection and analysis, and reports of the findings (stages 5 to 7). Finally, in stage 8, the findings from the qualitative and quantitative approaches are interpreted together, via the discussion.

5.5.4 Unit of Analysis

A unit of analysis is ‘the kind of case to which the variables or phenomena under study and the research problem refers, and about which data is collected and analysed’ (Collis & Hussey, 2014, p. 68). The unit of analysis depends on the study (Sekaran & Bougie, 2013). This research focuses on Thai dessert SMEs’ absorptive capacity; hence, the unit of analysis in this study is the firm.

5.6 Population and Sampling

Population refers to ‘an aggregate or totality of all the objects, subjects or members that conform to a set of specifications’ (Polit Denise & Hungler Bernadette, 1999, p. 37). In this research, the population of the study is Thai dessert SMEs. A sample is ‘a subset of a population chosen to participate in the study’ (Polit Denise & Hungler Bernadette, 1999, p. 227). To obtain a representative sample from a population, a sampling process is used. Thus, sampling is ‘the process of selecting a portion of population (sample) to represent as the entire population’ (Polit Denise & Hungler Bernadette, 1999, p. 95). The sampling technique will be discussed in the following section.

5.6.1 Sampling Technique

Sampling techniques can be divided into two main types: probability sampling and non-probability sampling (Saunders, Lewis, & Thornhill, 2009). Probability sampling is a random selection of a sample, so each member of a population has an equal opportunity to be chosen. Probability sampling provides a statistical basis demonstrating that the selected sample is representative of an entire population (Bartlett, 2005, p. 101). Non-probability sampling, in contrast, indicates that each member of a population does not have an equal probability of selection (Easterby-Smith et al., 2012), as non-probability sampling depends on the researcher’s judgement (Saunders et al., 2009). Table 5.7 presents the techniques of probability and non-probability sampling.

Table 5.7

Techniques of Probability and Non-probability Sampling

Techniques	Characteristics	Advantage
1. Probability sampling (random sampling)		
1.1 Simple random sampling	Every sample entity has an equal chance of being part of the sample	Easy to draw up a random list
1.2 Systematic random sampling	Generate a list in some form or other of the units in the population in which the researcher is interested	The list is essentially organised randomly, so that bias is not introduced
1.3 Stratified random sampling	Divide the population into homogeneous groups called strata and then take a simple random sample within each stratum	Small, but important, parts of the population are not missed
1.4 Cluster sampling	Divide the population into clusters, then sample all units from within the selected cluster	Reduces practical problems where the population units are spread very widely, such that the cost of approaching them all would be very high
1.5 Multi-stage sampling	Combine the above techniques	Achieve higher operational efficiency
2. Non-probability sampling		
2.1 Convenience sampling (or haphazard sampling)	Select sample units on the basis of how easily accessible they are	Quick and cost-effective
2.2 Quota sampling	Divide the relevant population up into categories and then continue selecting until a sample of a specified size is achieved within each category	Normally used for interview surveys
2.3 Purposive sampling	Researcher has a clear idea	Reasonable control over sample content

Techniques	Characteristics	Advantage
	of what sample units are needed and then approaches potential sample members to check whether they meet the eligibility criteria	
2.4 Snowball sampling	Starts with someone who meets the criteria for inclusion in the study, who is then asked to suggest other participants who would also be eligible	Suitable for samples where individuals vary and it is difficult to identify who belongs to the population
2.5 Self-selection sampling	Allows individuals show a desire to take part in the research	Suitable for exploratory research

Note: Easterby-Smith et al. (2012)

For this study, the research design relies on a mixed method, with both a qualitative and a quantitative approach. Thus, there are two phases of investigation in this research: a qualitative phase and a quantitative phase. For the qualitative phase, this research employed a purposive sampling technique to obtain samples. Purposive sampling is commonly used in qualitative research (Bryman & Bell, 2007; Collis & Hussey, 2003), as it can provide an in-depth analysis, rather than emphasising generalisability (Bryman & Bell, 2007). In this research, there were three main criteria used for purposive sampling: 1) province; 2) shop; and 3) interviewees. First, the provinces were selected on the basis of famous sites of Thai dessert products. In this study, the provinces situated near Bangkok were a focus, as the sites in those areas have abundant Thai dessert products under famous brands. Second, the Thai dessert shops selected for purposive sampling were based on famous shops in the Thai dessert brands. Otherwise, the brand must have existed for a long time. Third, the respondents selected as interviewees were the people involved with the firms' NPD activities.

For the quantitative phase, this study employed a sample size that relied on all of the population, with the removal of the samples used in the pilot survey. The reason for using 100% of the population was because the population size of Thai dessert SMEs is not very large, with a total of 844 Thai dessert SMEs (see Chapter 3). Also, the technique of structural equation modelling

(SEM), which will be further discussed in Section 5.9.4, requires a minimum sample size of 200. To ensure that there were enough samples for the SEM analysis, after the Thai dessert SMEs responded to the questionnaire, the researcher decided to use the entire population.

5.6.2 Sample Size

Sample size is the number of individuals in a group under study, gained from sampling techniques operating with the population. Determining the sample size required in data analysis mainly depends on the requirements of each statistical technique.

5.7 The Process of Investigation

The process of investigation in this research is composed of two main phases: the qualitative phase and the quantitative phase. Between these two main phases, a pilot survey was designed to develop the measures (items) and the survey instrument (see Figure 5.4). In the first phase, data collection was performed by using the interview method, and the data was analysed via a thematic analysis. The findings from the first phase addressed two related research questions: RQ1 and RQ2. These findings will be used to create the items for the local search experience (LSE) construct at the pilot survey stage. At the survey stage, the items for all constructs, including the LSE construct, were generated and purified for use in the second phase. In the second phase, data was collected via a survey, and the data was analysed to test the hypothesis using an SEM technique. Table 5.8 presents the process of the investigation.

Table 5.8
Process of Investigation

Phase	Approach	Method of data collection	Method of data analysis
Phase 1	Qualitative approach	Interview	Thematic analysis
Phase 2	Quantitative approach	Survey	SEM

Source: Author

5.8 Phase 1: Qualitative approach

5.8.1 Data Collection: Interview

In the qualitative approach phase, this study employed the interview method to collect data; specifically, a semi-structured interview. Interviews can be categorised into four main types: informal, unstructured, semi-structured, and structured (Bernard, 2000). Informal interviews lack structure or control; hence, researchers have to remember the conversation (Bernard, 2000). Unstructured interviews are those in which the questions are not pre-planned or standardised (Punch, 1998). These often start with a broad and open question concerning the area of study. Consequently, subsequent questions depend on the interviewee's responses (Doody & Noonan, 2013). A semi-structured interview is a mix of the unstructured and structured interviews (Bernard, 2000). Interview questions are pre-determined, and the researcher is free to seek clarification. With semi-structured interviews, although the interview questions are predetermined, the researcher can vary the order and wording of the questions, and is free to ask additional questions. Finally, the structured interview contains tightly structured and standardised questions for all interviewees. In other words, each interviewee is asked the same questions, with the same wording, in the same order (Doody & Noonan, 2013). In a structured interview, the set of questions is contained in the interview schedule (Doody & Noonan, 2013). Pre-coded categories are used for responses, and the interviewer does not attempt to go into any depth (Punch, 1998). Table 5.9 presents the advantages and disadvantages of each type of interview.

Table 5.9

Advantages and Disadvantages of Unstructured, Semi-Structured and Structured Interviews

Interview type	Advantage	Disadvantage
Unstructured	<ul style="list-style-type: none">▪ Flexible and non-directive▪ The researcher follows an interview guide comprising themes rather than specific questions▪ Enables the interviewee's thoughts and interests to be explored in depth, which generates rich data	<ul style="list-style-type: none">▪ Participants may talk about irrelevant issues, making it difficult to code and analyse the data▪ The researcher must try to link similar statements from different interviewees▪ Researchers need to ask questions carefully, considering what to ask and how to phrase the questions appropriately

Interview type	Advantage	Disadvantage
		<ul style="list-style-type: none"> ▪ Researchers must know when to prompt interviewees and probe for responses, including noting any new or interesting data the interviewees provide
Semi-structured	<ul style="list-style-type: none"> ▪ Flexible, with open-ended questions ▪ Creates a chance to explore new issues that arise spontaneously ▪ The researcher can explore issues newly emerging during the interview, which might not have been considered initially ▪ The researcher is able to word questions instinctively, developing a conversational style during the interview, to focus on the topic 	<ul style="list-style-type: none"> ▪ Researchers are often unable to identify where to ask prompt questions or probe responses. Thus, some relevant data may not be gathered.
Structured	<ul style="list-style-type: none"> ▪ Efficient with regard to time ▪ Limits a researcher's subjectivity and bias ▪ The researcher can control the topics and format of the interview ▪ Easier to code, analyse and compare data 	<ul style="list-style-type: none"> ▪ Similar to a spoken questionnaire, leaving no room for elaboration

Source: Adapted from Doody and Noonan (2013)

For this research, the semi-structured interview was chosen, because it allows new issues to emerge naturally from interviewees during the interview. These new issues are likely to be of special importance for interviewees (Smith, 2015). As a result, the researcher can gain new and valuable data.

5.8.2 Instrument: Interview Guide

In a semi-structured interview, a list of questions in a set order is contained in an interview guide (Bernard, 2000). Interview guides contain questions that form the basis of the interview. The interview guide for this research is available in Appendix 1.

5.8.3 Interview Administration

The researcher contacted interviewees to schedule the date and time of interviews, which were face to face and conducted on the basis of informed and written consent. Prior to the start of the interview, participants were asked to read an information sheet and provide written consent. During the interview, an interview schedule was used to ensure that the required topics were covered.

5.8.4 Data Analysis: Thematic Analysis

A thematic analysis was used as the analytical method for the interview data in this study. A qualitative analytical method can be divided into two main camps: 1) an analytical method stemming from a particular theoretical or epistemological position; 2) an analytical method independent of theory and epistemology, applicable across a range of theoretical and epistemological approaches (Braun & Clarke, 2006). The first camp covers analytical methods such as grounded theory, conversation analysis, interpretative phenomenological analysis, discourse analysis and narrative analysis. With the second camp, thematic analysis is a dominant analytical method firmly embedded in this camp.

A thematic analysis is used to identify, analyse and report repeated patterns, called themes, that emerge from the data (Braun & Clarke, 2006). A theme captures something important about the data in relation to the research question, and represents some level of response pattern repeated within the data set (Braun & Clarke, 2006, p. 82). A thematic analysis is appropriate to answer specific research questions (Braun & Clarke, 2006). On the basis of a philosophical background, a thematic analysis is applicable in both realist/essentialist and constructionist paradigms, although the outcome and focus will be different for each (Vaismoradi, Turunen, & Bondas, 2013). However, as both paradigms have the same key points, being largely based on the factist perspective, a thematic analysis is used when researchers try to determine the reality concerning actual behaviour, attitudes or motives of the people being studied, or to detect what has happened (Vaismoradi et al., 2013).

In this research, the adoption of thematic analysis searched for themes in relation to two research questions: RQ1 and RQ2. The themes were interpreted on two levels. First, at a basic level, the thematic analysis was conducted to search for themes answering RQ1: What are Thai dessert SMEs' motives in the inbound OI access in support of NPD? After addressing RQ1, all themes were re-interpreted into the second level of the knowledge domain, to answer RQ2: What kinds of knowledge domain do Thai dessert SMEs orient in the inbound OI access in support of NPD?

A thematic analysis often tends to be compared with grounded theory, because of their similarity in seeking to describe patterns across qualitative data. Thus, it is significant to note here that thematic analysis has a different approach from grounded theory. Thematic analysis and grounded theory are clearly distinguished in terms of epistemological and theoretical positions, including the issue of theory building. Thematic analysis is independent of epistemological and theoretical positions, while grounded theory is theoretically bound (Braun & Clarke, 2006). In other words, thematic analysis is not bound by any pre-existing theoretical frameworks; therefore, it can be applied to different theoretical frameworks. In addition, thematic analysis does not attempt to develop a theory, although it can generate a conceptual interpretation of data. The principle aim of grounded theory, in contrast, is to produce a theory about the phenomena that is grounded in the data (Holloway & Todres, 2003; McLeod, 2011). Thus, in adopting a thematic analysis, researchers need not subscribe to the implicit theoretical commitments of grounded theory (Braun & Clarke, 2006). Hence, thematic analysis can be adopted with confidence, if researchers do not wish to produce a fully worked-up grounded theory analysis.

5.8.5 Thematic Analysis: Inductive and Deductive Approach

Thematic analysis may be performed either inductively or deductively (Braun & Clarke, 2006). The inductive, or 'bottom-up', way is a process of coding data without a pre-existing coding frame. Thus, the codes and the themes are driven by the data set. Themes generated through inductive means are called data-driven themes. The deductive, or 'top-down', method is a process of coding data under a pre-existing coding frame. Thus, with deductive means, codes and themes are driven by theoretically analytical frameworks. Themes obtained deductively are theoretically-driven themes. An inductive thematic analysis is more akin to grounded theory than a deductive thematic analysis (Braun & Clarke, 2006). In general, inductive analyses are used in cases where there are no previous studies dealing with the phenomenon (Vaismoradi et al., 2013). Thus, coded categories are derived directly from the data. However, although inductive analyses are performed without a pre-existing coding frame, researchers cannot free themselves of their theoretical and

epistemological commitments, and data are not coded in an epistemological vacuum (Braun & Clarke, 2006). In contrast, deductive analyses are adopted if the general aim of the thematic analysis is to test a previous theory in a different situation, or to compare categories at different periods.

For this research, a thematic analysis was performed inductively, as the perspectives regarding research questions RQ1 and RQ2 were not to be much understood in the previous literature of the OI; rather, they were a new topic for exploration. Thus, data-driven themes are an appropriate approach to gain answers in relation to the research questions.

5.8.6 Procedure of Thematic Analysis

For this research, the procedure of thematic analysis, as suggested by Braun and Clarke (2006), was followed. According to Braun and Clarke (2006), there are six main steps in a thematic analysis. The first is becoming familiar with the data, the second is generating initial codes, the third is searching for themes, the fourth is reviewing themes, the fifth is defining and naming themes, and the sixth is producing the report. Each of these six steps is described in Table 5.10

Table 5.10

Procedure of Thematic Analysis

Step of Analysis	Description
1. Becoming familiar with the data	Transcribing the interview into written form. Reading and re-reading the data to become familiar with the content.
2. Generating initial codes	Creation of codes to capture features of data.
3. Searching for themes	Organising ‘codes’ and related ‘code extracts’ into themes.
4. Reviewing themes	Checking if the themes work in relation to the coded extracts and the entire data set, including generating a thematic map.
5. Defining and naming themes	Generating a clear definition and name for each theme.
6. Producing the report	Using extract examples to explain the themes and producing a report.

Source: Braun and Clarke (2006)

As seen in Table 5.10, the first step of the thematic analysis is to transcribe the interview data. Transcription is the process of generating a written record of an interview (Gillham, 2005). Interview transcripts will be produced at this stage and will be read several times to gain familiarity with their content.

The second step is the process of coding data segments. Coding is the process of assigning codes to the data, to reduce the text into manageable units of analysis. Codes identify interesting features in the data, in relation to the research questions (Crowe, Inder, & Porter, 2015), given by using the statement summarising or interpreting data segments. Coded segments of data are called data extracts. In coding, it is important to note that the same segment of data might be coded several times using different codes. The coded segments of data might be categorised into different themes. For this research, coding was done through manual-based coding and computer-based coding with NVivo. As discussed in Section 5.8.5, there are two distinct ways of coding: inductive and deductive. Inductive coding implies that codes are driven by the data, while deductive coding implies that the codes are predetermined from theory. Deciding between inductive coding and deductive coding mainly depends on the thematic analysis approach adopted.

The third step is theme development based on the coding. Themes and codes are distinguishable, in that the theme captures a pattern across a data set, whereas a code captures a single idea associated with a segment of data. Thus, the theme is at a broader level, whereas the code is more specific. Significantly, themes are not dependent on a large quantity of things interviewees say or quantifiable measures; rather, a theme captures something important in relation to the overall research question (Braun & Clarke, 2006). Some initial codes may form a theme or sub-theme (Braun & Clarke, 2006). A sub-theme shares the same central concept as the theme, but focuses on one notable specific element (Vaismoradi, Jones, Turunen, & Snelgrove, 2016). Thus, a sub-theme is a sub-component of a theme, underneath the umbrella of a theme.

The fourth step involves a review of all themes, to determine whether they are really themes. Themes are reviewed at two levels: the data extract and the entire data set (Braun & Clarke, 2006). Data extracts are assessed by considering whether they form a coherent pattern of themes. At the level of an entire data set, data are assessed in relation to individual themes. In reviewing themes, it is possible that separate themes might be joined to form one theme, or one theme might be broken down into separate themes.

In the fifth step, all themes are refined and defined (Braun & Clarke, 2006). Each theme is defined in terms of what it is about and what aspects of the data are covered by the theme (Crowe et al., 2015). Finally, in the sixth step, the emerging themes are reported (Braun & Clarke, 2006).

5.9 Phase 2: Quantitative Approach

5.9.1 Data Collection: Survey

For this research, a survey was used as the data collection method in the second phase of the investigation, to empirically test a hypothesis underlying a conceptual framework in this research (see Chapter 4). A survey is a method used to capture facts, opinions, behaviours or attitudes from a range of respondents (Maylor & Blackmon, 2005). A pilot survey (pre-testing) can be used prior to the survey. A pilot survey was conducted in this study, with a small sample of respondents, to identify and eliminate potential problems (Hunt et al., 1982).

Basically, there are two main strategies in the pilot survey, declared pre-testing and undeclared pre-testing (De Vaus, 2002). Declared pre-testing involves gaining feedback from experts and proxy respondents, in terms of their experiences in completing the questionnaire, meaning, and interpretation of items. On the other hand, undeclared pre-testing is a strategy wherein the respondents are not told that the instrument is still under development. This is advantageous as the actual conditions of administration can be assessed (De Vaus, 2002). For this study, undeclared pre-testing was adopted in the pilot survey. Participants were not told that their responses were given to develop a questionnaire; rather, they were invited to respond to one of two different versions of the questionnaire. Relying on a sampling procedure, 50 Thai dessert SMEs were randomly sampled and invited by phone to take part in the survey. In the case that some of the sampled SMEs declined to participate, new samples were chosen and contacted to enquire about their willingness to participate. This was performed until 50 samples were achieved, and then the questionnaires were sent to all participants. The procedure was performed in such a way that the samples could be retained for employing in the later stage of survey with full scale, in a maximum.

5.9.2 Instrument: Questionnaire

Questionnaires are employed to collect data through a survey. In this study, the questionnaire was designed using scaling questions. Scaling questions involve numerical measures of attitudes, opinions, feelings and perceptions, allowing statistical techniques to analyse the data. A scaling format might be a Likert scale or a semantic differential scale. A Likert scale asks respondents

their level of agreement with statements, with response choices being strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree. A semantic differential scale relies on a set of bipolar adjectives or phrases. For this research, a Likert scale was adopted, because it measures the respondents' level of agreement with the statements. A five-point Likert scale was used, with strongly disagree scored as one, disagree scored as two, neither agree nor disagree scored as three, agree scored as four, and strongly agree scored as five.

The questionnaires were initially developed in English and translated into Thai. The items, or questions, used for each construct were adopted from the literature review, except for the LSE construct, whose items were developed from the qualitative findings in this research. Questionnaires were originally created in the English language by using items (questions) from the literature written in English. Afterwards, they were translated into Thai. Due to issues of cross-culture, back translation was employed for this study, using a team of professional translators. Back translation is a procedure that involves translating a questionnaire into the target language by one translator, then translating it back into the source language by an independent translator, who is blind to the original questionnaire. Afterwards, the two versions in the original language are compared (McGorry, 2000). If differences are found, the translators are consulted for re-translation.

The questionnaire began with an introductory page, describing the aim of the study, and notifying respondents that their data would be anonymous. To ensure that the data were sourced from appropriate respondents, the introductory page also specified the qualifications of the respondents. After the introductory page, six sections, from A to F, were established, with the details as follows:

- Section **A** asks general questions about the company and respondents.
- Section **B** asks about the firm's access level to various sources of external knowledge.
- Section **C** asks about the performance of new products launched in the market in the past five years (2011–2015).
- Section **D** asks about the firm's knowledge base, in both knowledge breadth and knowledge depth.
- Section **E** asks about the firm's potential absorptive capacity (PAC) and realised absorptive capacity (RAC).

- Section **F** asks about the firm's innovation capability, covering seven dimensions: strategic orientation, resource management, organisational intelligence, creativity, structure and system, culture and climate, and management of technology.

In each of these six sections, questions will be contained into. In Section A, the questions revolve around general information on the background of the company and respondents. From Sections B to F, the questions were created on the basis of the literature review. They served as the items measuring the related constructs, as discussed in the conceptual framework of this research (see Figure 4.1). Details of creating the items (questions) in each of constructs will be presented in Chapter 7.

5.9.3 Questionnaire Administration

A questionnaire can be administered in two ways: self-administered or through an interviewer. A self-administered questionnaire is completed by the respondent. This type of administration can be conducted in three ways: 1) internet and intranet-mediated; 2) postal or mail; 3) delivery and collection (hand-delivered to the respondent and collected later). Questionnaires with an interviewer are administered via telephone or through structured interviews (Saunders et al., 2009). For this research, the questionnaire was self-administered via the post. In the pilot survey, respondents were contacted by phone before sending the questionnaire, to ensure that they agreed to participate. As a result, the questionnaires were sent to 50 Thai dessert SMEs, who agreed to participate in the pilot survey. With a large-scale survey, the questionnaires amended from the pilot survey were applied. In an attempt to improve the response rate and reduce the non-response bias, a guideline suggested by Dillman (2000) was adopted, with the enclosure of a stamped addressed envelope with the questionnaire, as well as assurances of confidentiality and anonymity.

5.9.4 Data Analysis: Structural Equation Modelling

Data collected through the survey was used to test hypotheses via the SEM technique. The SEM technique was chosen because the hypothesis testing in this research relied on the relationship among constructs, rather than among observed variables. Thus, SEM was suitable to employ, because it can test the relationship among constructs, whereas regression analysis cannot. Regression analysis can be only used to test the relationship among observed variables (Shah & Goldstein, 2006). It is important to clarify here that the construct is a theoretical concept that cannot be directly measured (Nunnally, 1967). Consequently, it is therefore measured through sets

of measures, which are called observed variables. The construct might also be called an unobserved variable, a latent factor or a factor (Ullman, 2006). Likewise, synonyms for the observed variables (measures) include the manifest variable, the indicator and the item (Ullman, 2006). For this research, the term ‘factor’ was used interchangeably with ‘construct’, while the term ‘item’ was used for ‘observed variable’.

The SEM is a multivariate technique advanced from regression analysis, by combining both confirmatory factor analysis (CFA) and path analysis (Weston & Gore, 2006). One difference between SEM and regression analysis, and an advantage of SEM, is its capacity to test the relationships among constructs and address measure-specific errors. In comparison, with regression analysis, constructs cannot be tested and measurement error is not modelled (Weston & Gore, 2006). Significantly, it is important to note that there are two distinct types of SEM techniques: covariance-based SEM (CB-SEM), and variance-based SEM (VB-SEM). These have their differences in terms of theoretical approaches. CB-SEM is used to test or confirm a theory regarding the factor structure of a construct (Lei & Wu, 2007). Confirmation relies on the evaluation of model-data fitness. In contrast, VB-SEM, often called component-based SEM (Gefen, Straub, & Boudreau, 2000; S. Davcik, 2014), is an exploratory study used to find the factor structure of a construct (Hair, Ringle, & Sarstedt, 2011). Table 5.11 shows the differences between CB-SEM and VB-SEM.

Table 5.11

The Differences between Covariance-Based SEM and Variance-Based SEM

Issue	CB-SEM	VB-SEM
Research goal	▪ Theory testing/Theory confirmation	▪ Theory building/Exploratory study
Application	▪ Not suitable if the theory is weak, or the number of variables is very large compared with the sample size	▪ Ability to perform, even if the theory is weak, or the number of variables is very large compared with the sample size
Statistical approach	▪ Parametric testing	▪ Non-parametric testing
Assumption of normal data distribution	▪ Required (as it is a fundamental requirement for parametric testing)	▪ Not required

Issue	CB-SEM	VB-SEM
Sample size	▪ A minimum of 100	▪ Ability to execute with small sample size (less than 100)
Type of related items	▪ Reflective items	▪ Formative and reflective items
Parameter estimation method	▪ Maximum likelihood (ML)	▪ Generalised least squares (GLS)
Model to be tested	▪ Measurement model and structural model	▪ Measurement model and structural model
Model fitness	▪ Required	▪ Not required (VB-SEM does not provide global goodness-of-fit criteria)
Applicable software programs	▪ LISREL, AMOS, Mplus, EQS	▪ PLS-SEM (Smart-Pls, Warp-Pls, Pls-GRAPH)

Source: Adapted from O’Loughlin and Coenders (2004), Hair, Sarstedt, Ringle, and Mena (2012), and Awang, Afthanorhan, and Asri (2015)

For this study, the factor structure analysis of the construct was approached on the basis of theory testing/confirmation, rather than on theory building, as in an exploratory study. Thus, this research adopted the CB-SEM for analysis. The AMOS software package, version 24, was used to facilitate the operation.

5.9.5 Procedure of Structural Equation Modelling

This research followed Anderson and Gerbing’s (1988) two-step procedure for SEM analysis. The first step is to examine the measurement model and the second step is to examine the structural model. For the first step, the measurement model represents the relationship between the construct (unobserved variables) and its set of items (observed variables), and was assessed to confirm the factor structure of the construct, or construct validity (Fei et al., 2007; Nasser & Takahashi, 2003; Weston & Gore, 2006). This was performed via a CFA, assessing the model-data fitness via the fitness index. It is important to note that, in the case of the construct being seen as multidimensional, its factor structure will be as the hierarchy, starting from first-order, second-order, to higher-order. When the construct is seen as multidimensional, it displays the hierarchy for at least two levels: first-order construct and second-order construct. The first-order construct is characterised by the presence of items as indicators, while the second-order construct is

characterised by the presence of first-order constructs as indicators (MacKenzie, Podsakoff, & Jarvis, 2005; Ping, 2004).

After the measurement model of each construct displays satisfactory fitness supporting to the factor structure of construct, the second step is to examine the structural model and the relationships among the constructs as hypothesised in theory (Schreiber, Nora, Stage, Barlow, & King, 2006). As with the measurement model, the structural model should demonstrate satisfactory fitness for the entire set of relationships, prior to the assessment of hypothesised relationships among the constructs.

5.9.6 Model Fit Index

To implement the CB-SEM, the assessment of model fitness is required. Both the measurement model and the structural model should demonstrate satisfactory fitness before hypothesis testing. The model fitness reflects the degree of consistency between a hypothesised model and the data collected from the field study. To evaluate the fitness of the model, a model fit index is employed with the criteria, to determine acceptable values. The model fit index can be divided into three main types: parsimonious fit, incremental fit, and absolute fit. Table 5.12 explains these three categories of fit indices and their models.

Table 5.12

Categorisation of Fit Index

Category	Description	Index
Absolute fit index	How well the hypothesised model fits the observed data	<ul style="list-style-type: none"> ▪ Chi-square (χ^2) ▪ Goodness-of-fit index (GFI) ▪ Root-mean-square error of approximation (RMSEA)
Parsimonious fit index	Compares models with differing number of parameters	<ul style="list-style-type: none"> ▪ Chi-square/degrees of freedom (χ^2/df)
Incremental fit index (Comparative fit index)	The relative position of the model between worst fit and perfect fit	<ul style="list-style-type: none"> ▪ Normed fit index (NFI) ▪ Tucker-Lewis index (TLI) ▪ Comparative fit index (CFI)

Source: Adapted from Nasser and Takahashi (2003) and Martínez-López, Gázquez-Abad, and Sousa (2013)

As seen in the fit indices in Table 5.12, at least one fit index in each category should be selected for reporting fitness (Jackson, Gillaspay Jr, & Purc-Stephenson, 2009). However, it is strongly recommended that three indices should be always reported: chi-square (χ^2), degrees of freedom (*df*), and significance of the chi-square test (*p*-value) (Martínez-López et al., 2013). To indicate good fitness, the *p*-value should be non-significant, reflecting that the empirical correlation matrix does not significantly differ from the modelled covariance matrix. The chi-square, with connected degrees of freedom, should be as small as possible to represent good fit. However, the chi-square statistic generally tends to be affected by sample size (Gerbing & Anderson, 1985). A larger sample size (generally above 200) tends to result in a chi-square statistic yielding a significant probability level (Schumacker & Lomax, 2010, p. 86), indicating a poor-fit model. Thus, it is recommended to use other fit indices in combination for consideration. For this research, seven fit indices were adopted: χ^2 , *df*, χ^2/df , GFI, TLI, CFI, and RMSEA. Table 5.13 presents the acceptable values, representing the goodness of fit in each of the fit indices.

Table 5.13

Acceptable Criteria of Fit Index

Fit Index	Acceptable Criteria	References
χ^2	$P > 0.05$	Wheaton, Muthen, Alwin, and Summers (1977)
χ^2/df	< 3 good; < 5 sometimes permissible	Schumacker and Lomax (2004)
GFI	> 0.9	Anderson and Gerbing (1988)
AGFI	> 0.9	Hoe (2008)
RMSEA	< 0.08	Browne and Cudeck (1993)
CFI	> 0.9	Hoe (2008)
TLI, NNFI	> 0.9	Hoe (2008)

Source: Hooper, Coughlan, and Mullen (2008)

5.10 Statistical Analysis with Quantitative Approach

Statistical analysis includes two levels of analysis, item and construct. Both item and construct may be either reflective or formative (Bollen and Lennox (1991). Formative construct refers to the constructs formed or induced by their indicators (Roberts, Thatcher, & Grover, 2010). Thus, in return, formative items indicate ‘the measures forming the construct’ (MacCallum & Browne, 1993). Formative constructs might be seen as an aggregate construct (Edwards, 2001), because

they are formed from the summed scores of their indicators (formative items). On the other hand, a reflective construct refers to the construct being the cause of the indicators (Roberts et al., 2010). Thus, reflective items indicate ‘the measures caused by the construct’ (MacCallum & Browne, 1993). The basic differences between reflective item and formative item are presented in Table 5.14.

Table 5.14

The Difference between Reflective and Formative Items

Issue	Reflective Item	Formative Item
1. Definition	Measures reflective constructs	Measures formative constructs
2. Direction of causality	Construct to measures	Measures to construct
3. Synonym	Effect item/scale	Cause item/index
4. Common theme	Have common themes (correlations) with other items	May or may not have a common theme (correlations) with other items, but they are not generally expected
5. Item interchangeability	Interchangeable – Removal of some items does not change the meaning of the construct	Not interchangeable – Removal of some items changes the essence of the construct
6. Internal consistency	Required	Not applicable
7. Item unidimensionality	Required	Not applicable
8. Position of error term	Item	Construct

Source: Adapted from Diamantopoulos and Sigauw (2006), S. Davcik (2014), and Petter, Straub, and Rai (2007)

The distinct nature of reflective and formative items leads to different requirements for statistical analysis. Table 5.15 presents different statistical analyses for reflective and formative items at both item level and construct level.

Table 5.15

Statistical Analyses for Item and Construct: Reflective and Formative

Level of analysis	Statistical analysis	Required type of item/construct	Measure/Statistical technique
1. Item	1.1 Reliability (internal consistency)	Reflective item	Cronbach's alpha
	1.2 Unidimensionality	Reflective item	Common factor analysis (applicable in two approaches: exploratory factor analysis and CFA)
	1.3 Multicollinearity	Formative item	Variance inflation factor (VIF)
2. Construct	2.1 Reliability	Reflective construct	Factor loading
			Composite reliability
	2.2 Validity		
	2.2.1 Convergent validity	Reflective construct	Average variance extracted (AVE)
	2.2.2 Discriminant validity	Reflective construct	Maximum shared squared variance (MSV) < AVE
Average shared square variance (ASV) < AVE			
		Square root of AVE > inter-construct correlation	

Source: Collated by author

5.10.1 Unidimensionality

Unidimensionality is required for reflective items, but not for formative items (Petter et al., 2007). Unidimensionality refers to a set of items forming a measure of construct, with each item being related to only one dimension of a multidimensional construct. Significantly, unidimensionality does not refer to internal consistency (Danes, 1984); therefore, it cannot be claimed through Cronbach's alpha, which is the coefficient used to measure internal consistency when assessing reliability. Basically, factor analysis (FA) is a technique applied for testing an item's unidimensionality.

FA is a technique that reduces a large set of variables into a smaller set of factors or components (Pallant, 2013). FA is based on examining the correlations or covariances between items, assuming that the highly correlated items, either positively or negatively, are likely affected by the same factors, while uncorrelated items are likely to be affected by different factors. FA can be divided into two distinct types of approaches: CFA and exploratory factor analysis (EFA). In the case of CFA, the researchers have an a priori specified theoretical factor structure, number of factors, relationships among the factors and relationships between the factors and items (Ullman, 2006). Thus, the CFA approach seeks to test or confirm factor structure as hypothesised in the theory (Child, 1990). For EFA, in contrast, researchers do not have an already known factor structure. Hence, the EFA approach explores the possible factor structure of a set of items (Child, 1990). EFA explores how many factors there are, and which items measure each factor most effectively (Schumacker & Lomax, 2010, p. 64). The key differences between CFA and EFA are summarised in Table 5.16.

Table 5.16

Differences of Confirmatory and Exploratory Factor Analysis

Issue	Confirmatory factor analysis	Exploratory factor analysis
Theory base	<ul style="list-style-type: none"> ▪ Strong theory and/or empirical base specifying an exact factor structure in advance 	<ul style="list-style-type: none"> ▪ Weak literature base, lacking an exact factor structure
Theory approach	<ul style="list-style-type: none"> ▪ Theory-testing approach 	<ul style="list-style-type: none"> ▪ Theory-generating approach
Logic of application	<ul style="list-style-type: none"> ▪ Structure of factors is hypothesised a priori and 	<ul style="list-style-type: none"> ▪ There is no preconceived structure of factors

Issue	Confirmatory factor analysis	Exploratory factor analysis
	verified empirically, rather than derived from the data	<ul style="list-style-type: none"> ▪ The data from the field study are employed to determine the underlying structure
Aim of application	<ul style="list-style-type: none"> ▪ Confirm unidimensionality ▪ Focus on whether a hypothesised factor model fits with the data 	<ul style="list-style-type: none"> ▪ Identify the nature of the constructs' underlying responses in a specific content area ▪ Test the dimensionality of items
Families of FA techniques	<ul style="list-style-type: none"> ▪ Common factor analysis 	<ul style="list-style-type: none"> ▪ Common factor analysis and component analysis
Type of item	<ul style="list-style-type: none"> ▪ Reflective 	<ul style="list-style-type: none"> ▪ Reflective and formative
Correlation of factor	<ul style="list-style-type: none"> ▪ Factors are correlated 	<ul style="list-style-type: none"> ▪ Factors are uncorrelated
Factor loading	<ul style="list-style-type: none"> ▪ Each item was loaded on a single factor ▪ All factors were allowed to correlate ▪ Error covariances were constrained to zero ▪ Allow residuals or errors to correlate 	<ul style="list-style-type: none"> ▪ Items free to load on all factors, and correlated residuals not considered
Analytical method	<ul style="list-style-type: none"> ▪ Covariance 	<ul style="list-style-type: none"> ▪ Correlations

Source: Adapted from Netemeyer, Bearden, and Sharma (2003), Lei and Wu (2007), and Stevens (2002)

For EFA, principal component analysis (PCA) and common factor analysis are the two main techniques for factor extraction. Both are FA techniques, which seek to produce a smaller number of linear combinations of original variables, by capturing the most variability within the pattern of correlation (Pallant, 2005, p. 172). However, PCA and common factor analysis have different analytical approaches for factor extraction. PCA uses all of the variance in the original variables and transforms them into a smaller set of linear combinations. In contrast, common factor analysis uses only shared variance in analysis (Pallant, 2005, p. 172). Thus, PCA is a technique for factor extraction that reduces items into smaller sets of composite components, retaining as much of the original items' variance as possible.

For this study, the factor structures of all constructs (with exception of the LSE construct) are a priori specified with the basis of theoretical factor structure. Thus, the factor analysis approach in this research mainly relies on CFA, rather than on EFA. For the LSE construct, its factor structure was not a priori specified in the literature. Thus, the factor structure of the LSE construct was explored in this research. Consequently, EFA was applied with this construct at the pilot survey stage, to explore the factor structure. After EFA, CFA will be performed in the same way with the other constructs, which are based on already-specified factor structures from theory, at the survey phase of the field study.

5.10.2 Reliability

Reliability refers to ‘the ratio of the variance of true score to the variance of observed score’ (Netemeyer et al., 2003, p. 42). Reliability can be assessed through internal consistency (Netemeyer et al., 2003), defined as ‘the degree which the items making up the construct are all measuring the same underlying attribute’ (Pallant, 2013, p. 6). Reliability in internal consistency is required for reflective items, but not for formative items, because formative items are not expected to correlate with one another (S. Davcik, 2014). Cronbach’s alpha (α) coefficient is commonly used for assessing internal consistency, with the recommended value above 0.70 (Pallant, 2013, p. 104). According to Nunnally (1978), if the Cronbach’s alpha coefficient is greater than 0.70, all items in the underlying construct would be kept, regardless of the value of Cronbach’s alpha should the item be deleted. Instead, the Corrected Item-Total Correlation (CITC) applies, which is the correlation between scores on each item and total scale scores. Thus, if the item displays a CITC greater than 0.5, as the recommended value, it would be kept. Put differently, any items displaying a CITC below 0.5 will be removed.

5.10.3 Multicollinearity

Multicollinearity refers to the relationship among the independent variables being highly correlated ($r = 0.9$ and above) (Pallant, 2013, p. 157). Multicollinearity is required for formative items, but not for reflective items. Multicollinearity is a crucial issue for formative items, as it might result in biased estimates (Bollen & Lennox, 1991). Multicollinearity can be assessed through the VIF, the inverse of the tolerance value, which identifies how much of the variability of a specified independent value is not explained by other independent variables in the model (Pallant, 2013). As a rule of thumb, if the VIF value is higher than 10, it reflects the presence of

multicollinearity (Pallant, 2013). Computing the VIF was adapted from Pallant (2013), using the following formula:

$$\text{VIF} = 1/(1-R^2)$$

R^2 = The goodness of fit of the linear model for dependent variables, based on all other independent variables

$1-R^2$ = Tolerance value

5.10.4 Construct Reliability

Construct reliability should be examined with item reliability (Martínez-López et al., 2013). For this study, construct reliability is assessed through composite reliability (CR), which refers to the internal consistency of the indicators measuring a given factor (Fornell & Larcker, 1981). The acceptable threshold for CR is 0.70 (Koufteros, 1999; Steenkamp & van Trijp, 1991). Testing composite reliability was adapted from Fornell and Larcker (1981), with the following formula:

$$\text{CR} = (\sum k)^2 / [(\sum k)^2 + (\sum (1 - k^2))]$$

k = standardised loading of items

$1 - k^2$ = measurement error for each item

5.10.5 Construct Validity: Convergent and Discriminant Validity

Construct validity is ‘the degree to which a scale measures what it intends to measure’ (Garver & Mentzer, 1999). Construct validity is applicable only for reflective constructs. Construct validity is assessed through convergent validity and discriminant validity. Convergent validity refers to ‘the extent to which the measures of the same construct converge or are highly correlated’ (Netemeyer et al., 2003, p. 86). Convergent validity is assessed through the value of AVE, which measures the amount of variance that a construct captures from its indicators, relative to the amount due to measurement error (Chin, 1998). The recommended value of AVE is greater than 0.5 (Ping, 2004). The formula of AVE is the sum of the factor loading power of two, divided by the number of all items being composed (Fornell & Larcker, 1981):

$$\text{AVE} = \sum k^2/n$$

k = factor loading of item

n = number of items

AVE can also be assessed through factor loading. If all loadings exceed 0.70 and are statistically significant, this indicates that convergent validity is achieved (Bagozzi & Yi, 1991; Hair, 1998; Schroeder, Bates, & Junttila, 2002).

Discriminant validity, in contrast, refers to ‘the extent to which the measures diverge from other operationalisations from which the construct is conceptually distinct’ (Netemeyer et al., 2003, p. 86). Generally speaking, discriminant validity reflects the construct measuring what it is intended to measure. There are various ways to assess discriminant validity. However, for this study, the assessment of discriminant validity, suggested by Fornell and Larcker (1981), was followed. According to Fornell and Larcker (1981), discriminant validity is achieved when the square root of AVE is greater than the correlations among the constructs, reflecting that shared variance between the construct and its items is more than with other constructs.

5.11 Methodological Remark

For this study, a pilot survey was designed as the link between the two phases of investigation. The pilot survey was designed to generate items (observed variables) for use in the field survey. Items that were responded to and collected through the pilot survey were also purified at this stage. Hence, the design of the pilot survey was beneficial in developing reliable items to include in the questionnaire.

5.12 Summary

This chapter discussed research methodologies, to select an appropriate methodology to address the research questions. Research philosophy was used as the starting-point, leading to the decision of which research methodology to adopt. In this study, pragmatism was the adopted research paradigm. Thus, a mixed-method approach was used for data collection and analysis. In this study, the mixed-method approach relies on an exploratory design, starting with a qualitative approach, followed by a quantitative approach. The use of mixed methods in this research is mainly reliant on the deductive approach. A pilot survey was included between the two approaches. The pilot survey was designed to purify the items for the constructs, before the access of the quantitative phase with the survey. The results of data collection and analysis in the first phase (the qualitative approach), the pilot survey and the second phase (the quantitative approach) are presented in Chapters 6, 7 and 8, respectively. The following chapter presents the results of data collection and analysis in the first phase.

Chapter 6 : Analysis and Findings in Phase 1 – Interview

6.1 Introduction

In the previous chapter, the research methodology was discussed and, as a result, a mixed method was adopted to address the research questions (RQs). The mixed method relies on an exploratory design, implying that it starts with a qualitative approach, followed by a quantitative approach. This chapter presents the results of data collection and analysis and the findings of the first phase based on the qualitative approach, to answer RQ1 and RQ2. The chapter is organised into eight main sections. The next section presents an overview of the research questions related to the qualitative approach. Section 6.3 presents the results of the data collected through the interview method. Section 6.4 presents the thematic analysis of the data. Section 6.5 presents the analytical results with the emerging themes. Section 6.6 discusses the links between the themes. Section 6.7 presents the findings in relation to the research questions. Section 6.8 summarises the chapter.

6.2 Related Research Questions

In this research, five research questions (RQ1–RQ5) were addressed. Among these five research questions, two research questions, RQ1 and RQ2, were addressed using the qualitative approach. Interviews were used as the method of data collection, conducted with three types of agencies: 1) Thai dessert SMEs; 2) government agencies responsible for the promotion of technology and innovation in Thai SMEs; 3) a large company with one production line that relies on an innovative Thai dessert product. The government agencies and the large company were included in the interviews to cross-check the data gained from the Thai dessert SMEs. The interview data were analysed with an inductive-based thematic analysis method to obtain data-driven themes. To answer the two research questions, the thematic analysis was performed with two levels of analysis. At the first level, the interview data were analysed to look for ‘themes’ in relation to RQ1. After the themes in relation to RQ1 were achieved, all themes were interpreted at the second level, as the knowledge domain, to answer RQ2. The framework of the knowledge domain was based on a priori specified literature for organising the related themes. For this research, the framework of the knowledge domain was adopted from Bogers and Lhuillery (2011).

6.3 Results of Data Collection

Data was collected via 14 semi-structured interviews, completed between September and October 2013. The interviews were conducted face-to-face at the workplace of the interviewees. All interviews were audio recorded and each interview took between one hour and one-and-a-half hours.

6.3.1 Interview Participants

Two government agencies were invited to participate in this research: the National Innovation Agency (NIA) and the Technology Management Center (TMC). Both the NIA and the TMC are managed by the Ministry of Science and Technology (MOST), Thailand. The NIA is the agency responsible for enhancing the national innovation system. The TMC is managed by the National Science and Technology Development Agency (NSTDA), as part of the MOST. The mission of the TMC is to support SMEs by introducing technology-based products and processes through its industrial technology assistance programme (iTAP). One large company participated in the interview. The products of this company are mainly processed from rice and rice flour. Furthermore, the company has produced innovative Thai dessert products in the form of ready-to-cook Thai dessert flour, which is distributed in both the local and foreign markets. Table 6.1 presents the interview participants' details.

Table 6.1

Interview Participants

Organisation	Number	Number of interviewees	Positions of interviewees	Amount of data
Thai dessert SMEs	10	10	Owner	10
Thai government agencies	2	3	Project manager	3
Large company	1	2	Research and development (R&D) and quality control (QC) manager, marketing manager	1
Total	<u>13</u>	<u>15</u>		<u>14</u>

Table 6.1 shows that all interviewees from the Thai dessert SMEs held the position of owner. From the large company, two participants were interviewed. One was the R&D and QC manager and the other was a marketing manager. The data from these two interviewees were combined into one set of data for the large company because the interviews were conducted together. From the two government agencies, all the interviewees held the position of project manager.

6.3.2 Anonymity of Participants

In accordance with research ethics, before starting the interviews, all interviewees from the Thai dessert SMEs and the large company were informed that their name and company would be kept anonymous. For the government agencies, although the names of the participating agencies were specified, the names of the interviewees were not identified. The data from the 14 interviews were coded to ensure anonymity. Table 6.2 presents the coding of the organisations and interviewees in this study.

Table 6.2

Coding of Organisations and Interviewees

Organisation no.	Type of Organisation	Interviewee no.	Position of Interviewee
1	Thai dessert SME	Interviewee 1 (Int. 1)	Owner
2	Thai dessert SME	Interviewee 2 (Int. 2)	Owner
3	Thai dessert SME	Interviewee 3 (Int. 3)	Owner
4	Thai dessert SME	Interviewee 4 (Int. 4)	Owner
5	Thai dessert SME	Interviewee 5 (Int. 5)	Owner
6	Thai dessert SME	Interviewee 6 (Int. 6)	Owner
7	Thai dessert SME	Interviewee 7 (Int. 7)	Owner
8	Thai dessert SME	Interviewee 8 (Int. 8)	Owner
9	Thai dessert SME	Interviewee 9 (Int. 9)	Owner
10	Thai dessert SME	Interviewee 10 (Int. 10)	Owner
11	TMC	Interviewee 11 (Int. 11)	Project manager
12	TMC	Interviewee 12 (Int. 12)	Project manager
13	NIA	Interviewee 13 (Int. 13)	Project manager

Organisation no.	Type of Organisation	Interviewee no.	Position of Interviewee
14	Large company	Interviewee 14 (Int. 14)	R&D and QC manager
		Interviewee 15 (Int. 15)	Marketing manager

6.4 Data Analysis

The 14 sets of interview data were analysed through a thematic analysis to answer RQ1, using a six-step guideline as suggested by Braun and Clarke (2006) (see Section 5.8.6). The interviews were transcribed verbatim in the Thai language, then translated to English to produce interview transcripts. The interview transcripts were read and re-read for familiarisation with the content. Afterwards, coding was performed. Some segments of the data considered important in relation to RQ1 were highlighted with a coloured pen; then, a code was used to describe the feature of the highlighted data. All the codes and their descriptions were recorded in a codebook to ensure the coding process was consistent. The coding process was conducted manually with the use of the NVivo11 software programme to systematically organise the codes and data extracts. The codes are described in the following section.

6.4.1 Codes and Description of Codes

All 69 codes were generated at the stage of coding. Table 6.3 presents the codes and their descriptions.

Table 6.3

Codes and Descriptions of Codes in the Interview Transcripts

Code no.	Code	Description of code
1	Brand/product differentiation	Products from the same factory, but differentiated with good-looking packages for different groups of customers
2	Separate management of business	Production process from the same factory, but separate management under different brands
3	Attractive product	Thai dessert products with beautifully designed packages

Code no.	Code	Description of code
4	Re-packing	Re-packing of Thai dessert products from suppliers
5	Attractive package	Beautifully designed package to contain Thai dessert products
6	Confidence in business growth	Confidence that the Thai dessert business can grow sustainably
7	Cleanliness of Thai dessert product	Clean, hygienic and standardised production
8	Elevation of product	Elevating Thai dessert products to attract the target group of medium-end and high-end customers
9	Extension of customer groups	Accessed by different groups of customers in the current customer base
10	Improvement depends on business survival	The notion of improvement is based on business survival
11	Customer needs	Feedback is obtained from customers for improvement of Thai dessert products
12	Focus on products and marketing, but not the production process	More focus on product, customers and marketing, rather than the production process
13	Suppliers of product	Suppliers produce and deliver Thai dessert products
14	Supplier management	Supplier management and control to produce and deliver Thai dessert products and raw materials in accordance with the firm's requirements
15	Problems with Thai dessert products	Issues related to Thai dessert production
16	Informal network	Groups of people or networks with whom the firm owner is familiar for consultation
17	Creativity of product development	Product development, in terms of physical features and cooking ingredients, so that products can be differentiated from the competitors' products.
18	Attitude to government agencies	Feedback to the access of the government agency
19	External knowledge access	Firm's access to external knowledge sources

Code no.	Code	Description of code
20	Current trends in consumption	Current customers' requirements regarding Thai dessert products
21	Technology in production	The use of technology and production machines to facilitate the production process
22	Assigning responsibility to employees	Assigning responsibility to trusted employees for NPD
23	E-commerce	Selling Thai dessert products via a website or social network
24	Communication on improvement	Communication from the owners to employees about ideas and plans for NPD projects
25	Influence of sales volume	Product development with a focus on the types of Thai desserts having high sales volumes
26	Lack of close network	Lack of close relationship network with other firms for consultation regarding product development
27	Demand for support from governmental agencies	The firm's demand to get support from government agencies
28	Meetings	Meetings between owners/executives and employees to talk about production problems and issues in product development
29	Openness to new ideas	Openness to new and creative ideas about product development
30	Employees' willingness	Employees' willingness to participate in the firm's NPD activities
31	Taking feedback from employees	Openness to employees' feedback and views on the launch of new projects of product development
32	Technology and machines in support of innovation	The use of technology and machines in support of innovation
33	Decoration of Thai dessert shops	Decoration of Thai dessert shops to attract customers
34	Learning from mistakes	Learning from the mistakes of previous projects/activities in NPD to improve the current project
35	Time consumed for learning	Disadvantage of technology in terms of time consumed for learning

Code no.	Code	Description of code
36	Employee's willingness to learn about technology	Open-mindedness of employees to learn about new technology that is different from the routines they are familiar with
37	Monitoring the quality of Thai dessert products	Sampling of Thai dessert products at a research institute to examine the parameters related to the quality of products
38	Formal network	External knowledge sources that the firm owners are not familiar with in person for consultation <u>Note:</u> This code is different from code 16
39	Fame of brand	Popularity of the brand
40	Internal R&D	In-house R&D
41	Consumer behaviour	Customers' pattern of consumption of Thai dessert products
42	Monitoring competitors	Monitoring competitors in the Thai dessert market, e.g. selling price, competitors' new products, etc.
43	Building the organisation's image	Building a good image of the organisation, using the concept of social responsibility and customer service
44	Placing importance on employees	Placing importance on employees having the potential to facilitate NPD activity
45	Communicating vision	Communicating the company vision to the employees
46	Improvement through production standards	The use of production standards in the food industry to develop the production process and quality
47	Improvement of packaging	Issues in the improvement of packaging, e.g. design, shelf life extension of products, etc.
48	Change before you must change	Awareness of the necessity of NPD before a critical situation in business survival arises
49	Worthiness of technology investment	Evaluation of investment in technology or production machines
50	Competitive competent	Issues in NPD to increase competitiveness
51	Customer feedback	Feedback from customers for the improvement of products

Code no.	Code	Description of code
52	Suppliers' introduction of new raw materials	Raw materials recommended by suppliers to facilitate the quality of Thai dessert products
53	Business alliance	Company's partners to help and support the development of Thai dessert products
54	Employee's skills/knowledge/experience	Employees' abilities relying on skills, knowledge and experience
55	Suppliers of raw materials	Suppliers delivering raw materials in the production process of Thai dessert <u>Note:</u> This is different from code 13
56	Production process standards	Standards of production process in the food industry, such as GMP, HACCP, etc.
57	Improvement of existing resources	The firm's NPD based on its existing resources
58	Measurement of cooking ingredients to standardise the production process	Measuring the cooking ingredients to standardise the process of production
59	Quality assurance standards	Quality assurance standards
60	The use of machines in the production process	The use of machines in the process of producing Thai desserts
61	Use of technology depends on customers' consuming behaviours	The decision of using technology in support of product development is considered in terms of customers' consuming behaviours
62	Product quality and improvement	Focus on product quality and product development
63	Brand image	Good brand image
64	Customer complaints	Negative feedbacks and comments from customers
65	Brand loyalty	Customers' brand loyalty
66	Openness to the knowledge of science and technology	Openness to the use of science and technology in product development
67	Continuous improvement	Improvement of new products introduced in the market
68	Vision of executives	The direction of NPD depends on the firm executives' vision

Code no.	Code	Description of code
69	Differentiation in terms of customer groups	Differentiation of products from the same factory using different packaging and brands, to serve different groups of customers

6.4.2 Searching for Themes

After the completion of coding, all codes and their related data extracts were sorted to form themes and sub-themes. At this stage, the themes and sub-themes still required review. After the review of the themes and sub-themes through the data extracts and the entire data set (Braun & Clarke, 2006), the final six themes were regarded as the emerging themes in relation to RQ1. These six themes were brand building, product quality, improvement, employees, technology management and openness. Product quality, improvement, employees and openness were supported by sub-themes, while brand building and technology management were not. Each theme was described based on the data extracts and bound with the codes sorted to the relevant theme. Table 6.4 presents the definition of the themes and coding of the text segments.

Table 6.4

Definition of Themes and Supporting Codes

Theme	Sub-theme	Code no.	Code	Definition of Theme
1. Brand building				Demand for brand image building through products and the organisation
		1	Brand/product differentiation	
		2	Separate management of business	
		3	Attractive product	
		4	Re-packing	
		5	Attractive package	
		8	Elevation of product	
		33	Decoration of Thai dessert shops	
		39	Fame of brand	
		43	Building the organisation's image	
		63	Brand image	
		65	Brand loyalty	
		69	Differentiation in terms of customer groups	
2. Product quality				Demand for access to a production process standard, leading to hygiene and cleanliness of products

Theme	Sub-theme	Code no.	Code	Definition of Theme
		7	Cleanliness of Thai dessert product	
		56	Production process standards	
	2.1 Quality management system	37	Monitoring the quality of Thai dessert products	
		46	Improvement through production standards	
		58	Measurement of cooking ingredients to standardise the production process	
		59	Quality assurance standards	
	2.2 Supplier management	13	Suppliers of product	
		14	Supplier management	
		55	Suppliers of raw materials	
3. Improvement				Demand for improvement in business survival and for said improvement to rely upon customer requirements
		6	Confidence in business growth	
		15	Problems with Thai dessert products	
		25	Influence of sales volume	
		34	Learning from mistakes	
		40	Internal R&D	

Theme	Sub-theme	Code no.	Code	Definition of Theme
		57	Improvement of existing resources	
		67	Continuous improvement	
		68	Vision of executives	
	3.1 Business survival	10	Improvement depends on business survival	
		42	Monitoring competitors	
		48	Change before you must change	
		50	Competitive competent	
		62	Product quality and improvement	
	3.2 Customer satisfaction	9	Extension of customer groups	
		11	Customer needs	
		12	Focus on products and marketing, but not the production process	
		20	Current trends in consumption	
		41	Consumer behaviour	
		17	Creativity of product development	
		47	Improvement of packaging	
		64	Customer complaints	

Theme	Sub-theme	Code no.	Code	Definition of Theme
4. Employees				Employees are internal support resources for improvement and innovation. The characteristics defining their support in product development are skills, knowledge, experience and willingness to participate.
		44	Placing importance on employees	
		30	Employees' willingness	
	4.1 Participation	24	Communication on improvement	
		28	Meetings	
		31	Taking feedback from employees	
		45	Communicating vision	
	4.2 Skills and knowledge	54	Employee's skills/knowledge/experience	
	4.3 Trust	22	Assigning responsibility to employees	
5. Technology management				Technology and machines are tools to support and improve the efficiency of production processes and new products
		21	Technology in production	
		23	E-commerce	

Theme	Sub-theme	Code no.	Code	Definition of Theme
		32	Technology and machines in support of innovation	
		35	Time consumed for learning	
		36	Employee's willingness to learn about technology	
		49	Worthiness of technology investment	
		60	The use of machines in the production process	
		61	Use of technology depends on customers' consuming behaviours	
6. Openness				Access to external sources to gain new ideas and knowledge for the improvement of production processes and new products
		16	Informal network	
		38	Formal network	
		29	Openness to new ideas	
		19	External knowledge access	
	6.1 Openness to customers	51	Customer feedback	
	6.2 Openness to suppliers	52	Suppliers' introduction of new raw materials	

Theme	Sub-theme	Code no.	Code	Definition of Theme
	6.3 Openness to knowledge/ideas/technology	18	Attitude to government agencies	
		26	Lack of close network	
		27	Demand for support from governmental agencies	
		66	Openness to the knowledge of science and technology	
	6.4 Openness to business alliances	53	Business alliance	

6.5 Findings: Emerging Themes

The results of the thematic analysis revealed six emerging themes in relation to RQ1. Among the six themes, three themes directly answered RQ1: brand building, product quality and improvement. The other themes, employees, technology management and openness, were dominant themes. These unexpectedly emerged from the interviews in relation to RQ1, in terms of supporting factors being concerned along with the motives, to lead to successful NPD activity. Employees and technology management are internal factors that support NPD activity. Openness is considered a type of OI practice that brings knowledge from external sources to facilitate NPD within a firm. Both internal factors (employees and technology management) and the type of OI practice (openness) were two key issues that Thai dessert SMEs were concerned with regarding the perspective of motives. The categorisation of the six themes is presented in Table 6.5

Table 6.5

Categorisation of Themes

Category	Themes and definitions
Motives for inbound OI access	Theme 1 - Brand building: Demand for brand image building through products and the organisation.
	Theme 2 - Product quality: Demand for access to a production process standard, leading to hygiene and cleanliness of products. Sub-theme 1: Quality management system Sub-theme 2: Supplier management
	Theme 3 - Improvement: Demand for improvement in business survival and for said improvement to rely on customer requirements. Sub-theme 1: Business survival Sub-theme 2: Customer satisfaction
Internal factor	Theme 4 - Employee: Employees are internal support resources for improvement and innovation. The characteristics defining their support in product development are skills, knowledge, experience and willingness to participate. Sub-theme 1: Participation Sub-theme 2: Skills and knowledge Sub-theme 3: Trust
	Theme 5 - Technology management: Technology and machines are tools to support production processes and to improve the efficiency of production processes and new products.

Category	Themes and definitions
Type of OI practice	<p>Theme 6 - Openness: Access to external sources to gain new ideas and knowledge for the improvement of production processes and new products.</p> <p>Sub-theme 1: Openness to customers</p> <p>Sub-theme 2: Openness to suppliers</p> <p>Sub-theme 3: Openness to knowledge/ideas/technology</p> <p>Sub-theme 4: Openness to business alliances</p>

To further explain the definition of each theme, data extracts supporting these are presented in the following sections.

6.5.1 Theme 1: Brand Building

Brand building was an emerging theme as Thai dessert SMEs' motive in inbound OI access, in support of NPD. Per the data extracts that formed the theme, brand building was defined as the demand for brand image building through products and the organisation. Examples of data extracts reflecting the brand building theme are presented below:

A respondent from a Thai dessert SME referred to a brand as something more than a logo, because it is in a customer's mind:

Brand building needs time. Some people think about a brand and that it means a logo.

Actually, the brand is something that is inside customers' mind. The customers have to feel that they are owners. (Int. 6)

Another respondent from a Thai dessert SME referred to a brand as something that reflects the identity of the products, which the customers remember:

Most of my customers tend to remember that my brand has packaging in such a style.

I used to change the style of packaging to be more modern. However, after this change, some customers are not sure that this is my brand. (Int. 8)

A respondent from a Thai dessert SME referred to a brand as something that reflects the famous goods of the province:

My brand and shop are like the symbols of this province. The customers who would like to eat my desserts must travel to only this province to buy them. (Int. 9)

Another respondent from a Thai dessert SME talked about the brand in terms of customer loyalty:

Initially, when I had just opened my Thai dessert shop, I needed to spend time to build customers' brand loyalty to my products. (Int. 6)

Several respondents from the Thai dessert SMEs referred to a brand in terms of the fame of the brand and its influence on the volume of sales:

There are several small producers offering to sell their Thai dessert products to me for labelling under my brand. However, I refuse this offer. I do not know their production process. I do not know what they add to the product during production. Uhm...I do not want my brand to lose its fame. (Int. 4)

My brands have existed in the market for 30 years. Thus, when I produce or improve something new, it can always be sold. (Int. 3)

Mostly, customers will consider which brands are famous and producing delicious Thai desserts. If Thai dessert products are labelled under famous brands, they can be sold in high volumes. (Int. 5)

Some respondents from the Thai dessert SMEs talked about brand differentiation for products produced from the same factory:

Thai dessert products under my brand and my father's brand are produced from the same factory, that is, my father's factory. However, the business management of both brands is separate. I manage the production of Thai desserts and the business growth under my brand, while my father manages that under his brand. (Int. 1)

I sell Thai dessert products labelled with my own brand to small famous souvenir shops of Thai desserts in this province... for the large Thai desserts souvenir shop that I have the deal with them with being as the supplier of products, they will label these products under their own brand. (Int. 5)

Several respondents from the Thai dessert SMEs referred to a brand as portraying an image. Two key aspects are related to a brand image: the target groups of customers and customer satisfaction:

Thai dessert products under my brand and my father's brand are produced from the same factory, that is, my father's factory...My target groups of customers are different from my father's. I build my own brand for being sold on shelves in department stores. (Int. 1)

Most Thai dessert shops in this province attract customers from tours or van groups. However, this is not for me. I do not focus on these customer groups. I focus on my target groups of customers with a niche market. (Int. 6)

Some customers buy Thai dessert products for others. They buy them as gifts... I want the ones receiving the gifts to be impressed with the attractive products when they receive my brand of Thai dessert gifts. I want to give the gift receivers a memorable experience when consuming my brand of Thai dessert gifts. (Int. 6)

Several respondents from the Thai dessert SMEs referred to the building of a brand image through the use of attractive packaging and the organisation's image:

My father mainly focused on wholesale trading, rather than creating added value with a good-looking image for the products. Thai desserts under my production line have beautifully designed packages and are labelled with my brand. (Int. 1)

I don't think I sell only Thai desserts, I sell an image too. Nowadays, some groups of tourists visiting my Thai dessert shop conduct some activities together, such as workshops, rallies or site visits at my factory. (Int. 2)

I am now concerned about the groups of disabled customers... I am also concerned about providing a toilet for infants to change their napkins...I think if I am intending to focus on medium-end and high-end customers, I should provide them with these facilities. (Int. 6)

6.5.2 Theme 2: Product Quality

In addition to brand building, product quality was an emerging theme as Thai dessert SMEs' motive in inbound OI access, in support of NPD. Per the data extracts that formed the theme, product quality was defined as the demand for access to a production process standard, leading to hygiene and cleanliness of products. Based on the findings in this research, the product quality

theme was supported by two notable sub-themes: a quality management system and supplier management. These two sub-themes represent different perspectives but share the same central concepts representing the product quality theme. A quality management system was a sub-theme related to the production process standard with the quality assurance system, while supplier management was a sub-theme related to supplier management in the delivery of qualified goods, as required by Thai dessert SMEs. Examples of data extracts reflecting the product quality theme are presented below:

Most Thai dessert SME interviewees referred to the product quality approach in their production processes:

I don't reduce the quality of my Thai dessert products. Cost reduction in production can be done, but this means the quality of products will be reduced consequently (Int. 2)

I always tell my employees that we must maintain the quality. (Int. 3)

I focus on the quality. I do not add preservatives to my Thai dessert products. The addition of these preservatives results in a change in taste, leading to a bad taste. The additives lead to changes in the quality of Thai dessert products. (Int. 4)

6.5.2.1 Sub-Theme 2.1: Quality Management System

A quality management system was a notable sub-theme supporting the product quality theme in this study. Examples of data extracts reflecting the quality management system sub-theme are presented below:

Several respondents from the Thai dessert SMEs referred to product quality in terms of production process standards:

I want to develop my factory to access the standard. (Int. 1)

I feel the issue of contaminants in Thai dessert products may arise in the future. This might be problematic for sales in the future. For these reasons, I intend to achieve the hygiene standard in Thai dessert production. (Int. 1)

I started my business in 1997. At the starting point, it was a family business. Afterwards, it was transformed into the group of OTOP products. Therefore, it is important to develop the production process to achieve the standard. (Int. 8)

Some respondents from the Thai dessert SMEs referred to the production process standard in terms of the measurement of cooking ingredients during production:

All procedures within my factory must be noted and the cooking ingredients must be measured. Even in the step of baking the Thai dessert, the temperature and time will be different for each type of Thai dessert. Thus, the temperature and time will have to have a set standard in order to control the production process for each type of Thai dessert. These procedures of standardisation are important. (Int. 2)

The cooking of Thai desserts relies on the use of indigenous knowledge. Thus, some cooks are not concerned with the measurement of ingredients. The measurement of ingredients is not important or necessary for some Thai dessert cooks, as they use skills and experience... However, if you have to cook in mass quantity, you need to use the exact quantity to control quality. (Int. 2)

I have the recipe for each type of Thai dessert. I measure each cooking ingredient in order to produce Thai desserts with the same taste every time. (Int. 10)

In a different view, some respondents from the Thai dessert SMEs referred to the production process standard as the same operation for every instance of production:

I view every step of the production as routine, with the same method and the same recipes; therefore, the Thai desserts produced should be the same every time. (Int. 3)

A respondent from a Thai dessert SME referred to product quality as the approach of GMP:

After I accessed the GMP, it helped solve various problems in the production process. The cleanliness is the result of GMP access... I achieved the standard of international GMP to implement in my factory because I would like to produce products with good quality. (Int. 6)

Several respondents from the Thai dessert SMEs talked about the control of product quality through the regulation of related government agencies. For example:

My Thai desserts are OTOP products. Thus, related government agencies, such as the agency of community development and the agency of industry, visit my factory regularly in order to monitor the production process every year. They visit about two times per year. (Int. 3)

My factory has gained certification from the Thai Food and Drug Administration (Thai FDA). With the Thai FDA, I must give samples of my Thai desserts to the regulators to be tested every three to four months. (Int. 5)

I have obtained certification from the Thai FDA. The staff from Thailand's FDA generally monitor my factory every three years. They suggested I improve some areas of the production site, as per the standard, and I am working towards this improvement. (Int. 7)

6.5.2.2 Sub-Theme 2.2: Supplier Management

Supplier management was a notable sub-theme supporting the product quality theme in this study. In the Thai dessert industry, there are two types of suppliers: suppliers of raw materials and suppliers of products. Examples of data extracts reflecting the supplier management sub-theme are presented below:

Several respondents from the Thai dessert SMEs talked about the approach of product quality in terms of management for the suppliers. This was regarding both suppliers of raw materials and suppliers of products delivering high-quality goods to them. For instance:

I sometimes have access to their production site, in order to understand the production process. I evaluate their production process and the surrounding environment of the production site to determine whether it is hygienic enough and acceptable. If it is acceptable, I order Thai dessert products from them... If I cannot control and manage them to produce Thai desserts under the hygienic conditions I require, I promptly refuse to order Thai dessert products from them, although they can cook delicious Thai desserts. (Int. 1)

When I start ordering raw materials, I specify my requirements to suppliers regarding the characteristics of the raw materials that I require... I provide the specifications of the raw

materials that I want. Afterwards, the suppliers control and manage their own process in order to deliver raw materials with the quality I requested. (Int. 2)

When I touch the coconuts, I have enough skills to know whether they are young coconuts or old coconuts. In case the suppliers deliver old coconuts instead of young coconuts, I notify them with a warning that I might change my mind and not buy raw materials from them if they cannot deliver coconuts with the characteristics I require. As a result, the suppliers try to adapt themselves to control the quality of raw materials in accordance with my requirements. (Int. 5)

A respondent from a Thai dessert SME talked about supplier management in terms of contact with various suppliers to balance raw material management:

I can partly control the quality of raw materials. I have three suppliers of raw materials... Contacting various suppliers helps create a balance and reduces the risk of a shortage of raw materials. If one of the suppliers cannot provide raw materials that meet my requirements, my other suppliers can support me. (Int. 2)

6.5.3 Theme 3: Improvement

Besides brand building and product quality, improvement was an emerging theme in this research. This theme related to Thai dessert SMEs' motive in inbound OI access in support of NPD. Per the data extracts that formed the theme, improvement was defined as the demand for improvement for business survival and for said improvements to rely upon customer requirements. Based on the findings in this research, the improvement theme was supported by two notable sub-themes: business survival and customer satisfaction. These two sub-themes represent different perspectives but share the same central concepts representing the improvement theme. Business survival was related to improvements to sustain the business, while customer satisfaction was related to improvements to satisfy the customers. Examples of data extracts reflecting the improvement theme are presented below:

Most of the interviewees from the Thai dessert SMEs talked about how to approach the improvement of Thai dessert products to sustain their business. For instance:

The Thai dessert industry needs to adapt itself before it reaches the situation of being forced to adapt. One does not need to ask when this change will end. Change is the starting point, which is endless. (Int. 6)

Several respondents from the Thai dessert SMEs and a respondent from the large company talked about improvement as the addition of something new into existing things. For example:

Actually, the old is not wrong. We should think more about how we can mix the old and the new together. (Int. 6)

In general, it is relevant to the improvement in the resources that we have. (Int. 4)

A respondent from a Thai dessert SME talked about improvement with the aim of attracting a new target group of customers:

I would like to improve the status of Thai desserts to attract either the medium-end or high-end market. (Int. 1)

My main focus is on the domestic market in Thailand now. However, I also plan to extend to the group of ASEAN countries. (Int. 1)

A respondent from a Thai dessert SME talked about improvement with a focus on some types of Thai desserts having a high impact on sales volume:

I would like to highly improve the Toddy palm cake because it has a high volume of sales. I sold about 30 boxes per day. There are around 200 pieces of Toddy palm cake per box. (Int. 1)

Several respondents from the Thai dessert SMEs talked about the issue of improvement in light of the problematic facets of Thai desserts. For instance:

The key problem of Thai desserts is the shelf life... I think that there are many problems, such as the short shelf life of Thai desserts and the high cost of raw materials, including inconsistent availability of raw materials. (Int. 2)

I face the problem of short shelf life of desserts. I would like to know about technology to help extend shelf life. (Int. 7)

Concerning the issue of improvement, the interviewees from the government agencies talked about the direction of improvement in Thai desserts. For instance:

It might be a stable market. As I said, the main market for the Thai dessert industry is the gift-related market. Generally speaking, domestic customers still consume. However, if you ask me whether it will boom, I think it will not. It is a stable market. (Int. 11)

I think that Thai dessert SMEs will be more potent. I think international customers consume Thai desserts, but we need to adapt some tastes in their favour. (Int. 12)

6.5.3.1 Sub-Theme 3.1: Business Survival

Business survival was a notable sub-theme supporting the improvement theme in this study. Examples of data extracts reflecting the business survival sub-theme are presented below:

Several respondents from the Thai dessert SMEs referred to the necessity of improvement for business survival. For instance:

I would quote an ex-CEO of GE (General Electric), Jack Welch. He said ‘change before you have to’. You must think of change in advance. If you wait until the time of change arrives, you are likely to be a victim of change. (Int. 6)

If we cannot improve to be more competitive, our business might be extinct in the future. (Int. 6)

If my Thai dessert products are sold in the same style and there is no improvement, I think that my products might be extinct from the market soon. (Int. 2)

When I adapted my dessert products with new ingredients, other producers adapted their products in the same way. Therefore, I must try to move further to escape from them. (Int. 3)

The interviewee from the NIA talked about the necessity of improvement for sustaining a business:

Innovation is risky. However, if the entrepreneurs do not think about innovation, their business may collapse. If they do not think of producing something new, this means they are waiting for the collapse of their business. (Int. 13)

Some respondents from the Thai dessert SMEs talked about improvement in terms of the potential of the industry to sustain itself in the market. Therefore, improvement is required for a competitive advantage and business survival. For instance:

I think that there is no way for Thai dessert products to be extinct. They will exist sustainably forever, especially in Phetchaburi province, which is the original famous site of Thai dessert products. (Int. 1)

I don't think the Thai dessert business will drop. Thai desserts can be sold continuously, but it might not be a very flourishing business. In the period of special festivals, they can be sold. (Int. 3)

I think the market of Thai desserts can grow, but not by leaps and bounds. The growth of Thai dessert business seems likely. (Int. 6)

6.5.3.2 Sub-Theme 3.2: Customer Satisfaction

Customer satisfaction was a notable sub-theme supporting the improvement theme in this study. Examples of data extracts reflecting the customer satisfaction sub-theme are presented below:

Several respondents from Thai dessert SMEs referred to improvement in response to customer satisfaction. For instance:

I also view that the healthy trend is more relevant in the present situation. Thai desserts should be improved with the reduction of sweetness. (Int. 1)

Customers in the modern age do not like food cooked with too much sugar. Therefore, I improved the taste of my Thai desserts with reduced sweetness or no sugar. (Int. 3)

When I order some types of Thai desserts from other suppliers in bulk... I think that if these Thai desserts are packed in a big bag, they might not be attractive to customers. Therefore, I re-pack them into small bags with the style of assortment variety in each pack. (Int. 6)

I use the zip lock bags for packing my Thai desserts. I use these bags because customers can close the end of package comfortably when they cannot eat the entire dessert in one go. (Int. 6)

I have done this business for 30 years. I thought that my customers might feel bored with the same goods. I have adapted my desserts in terms of the flour and filler. (Int. 3)

New fillings of my desserts come from the requirements of customers. (Int. 7)

Some respondents from the Thai dessert SMEs talked about customer satisfaction reflected by customer complaints and purchase orders. For instance:

If customers do not have any comments or suggestions, it indicates that the Thai desserts produced are acceptable to the customers. (Int. 5)

However, if the customers comment on why we do not produce Thai desserts in other styles, it means that we need to improve. It depends on the customers' requirements. (Int. 5)

I think that customers are satisfied. If you ask me how I know, I notice from the purchase orders. (Int. 8)

6.5.4 Theme 4: Employee

Based on the findings in this study, the theme of employee emerged as an internal factor supporting NPD activity. Per the data extracts that formed the theme, an employee is defined as an internal support resource of an organisation to support improvement and innovation. Based on the findings of this study, the employee theme is supported by three notable sub-themes: participation, skills and knowledge, and trust. These three sub-themes represent different perspectives but share the same central concepts representing the employee theme. Participation was a sub-theme related to the involvement of employees in NPD activity. Skills and knowledge was a sub-theme related to the employees' ability to support NPD activity. Trust was a sub-theme related to employers' trust in employees supporting NPD activity. Examples of data extracts reflecting the employee theme are presented below:

Employee was mentioned by the majority of respondents from the Thai dessert SMEs, with an emphasis on the role of employees in supporting NPD activity. For example:

If I want to improve products in my new line, I ask the employees whether they think it will work or not. (Int. 2)

I follow the principle that every employee has to take part in improvement of their own work. I listen to and accept ideas from all employees...I do things in such a way in order to get opinions and views from them, especially from employees who are accustomed to the working areas of operation in every-day business. (Int. 2)

If they would like to improve something and suggest the aspect of improvement, I listen to them. (Int. 3)

If my employees would like to suggest new ideas, they talk to me. (Int. 1)

6.5.4.1 Sub-Theme 4.1: Participation

Participation was a notable sub-theme supporting the employee theme in this study. Examples of data extracts reflecting the participation sub-theme are presented below:

Several respondents from the Thai dessert SMEs talked about giving employees the opportunity to participate in NPD activities. For instance:

For the issue of improvement or change for new things, I mostly think and search for information myself. Afterwards, I discuss with my employees. If they think it will not work, I stop the change. (Int. 1)

If I want to improve products in my line, I ask the employees whether they think it will work or not. (Int. 2)

I do not keep these ideas to myself, but I communicate them to my employees to understand, perceive and create an understanding together. I explain why I have this new idea...I think that employees' willingness is very important because it will automatically encourage them to create innovative work as per their capability. (Int. 2)

They participate to support me. The creation of new products is based on my ideas initially. Afterwards, I do consult my staff teams, asking whether the taste is OK, or whether this new packaging is okay. (Int. 8)

Some respondents from the Thai dessert SMEs talked about the channels provided for employees to participate. For instance:

We have a meeting on Mondays. If they have new ideas to offer, they will ask me to consider. I take part in brainstorming sessions with them on that day, to check whether it works. (Int. 6)

6.5.4.2 Sub-Theme 4.2: Skills and Knowledge

Skills and knowledge was a notable sub-theme supporting the employee theme in this study.

Examples of data extracts reflecting the skills and knowledge sub-theme are presented below:

Several respondents from the Thai dessert SMEs talked about their employees' skills and knowledge in producing new products. For instance:

I think that Thai dessert cooking is an artform... I think that cooking Thai desserts need to rely on both knowledge and skills. (Int. 6)

I noticed that the employees of our partner company cannot cook delicious Thai desserts like my employees and myself, although we teach them... Generally speaking, cooking Thai dessert is an artwork and difficult to copy and imitate. (Int. 6)

Employees need to use their knowledge in both science and art. Although there are standardised procedures in terms of the measurement of cooking ingredients... I would like to say that employees need to use their own skills, including their experiences to work in combination... I think employees' skills are more important than their education... However, education is relevant. Someone with on-the-job skills, but no high-level education, might not be able to improve anything more than their routine work. (Int. 2)

I think these employees do not have knowledge to help with improvement. They only think of what they can do in their routine. (Int. 1)

A respondent from the large company talked about the importance of employee education levels in supporting NPD activity:

In my research and development (R&D) team, most staff graduated with a bachelor's degree. A small proportion graduated with a master's degree and no staff have a PhD. I am the only person assigning the work to them in terms of research... I think that it is difficult to make them think by themselves and propose new ideas. (Int. 14)

I think R&D staff should have a broad knowledge in the field and they need to read several academic journals. (Int. 14)

A respondent from a Thai dessert SME reflected on the need for high skills for producing Thai desserts:

When I grasp the coconuts, I have enough skills to know whether they are young coconuts or old coconuts. (Int. 5)

6.5.4.3 Sub-Theme 4.3: Trust

Trust was a notable sub-theme supporting the employee theme in this study. Based on the findings of this study, trust refers to an employer's trust given to employees that they can facilitate NPD activity. An example of a data extract reflecting the trust sub-theme is presented below:

A respondent from a Thai dessert SME talked about the trust involved when assigning the burden related to NPD to employees who have potential:

I will consider and look at which employees have the potential to help me with improvement. (Int. 2)

6.5.5 Theme 5: Technology Management

Based on the findings in this study, the theme of technology management emerged as an internal factor supporting successful NPD. Per the data extracts that formed the theme, technology management is defined as technology and machines used to support production processes and to improve the efficiency of production processes and new products. Examples of data extracts reflecting the technology management theme are presented below:

Several respondents from the Thai dessert SMEs talked about the use of technology in support of NPD activities and the importance of technology management. For instance:

I think technology and management must go together in support of innovation. (Int. 6)

However, if you ask me which one is more important between management and technology, I think that it should be management. I believe that people who manage something must already have a concept of technology in their mind. Generally speaking, management must lead, not technology. (Int. 6)

I think that technology, innovation and quality are related... if I would like to create innovative Thai desserts, I need to employ technology to support quality... Technology supports innovation to achieve good quality innovative products. (Int. 2)

Without technology, innovation cannot happen. (Int. 9)

I think technology and innovation are essential for management in this modern era, as they help us work faster and more comfortably. (Int. 1)

Some respondents from the Thai dessert SMEs talked about investing in technology to support the production process, including the worth and the necessity of using technology. For example:

I invested in the technology of machines to use in my factory. (Int. 9)

I sometimes buy technology from these exhibition shows. (Int. 1)

For example, the cost of new machines is approximately 25 million baht. I think that it is not worth investing so much compared with the profit... I need to look at the market size too. (Int. 6)

I consider the economic benefits. Moreover, I consider customer requirements as well. If customers want to buy Thai desserts for themselves to eat, not as gifts for others, I think fresh Thai dessert will be better. No need to put an oxygen absorber in the package. (Int. 2)

If they want to buy Thai desserts as gifts for others, an oxygen absorber is put into the package in order to extend product shelf life. (Int. 2)

I used a vacuum packing machine. If you ask me whether it worked, I think it was not an essential technology because most customers tend to tear the package to eat at that time.

(Int. 3)

Some respondents from the Thai dessert SMEs talked about the obstacles related to employees' use of technology when the firms adopt new technology. For instance:

Technology affects the changes in the system of production, and it is essential to build an understanding among employees as practitioners to accept revisions in the working process. (Int. 1)

Sometimes, it takes time to understand the usage. (Int. 1)

6.5.6 Theme 6: Openness

Based on the findings in this study, the theme of openness emerged as a type of open innovation practice supporting successful NPD. Per the data extracts that formed the theme, openness is defined as access to external sources to gain new ideas and knowledge for the improvement of production processes and new products. Based on the findings in this study, openness is supported by four notable sub-themes: 1) openness to customers; 2) openness to suppliers; 3) openness to knowledge/ideas/technology; and 4) openness to business alliances. These four sub-themes represent different perspectives but share the same central concepts representing the openness theme. Openness to customers was a sub-theme regarding access to customer-based external sources. Openness to suppliers was a sub-theme regarding access to supplier-based external sources. Openness to knowledge/ideas/technology was a sub-theme regarding access to external sources related to an institutional source or other channels of knowledge or data, such as meetings, the internet and computer databases. Openness to business alliances was a sub-theme regarding co-operation with external agents. Examples of data extracts reflecting the openness theme are presented below:

I still do not know what to do. I am not startled by issues. If someone suggests something interesting to be done, I might do it. (Int. 6)

If some organisations can give me some advice, I open my mind to listen. However, I need to consider. If I think that advice will work, I will implement it. (Int. 2)

6.5.6.1 Sub-Theme 6.1: Openness to Customers

Openness to customers was a notable sub-theme supporting the openness theme in this study. An example of a data extract reflecting the openness to customers sub-theme is presented below:

If customers do not have any comments or suggestions, it indicates that the Thai desserts produced are acceptable to the customers. However, if the customers comment on why we do not produce Thai desserts in other styles, it means that we need to improve. (Int. 5)

6.5.6.2 Sub-Theme 6.2: Openness to Suppliers

Openness to suppliers was a notable sub-theme supporting the openness theme in this study. An example of a data extract reflecting the openness to suppliers sub-theme is presented below:

I learn from the suppliers and the internet. Sometimes, I learn from visiting exhibitions. (Int. 2)

6.5.6.3 Sub-Theme 6.3: Openness to Knowledge/Ideas/Technology

Openness to knowledge/ideas/technology was a notable sub-theme supporting the openness theme in this study. Examples of data extracts reflecting the openness to knowledge/ideas/technology sub-theme are presented below:

I do some research online to find what I should do for standardised production... Mostly, I check websites and access various sources to apply in my own style as appropriate... Furthermore, I attend exhibition shows on technology every year. (Int. 1)

I used to visit the exhibition of SMEs and OTOP held by some government agencies. (Int. 2)

A respondent from a government agency said that Thai dessert SMEs should be open to knowledge and technology from external sources to support NPD:

It is about the adoption of scientific and technological knowledge to use. (Int. 11)

6.5.6.4 Sub-Theme 6.4: Openness to Business Alliances

Openness to business alliances is a notable sub-theme supporting the openness theme in this study. An example of a data extract reflecting the openness to business alliances sub-theme is presented below:

My business alliance is based on the same business of Thai dessert... our dominant lines of Thai dessert types are different. However, we share information regarding technology and knowledge with each other. We share the method of cooking to create delicious Thai desserts in which we have expertise. (Int. 6)

6.6 Linkage of Themes

Six themes emerged in relation to RQ1. These included brand building, product quality, improvement, employees, technology management and openness. Three themes directly answered RQ1 as the motives: brand building, product quality and improvement. The other three themes involved internal factors and the type of OI practices. Internal factors covered two themes – employees and technology management. The types of OI practice covered one theme – openness. However, the themes of employees, technology management and openness were related to RQ1 because all six themes are inter-related and bound together in the findings answering RQ1. The linkage of these six themes are first discussed along with related categories, and then across categories to enable to see the linkage in all.

Motives

The three motive-related themes—brand building, product quality and improvement—are closely related. Brand is a broad term that might refer to a brand name or logo, or elements and activities that the manufacturers assign to a particular product, service or idea, to inform the market (Vranešević & Stanec, 2003). Brands help to differentiate the goods and services of one seller or organisation from competitors (Fan, 2005; Porter & Claycomb, 1997). Based on the findings in this study, brand building reflects the ‘brand image building’ through products and organisations.

Brand image involves brand loyalty, which leads to customer loyalty (Lin & Wang, 2006). Brand image is also related to quality (Wood, 2000). This is because brand image can be regarded as a type of quality, in terms of subjective quality. Subjective quality refers to the quality perceived by consumers (Grunert, 2005, p. 371). This implies that the brand building theme, through the brand image, is closely related to the product quality theme. Quality means superiority or excellence (Zeithaml, 1988). Quality is a key element helping to retain current customers through customer loyalty (Demirbag, Tatoglu, Tekinkus, & Zaim, 2006). As brand building through brand image results in brand loyalty and leads to customer loyalty, this implies that there is a close relationship

between the themes of product quality and brand building, in that they are both related to customer loyalty.

Improvement, as another motive-related theme, might be viewed as the type of innovation relying on incremental innovation. Incremental innovation refers to something improved (Anahita et al., 2012). Incremental innovation involves incremental improvements to existing products/processes and contributes to continuous improvement (Peng, Schroeder, & Shah, 2008). Thus, improvement is closely related to incremental innovation. Incremental innovation generally involves serving existing customers, rather than prospective customers (Atuahene-Gima, 2005; Xu, 2014). This implies that the improvement theme has the approach of serving existing customers. Relying on this research, the improvement theme is supported by two sub-themes: business survival and customer satisfaction. In general, the primary objective of an SME is business survival, rather than business growth (Storey, 1994). Focusing on customer satisfaction also results in customer loyalty (Hallowell, 1996; Kandampully & Suhartanto, 2000; Lam, Shankar, Erramilli, & Murthy, 2004). Thus, the improvement theme is closely related to the themes of brand building and product quality, in terms of leading to customer loyalty.

Finally, the discussion on the linkage of the three motive-related themes—brand building, product quality and improvement—leads to a significant connection to customer loyalty. Further discussion of these three themes will be presented in Chapter 9.

Internal Factors

Based on the findings in this study, employee and technology management are two themes related to internal factors. The employee theme is regarded as the primary repository of organisational knowledge, embedded with abilities, intelligence and skills acquired from education and job experience (Smith et al., 2005). A high level of skills and knowledge reflects the expertise of employees (Jacoby, Troutman, Kuss, & Mazursky, 1985). In the context of SMEs, employees' competencies and the relationships with customers are identified as the main drivers for the development of SMEs (Cohen & Kaimenakis, 2007). This significantly reflects the important role of employees in SMEs. Technology management, as another theme related to internal factors, is identified as a critical strategic asset and an integral driver of innovation (Prajogo & Ahmed, 2006; Zhao, Tong, Wong, & Zhu, 2005). Employees and technology management both support successful NPD.

Types of OI Practice

Openness is linked to OI practice and reflects external search (Laursen & Salter, 2004). Based on this study, openness covers four key sources – customers, suppliers, knowledge/ideas/technology and business alliances. SMEs generally have strong relationships with customers and suppliers. Customer involvement and supplier involvement significantly contribute to firms' internal innovation processes (Gassmann, 2006; Von Hippel, 1988). Openness to knowledge/ideas/technology reflects the extent to which a firm accesses external sources of knowledge (Caloghirou et al., 2004). This sub-theme reflects the access of external sources of knowledge without regarding the specific type of sources. Openness to alliances is a pattern of openness involving any inter-firm cooperation. An alliance refers to 'any interfirm cooperation that falls between the extremes of discrete, short-term contracts and the complete merger of two or more organisations' (Contractor & Lorange, 2002).

The linkage of motives, internal factors and the type of OI practice

Discussion of all six themes, in each of the related categories in light of the literature, leads to the insight of connections between themes within the same category. Linking across categories, three categories are closely related. Relying on the category of motive comprising brand building, product quality and improvement (See Table 6.5), they have the same point of connection, i.e., customer loyalty. The motive needs to be facilitated by openness, which is a pattern of OI practice. Openness enables firms to gain knowledge, ideas and technologies from external sources to support their NPD activities. Consequently, this leads to customer satisfaction and finally customer loyalty. This reflects the significant connection between motives and the types of OI practice.

When implementing openness by accessing external sources, the ideas, knowledge and technologies gained from external sources need to be applied within the firms through the support of internal factors, namely, employees and technology management. This significantly reflects the link between the type of OI practice and internal factors. Employees are an organisational knowledge base, facilitating the application of ideas, knowledge and technologies from external sources, in combination with the firm's existing knowledge. The key evidence supporting this explanation can be noticed from the data extracts regarding the employee theme, which focused on the participation of employees in adopting new ideas, knowledge and technology from external sources. Technology management is an internal factor supporting NPD, in that technology can facilitate the production processes within NPD.

Linking the three categories reflects that the type of OI practice, or openness, is the central link connecting motives and internal factors. In other words, this means that motives in the inbound OI access in support of NPD cannot be achieved without the implementation of OI practice. At the same time, when firms are open to accessing external sources, these discoveries need to be facilitated by internal factors—employees and technology management—to drive the successful application of external knowledge, ideas and technology in the firm’s NPD activity.

6.7 Interpretation of Themes into Oriented-Knowledge Domain

To answer RQ2, all six themes in relation to RQ1 were interpreted in the knowledge domain. The framework of the knowledge domain was *a priori* established from the literature by adopting the concept of Bogers and Lhuillery (2011). The initial framework of the knowledge domain was created using three functional areas of firms: 1) marketing-based knowledge; 2) manufacturing-based knowledge; and 3) R&D-based knowledge. The interpretation of the six themes into these knowledge domains, which orient Thai dessert SMEs to access inbound OI, is presented in Table 6.6.

Table 6.6

Interpretation of Themes as Knowledge Domain

Category	Themes and definitions
Marketing-based knowledge	<p>Theme 1 - Brand building: The demand for brand image building through products and the organisation.</p> <hr/> <p>Theme 3 - Improvement: The demand for improvement in business survival and for said improvement to rely on customer requirements.</p> <p>Sub-theme 1: Business survival</p> <p>Sub-theme 2: Customer satisfaction</p>
Manufacturing-based knowledge	<p>Theme 2 - Product quality: The demand for access to a production process standard, leading to hygiene and cleanliness of products.</p> <p>Sub-theme 1: Quality management system</p> <p>Sub-theme 2: Supplier management</p>
R&D-based knowledge	N/A

Table 6.6 shows that two themes—brand building and improvement—are interpreted as marketing-based knowledge because these two themes involve the perspective of marketing (brand building) and customer satisfaction (improvement). Product quality is interpreted as manufacturing-based knowledge, as this theme involves the standardised development of production processes. R&D-based knowledge is not considered a knowledge-oriented domain in inbound OI access in the social phenomenon of Thai dessert SMEs. Most Thai dessert SMEs conduct in-house R&D activity. However, they search for knowledge from external sources to facilitate in-house R&D activity. Thus, none of these six themes could be linked or interpreted as R&D-based knowledge which Thai dessert SMEs oriented to.

6.8 Summary

This chapter presented qualitative findings through the interview method. In this study, semi-structured interviews were used. Data were collected from 14 interviews, based on three types of agencies. These were Thai dessert SMEs, government agencies responsible for the promotion of technology and innovation in Thai SMEs, and a large company possessing one production line with an innovative Thai dessert product. The 14 sets of interview data were thematically analysed, revealing six emerging themes in relation to RQ1: 1) brand building; 2) product quality; 3) improvement; 4) employees; 5) technology management; and 6) openness. These themes reflect three key issues – motives for OI access, internal factors and the type of OI practice. Motives for OI access cover brand building, product quality and improvement. Internal factors included employees and technology management. The type of OI practice included openness. To answer RQ2, six themes from RQ1 were interpreted in terms of the knowledge-oriented domains. As a result, the findings revealed two types of knowledge domains that orient Thai dessert SMEs – marketing-based knowledge and manufacturing-based knowledge with a quality management system. The next chapter presents the creation of items (measures) to use for measuring the constructs, and the results of the pilot survey, as well as item purification.

Chapter 7 : Development of Measures and Item Purification in the Pilot Survey

7.1 Introduction

In the previous chapter, the findings from the first phase, with the qualitative approach, completely answered the first two research questions. The next stage, the second phase with a quantitative approach, will be used to answer the three remaining research questions: RQ3 to RQ5. This chapter involves the creation of measures (items) for measuring the constructs and data collected via the pilot survey to use for the item purification process. The chapter is organised into five main sections. The next section, 7.2, describes the measurement model of each construct as it appears in the conceptual framework of this research. Section 7.3 presents the item purification process and its results. Section 7.4 provides the revision of the questionnaire with the purified items. Finally, Section 7.5 summarises the chapter.

7.2 Measurement Model of Construct

Based on the conceptual framework (see Figure 4.1), this research examines the relationships between 10 constructs: 1) local search experience; 2) search breadth; 3) search depth; 4) potential absorptive capacity; 5) realised absorptive capacity; 6) knowledge dissemination ability; 7) knowledge breadth; 8) knowledge depth; 9) new product performance; and 10) innovation capability. Per Churchill's (1979) procedure of measure development, the domains of these constructs will be specified through their definitions, followed by the generation of items. For this research, the creation of items for all the constructs was based on the literature, with the exception of LSE. The item set for this construct was newly created in this research by using data from the qualitative findings, as presented in Chapter 6. All constructs were measured using multiple items with a five-point Likert scale, as discussed in Section 5.9.2. The measurement models for each construct are presented as follows.

7.2.1 Construct 1: Local Search Experience

Based on the literature related to the search experience, a conceptual definition was developed for the domain of LSE. For this research, LSE was defined as 'the experience of local search resulting from the frequent search behaviour of the knowledge domain within the industry'. LSE was operationalised as a second-order formative construct with two dimensions: marketing-

oriented knowledge and manufacturing-oriented knowledge with a quality management system. The operational definition of LSE relied on the responses to the formative items in these two dimensions.

For the dimensions of LSE, it is important to emphasise that the initial dimension framework was created from the literature – adopting the concept of Bogers and Lhuillery (2011) – and later revised using the qualitative findings of this research. In line with the recommendations of Bogers and Lhuillery (2011), the initial framework of the knowledge domain was created using three functional areas of the firms: 1) marketing-based knowledge; 2) manufacturing-based knowledge; and 3) R&D-based knowledge. However, the qualitative findings of this research revealed that R&D-based knowledge was not the theme of oriented-knowledge in the context of Thai dessert SMEs. The findings also revealed that manufacturing-based knowledge was emphasised in the quality management system approach. As a result, marketing-oriented knowledge and manufacturing-oriented knowledge with a quality management system were chosen as the two dimensions of LSE.

The use of formative constructs tends to lead to the problem of identification in CB-SEM and obstructs the CB-SEM software program (Jarvis, MacKenzie, & Podsakoff, 2003). To solve this issue, a solution suggested by Diamantopoulos and Winklhofer (2001) was adopted. This research followed the multiple indicators and multiple causes (MIMIC) model, which is created by the addition of reflective items into a formative construct to combine both formative items (cause items) and reflective items (effect items) in the same model. To evaluate a MIMIC model, the loadings and weights of the formative individual indicators are not focused on; rather, the fit of the overall model is the focus (Roberts et al., 2010). Use of the MIMIC model makes measurement parameters more stable and less sensitive to changes in structural parameters (Diamantopoulos, Riefler, & Roth, 2008). Upon applying the MIMIC model, the LSE construct was established with five reflective items adopted from the items of information acquisition ability, which is a dimension of the information processing capability construct in the work of Akgün, Dayan, and Benedetto (2008). Table 7.1 presents the measurement model of the LSE construct.

Table 7.1

Measurement Model for Local Search Experience

Construct/Dimension/Item	Type and Hierarchy
Construct: Local search experience (LSE)	Second-order formative construct
<i>Dimension 1: Marketing-based knowledge (MK)^a</i>	<i>First-order formative construct</i>
MK1: New packaging design	Formative item
MK2: Improved raw materials to improve product quality	Formative item
MK3: Customers' positive suggestions for product development	Formative item
MK4: Customers' negative comments for product improvement	Formative item
MK5: Current customers' consumption behaviour related to product	Formative item
<i>Dimension 2: Manufacturing-based knowledge with quality management system (QS)^b</i>	<i>First-order formative construct</i>
QS1: Application of GMP standard based on Thai FDA fitting with the company	Formative item
QS2: Application of Codex GMP standard fitting with the company	Formative item
QS3: Application of HACCP standard fitting with the company	Formative item
QS4: New technology, including machines and equipment, to facilitate food quality and safety standards	Formative item
QS5: New packaging technology for extending the shelf life of products and maintaining product quality	Formative item
Reflective items in MIMIC model^c	
RI1: We have the ability to continuously collect information from customers.	Reflective item
RI2: We have the ability to continuously collect information about competitors' activities.	Reflective item
RI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	Reflective item
RI4: We have the ability to continuously collect information from external experts, such as consultants.	Reflective item
RI5: We have the ability to continuously re-examine the value of information collected in previous studies.	Reflective item

Source of item: Author and Akgün et al. (2008)

Note: ^a and ^b were created from the data based on the qualitative findings of this research.

^c was adapted from Akgün et al. (2008)

To operationalise the measures of LSE, the firms were asked to rate, on a scale from one (never) to five (always), the question ‘How often does the firm search for the following knowledge’. To measure each dimension in the construct, the formative items under each dimension were combined by adding their rating scales and using the summed items as the dimension (Diamantopoulos et al., 2008). For the added reflective items, the firms were asked to rate each item using a five-point Likert scale from one (strongly disagree) to five (strongly agree).

7.2.2 Construct 2: Search Breadth

Based on the literature review in this research, the conceptual definition of search breadth used was ‘the number of external sources or search channels that firms rely upon in their innovative activities’ (Laursen & Salter, 2006, p. 134). Search breadth was operationalised as a formative construct and created using the number of external channels that the firms draw on for knowledge on innovation (Laursen & Salter, 2006). For this research, the external source types were adapted from the work of Laursen and Salter (2006), who used 16 external sources of 4 types: market, institution, specialised, and other. However, in this research, the source of technical/trade press and computer databases, as identified in the work of Laursen and Salter (2006), was divided into two sub-channels. Therefore, 17 external knowledge sources were used as a cause item of search breadth in this research. Table 7.2 presents the measurement model for the search breadth.

Table 7.2

Measurement Model for Search Breadth

Construct/Dimension/Item	Type and Hierarchy
Construct: Search breadth (SB) (17 items)	Formative construct
<i>Market</i>	
SB1: Suppliers of equipment, materials, components, or software	Formative item
SB2: Clients or customers	Formative item
SB3: Competitors	Formative item
SB4: Consultants	Formative item
SB5: Commercial laboratories/R&D enterprises	Formative item
<i>Institutional</i>	
SB6: Universities or other higher education institutes	Formative item
SB7: Government research organisations	Formative item
SB8: Other public sectors, e.g. business links, government offices	Formative item
SB9: Private research institutes	Formative item

Construct/Dimension/Item	Type and Hierarchy
<i>Specialised</i>	
SB10: Technical standards	Formative item
SB11: Health and safety standards and regulations	Formative item
SB12: Environmental standards and regulations	Formative item
<i>Other</i>	
SB13: Professional conferences, meetings	Formative item
SB14: Trade associations	Formative item
SB15: Technical/trade press	Formative item
SB16: Computer databases	Formative item
SB17: Fairs, exhibitions	Formative item

Source of item: Adapted from Laursen and Salter (2006)

The operational definition of search breadth suggested by Laursen and Salter (2004) was adopted. The firms were asked to rate, on a scale from one (not relevant at all) to four (most relevant), the question ‘To what extent is the use of an external knowledge source relevant to the firm’. Each source was coded as a dummy variable with 0 and 1. The value of ‘0’ was used to represent the unused sources, i.e. when the firm gave the knowledge source a rating of one (not relevant at all). On the other hand, the ‘1’ was used to represent the sources that were given a rating from two to four. The sum of all 17 sources was the score representing the search breadth. A firm was given a score of 17 when all knowledge sources were used.

7.2.3 Construct 3: Search Depth

Based on the literature review, search depth was defined as ‘the extent to which firms draw deeply from different external sources’ (Laursen & Salter, 2006, p. 134). The search depth was operationalised as a formative construct, formed by the number of channels from which the firm intensively sources ideas for innovations. Concerning the external sources, the same set of 17 items used for search breadth was applied here. Table 7.3 presents the measurement model for the search depth.

Table 7.3

Measurement Model for Search Depth

Construct/Dimension/Item	Type and Hierarchy
Construct: Search depth (SD) (17 items)	Formative construct
<i>Market</i>	
SD1: Suppliers of equipment, materials, components, or software	Formative item
SD2: Clients or customers	Formative item
SD3: Competitors	Formative item
SD4: Consultants	Formative item
SD5: Commercial laboratories/R&D enterprises	Formative item
<i>Institutional</i>	
SD6: Universities or other higher education institutes	Formative item
SD7: Government research organisations	Formative item
SD8: Other public sectors, e.g. business links, government offices	Formative item
SD9: Private research institutes	Formative item
<i>Specialised</i>	
SD10: Technical standards	Formative item
SD11: Health and safety standards and regulations	Formative item
SD12: Environmental standards and regulations	Formative item
<i>Other</i>	
SD13: Professional conferences, meetings	Formative item
SD14: Trade associations	Formative item
SD15: Technical/trade press	Formative item
SD16: Computer databases	Formative item
SD17: Fairs, exhibitions	Formative item

Source of item: Adapted from Laursen and Salter (2006)

The operational definition of search depth suggested by Laursen and Salter (2004) was followed. The firms were asked to rate, on a scale from one (not relevant at all) to four (most relevant), the question ‘To what extent is the use of an external knowledge source relevant to the firm’. Each source was coded as a dummy variable with 0 and 1. The value of ‘1’ was given when the firm rated the knowledge source a four, representing a high degree of relevance. On the other hand, the value of ‘0’ was given when the firm rated the knowledge source a one to three, representing the degrees of no, low, or medium relevance of the given source, respectively. The sum of all 17

sources was the score representing the firm’s search depth. A firm received a score of 17 when all knowledge sources were deeply sourced.

7.2.4 Construct 4: Potential Absorptive Capacity

Based on the literature review, potential absorptive capacity (PAC) was defined as a ‘firm’s capability to value and acquire external knowledge, but does not guarantee the exploitation of the knowledge’ (Zahra & George, 2002, p. 190). The PAC was operationalised as a second-order reflective construct with two dimensions: acquisition and assimilation. Acquisition referred to a firm’s capability to identify and acquire externally-generated knowledge, which is critical to its operations (Zahra & George, 2002). Assimilation referred to a firm’s routines and processes when analysing, processing, interpreting, and understanding the externally-acquired knowledge (Zahra & George, 2002). To measure acquisition and assimilation, the set of items validated in the work of Flatten et al. (2011) was adopted. Table 7.4 presents the measurement model of PAC.

Table 7.4

Measurement Model for Potential Absorptive Capacity

Construct Dimension Item	Type and Hierarchy
Construct: Potential absorptive capacity	Second-order reflective construct
<i>Dimension 1: Acquisition (3 items)</i>	<i>First-order reflective construct</i>
AC1: The search for relevant information concerning our industry is an every-day business in our company.	Reflective item
AC2: Our management motivates the employees to use information sources within our industry.	Reflective item
AC3: Our management expects the employees to deal with information beyond our industry.	Reflective item
<i>Dimension 2: Assimilation (4 items)</i>	<i>First-order reflective construct</i>
AS1: In our company, ideas and concepts are communicated on a cross-departmental basis.	Reflective item
AS2: In our company, there is quick information flow, e.g. if a business unit obtains important information, it communicates this information promptly to all other business units or departments.	Reflective item

Construct/Dimension/Item	Type and Hierarchy
AS3: Our management emphasises cross-departmental support to solve problems.	Reflective item
AS4: Our management demands periodical cross-departmental meetings to share new developments, problems, and achievements.	Reflective item

Source of item: Flatten et al. (2011)

As shown in Table 7.4, the measurement model for PAC was composed of a total of seven reflective items for acquisition (three) and assimilation (four). To operationalise the items, the firms were asked to rate them using a five-point Likert scale from one (strongly disagree) to five (strongly agree).

7.2.5 Construct 5: Realised Absorptive Capacity

Based on the literature review, realised absorptive capacity (RAC) was defined as ‘the firm’s capacity to leverage the knowledge that has been absorbed through a function of the transformation and exploitation capabilities’ (Zahra & George, 2002, p. 190). The RAC was operationalised as a second-order reflective construct with two dimensions: transformation and exploitation. Transformation referred to a firm’s capability to develop and refine the routines that combine existing knowledge and newly acquired and assimilated knowledge (Zahra & George, 2002). Exploitation referred to the capability to refine, extend, and leverage existing competencies, or to create new ones by incorporating acquired and transformed knowledge into an organisation’s operations (Zahra & George, 2002). To measure transformation and exploitation, the set of items validated in the work of Flatten et al. (2011) was adopted. Table 7.5 presents the measurement model for RAC.

Table 7.5

Measurement Model for Realised Absorptive Capacity

Construct/Dimension/Item	Type and Hierarchy
Construct: Realised absorptive capacity	Second-order reflective construct
<i>Dimension 1: Transformation (4 items)</i>	<i>First-order reflective construct</i>
TS1: Our employees have the ability to structure and use collected knowledge.	Reflective item
TS2: Our employees are used to absorbing externally new knowledge as well as to prepare it for further purposes and make it available.	Reflective item
TS3: Our employees successfully link internally existing knowledge with external insights.	Reflective item
TS4: Our employees are able to apply new external knowledge in their practical work.	Reflective item
<i>Dimension 2: Exploitation (3 items)</i>	<i>First-order reflective construct</i>
EX1: Our management supports the development of prototypes.	Reflective item
EX2: Our company regularly reconsiders technologies and adapts them according to new knowledge.	Reflective item
EX3: Our company has the ability to work more effectively by adopting new technologies.	Reflective item

Source of item: Flatten et al. (2011)

Table 7.5 shows that the measurement model for RAC was composed of seven reflective items for transformation and exploitation. To operationalise the measures, the firms were asked to rate the items with a five-point Likert scale from one (strongly disagree) to five (strongly agree).

7.2.6 Construct 6: Knowledge Dissemination Ability

Based on the literature review, knowledge dissemination ability (KDA) was defined as ‘the organisation’s capacity to diffuse and transmit the information among relevant members of the organisation, involving formal and informal information transmission via interpersonal interactions, meetings, memos, etc.’ (Akgün et al., 2008). This conceptual definition of KDA was adapted from the definition of information dissemination ability, which was a dimension of the information processing capability construct in the work of Akgün et al. (2008). The KDA was

operationalised as a unidimensional reflective construct. To measure the KDA, the set of items measuring information dissemination ability employed in the work of Akgün et al. (2008) was adopted. Table 7.6 presents the measurement model for KDA.

Table 7.6

Measurement Model for Knowledge Dissemination Ability

Construct/Dimension/Item	Type and Hierarchy
Construct: Knowledge dissemination ability (4 items)	Unidimensional reflective construct
KDA1: We have formal information links established among all parties involved in a project.	Reflective item
KDA2: We have informal networks that ensure all employees have the information they need.	Reflective item
KDA3: Employees of the NPD team are able to educate each other during a project.	Reflective item
KDA4: Employees of the NPD team are trained in new tasks relating to a project.	Reflective item

Source of item: Adapted from Akgün et al. (2008)

Table 7.6 shows that the measurement model for KDA was composed of four reflective items. To operationalise the items, the firms were asked to rate each item with a five-point Likert scale from one (strongly disagree) to five (strongly agree).

7.2.7 Construct 7: Knowledge Breadth

Based on the literature review, knowledge breadth was defined as ‘the diversification in a firm’s knowledge of customer portfolios, market segments, and technological background’ (Zhou & Li, 2012). Knowledge breadth was operationalised as a unidimensional reflective construct. To measure knowledge breadth, the set of items employed in the work of Zhou and Li (2012) was adopted. Table 7.7 presents the measurement model for knowledge breadth.

Table 7.7

Measurement Model for Knowledge Breadth

Construct/Dimension/Item	Type and Hierarchy
Construct: Knowledge breadth (4 items)	Unidimensional reflective construct
KB1: We possess market information from a wide-ranging customer portfolio.	Reflective item
KB2: We possess market information from a diversified customer portfolio.	Reflective item
KB3: We have accumulated knowledge of multiple market segments.	Reflective item
KB4: Our R&D expertise consists of technical knowledge from a variety of backgrounds.	Reflective item

Source: Adapted from Zhou and Li (2012)

Table 7.7 shows that the measurement model of knowledge breadth was composed of four reflective items. To operationalise the items, the firms were asked to rate each item using a five-point Likert scale from one (strongly disagree) to five (strongly agree).

7.2.8 Construct 8: Knowledge Depth

Based on the literature review, knowledge depth was defined as ‘the thoroughness of a firm’s knowledge and technical expertise within its specialised fields’ (Zhou & Li, 2012). Knowledge depth was operationalised as a unidimensional reflective construct. To measure knowledge depth, the set of items employed in the work of Zhou and Li (2012) was adapted for this application. Table 7.8 presents the measurement model for knowledge depth.

Table 7.8

Measurement Model for Knowledge Depth

Construct/Dimension/Item	Type and Hierarchy
Construct: Knowledge depth (3 items)	Unidimensional reflective construct
KD1: We have a thorough understanding and experience of current customers.	Reflective item
KD2: We have accumulated in-depth knowledge of the key market segment that we focus on.	Reflective item
KD3: Our R&D experts have thorough technical knowledge and skills within our specialised domain.	Reflective item

Source: Adapted from Zhou and Li (2012)

Table 7.8 shows that the measurement model of knowledge depth was composed of three reflective items. To operationalise the items, the firms were asked to rate each item using a five-point Likert scale from one (strongly disagree) to five (strongly agree).

7.2.9 Construct 9: New Product Performance

Based on the literature review, new product performance was defined as a concept ‘measured through three indices: sales growth, profit growth, and market share growth’ (Auh & Menguc, 2010). New product performance was operationalised as a unidimensional reflective construct. To measure new product performance, the set of items used in the work of Chang, Chen, and Lin (2014) was adopted. Table 7.9 presents the measurement model for new product performance.

Table 7.9

Measurement Model for New Product Performance

Construct/Dimension/Item	Type and Hierarchy
Construct: New Product Performance (6 items)	Unidimensional reflective construct
NPP1: The quality of new products in our company is better than that of the major competitors.	Reflective item
NPP2: New products of our company can meet the needs of its customers.	Reflective item

Construct/Dimension/Item	Type and Hierarchy
NPP3: The ratio of the successful NPD projects in our company is higher than that of major competitors.	Reflective item
NPP4: New products of our company attain the goal of expected sales.	Reflective item
NPP5: New products of our company attain the goal of expected profitability.	Reflective item
NPP6: Overall performance of new products of our company is successful.	Reflective item

Source: Chang et al. (2014)

Table 7.9 shows that the measurement model for new product performance was composed of six reflective items. To operationalise the items, the firms were asked to rate each item using a five-point Likert scale from one (strongly disagree) to five (strongly agree).

7.2.10 Construct 10: Innovation Capability

Based on the literature review, innovation capability was defined as the ‘ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders’ (Lawson & Samson, 2001, p. 384). Innovation capability was operationalised as a second-order reflective construct with seven dimensions: 1) strategic orientation; 2) resource management; 3) organisational intelligence; 4) creativity; 5) structure and system; 6) culture and climate; and 7) management of technology. These seven dimensions were adapted from the seven-factor structure of innovation capability proposed by Lawson and Samson (2001). To measure each dimension of innovation capability, the set of items measuring each dimension was tested for fitness in each dimension prior to the test of the overall measurement model. Table 7.10 presents the definitions and sources of the items in each dimension of innovation capability, and Table 7.11 presents the measurement model used in this research for innovation capability.

Table 7.10

Definition and Source of Items for Each Dimension of Innovation Capability

Dimension	Definition of dimension	Source of adopted item in this research
Strategic orientation	Strategic orientation refers to ‘the set of activities and behaviours that are implemented for achieving its innovation goals’ (Jeong et al., 2006, p. 350). Strategic orientation covers three dimensions: technology orientation, competitor orientation, and customer orientation. Technology orientation means the ‘ability and will to acquire a substantial technological background and use it in the development of new products’ (Gatignon & Xuereb, 1997, p. 78). Competitor orientation means the ‘ability and the will to identify, analyse, and respond to competitors’ actions’ (Gatignon & Xuereb, 1997, p. 78). Customer orientation refers to the ‘ability and the will to identify, analyse, understand, and answer user needs’ (Gatignon & Xuereb, 1997, p. 78).	Qualls and Spanjol (2011)
Resource management	Resource management is represented as a management capability, which is defined as ‘the ability to assemble, integrate, and deploy various firm-specific resources, in particular human, organisational and relational, to fulfil diverse client-related business requirements’ (Lahiri et al., 2012, p. 145).	Lahiri et al. (2012)
Organisational intelligence	Organisational intelligence is conceptualised as purposeful information processing, which enables adaptation to environmental demands (Glynn, 1996). Organisational intelligence refers to ‘the capability to process, interpret, encode, manipulate and access information in a purposeful, goal-directed manner, so it can increase its adaptive potential in the environment in which it operates’ (Glynn, 1996, p. 1088).	Akgün et al. (2008)
Creativity	Creativity is defined as ‘the employee’s generation of novel and potentially useful ideas’ (Amabile, 1988).	Zhou and George (2001)

Dimension	Definition of dimension	Source of adopted item in this research
Structure and system	Structure is represented through various perspectives, such as formalisation, centralisation, and organisational size (Auh & Menguc, 2010). System is defined as ‘the rules, procedures, guidelines and instruments with which the daily functioning of people in the organisation is facilitated’ (uit Beijerse, 2000).	Cormican and O’Sullivan (2004)
Culture and climate	Culture and climate refers to ‘common values and norms promoting innovation’ (Nystrom, 1990).	Cormican and O’Sullivan (2004)
Management of technology	Management of technology refers to ‘the capability to stimulate the effective use of technical knowledge and skills to develop new products and processes, the improvement of existing technology, and the generation of new knowledge and skills’ (Jin & Von Zedtwitz, 2008; Oerlemans et al., 2013).	Prajogo and Sohal (2006)

Table 7.11

Measurement Model for Innovation Capability

Construct/Dimension/Item	Type and Hierarchy
Construct: Innovation capability	Second-order reflective construct
<i>Dimension 1: Strategic orientation (20 items)</i>	<i>First-order reflective construct</i>
<i>Customer orientation</i>	
SO1: Our business objectives are driven primarily by customer satisfaction.	Reflective item
SO2: We constantly monitor our level of commitment and orientation to serve customer needs.	Reflective item
SO3: Our strategy for competitive advantage is based on our understanding of customers' needs.	Reflective item
SO4: We measure customer satisfaction systematically and frequently.	Reflective item
SO5: We routinely or regularly measure our customer service.	Reflective item
<i>Competitor orientation</i>	
SO6: Our salespeople regularly share information within our business concerning competitors' strategies.	Reflective item
SO7: We rapidly respond to competitors' actions that threaten us.	Reflective item
SO8: Top management regularly discusses competitors' strengths and strategies.	Reflective item
SO9: We target customers where we have an opportunity for competitive advantage.	Reflective item
<i>Technology orientation</i>	
SO10: Our new products are always at the state-of-the-art of the technology.	Reflective item
SO11: We have better technological knowledge than our competitors.	Reflective item
SO12: Our R&D programmes are more ambitious than those of our competitors.	Reflective item
SO13: Our firm is always the first one to use a new technology for NPD.	Reflective item
SO14: Our strategic business unit (SBU) uses sophisticated technologies for its NPD.	Reflective item
SO15: Our SBU is very proactive in the development of new technologies.	Reflective item

Construct/Dimension/Item	Type and Hierarchy
SO16: Our SBU is very proactive in the construction of new technical solutions to address users' needs.	Reflective item
SO17: Our SBU has the will and the capacity to build and market a technological breakthrough.	Reflective item
SO18: Our SBU has built a large and strong network of relationships with suppliers of technological equipment.	Reflective item
SO19: Our SBU has an aggressive technological patent strategy.	Reflective item
SO20: Our SBU has better industrial methods than the competitor.	Reflective item
<i>Dimension 2: Resource management (4 items)</i>	<i>First-order reflective construct</i>
RM1: We manage our human resources efficiently.	Reflective item
RM2: We manage our information systems efficiently.	Reflective item
RM3: We manage various technology-related changes efficiently.	Reflective item
RM4: We manage to satisfy most of our clients' requirements.	Reflective item
<i>Dimension 3: Organisational intelligence (15 items)</i>	<i>First-order reflective construct</i>
<i>Information acquisition ability</i>	
OI1: We have the ability to continuously collect information from customers.	Reflective item
OI2: We have the ability to continuously collect information about competitors' activities.	Reflective item
OI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	Reflective item
OI4: We have the ability to continuously collect information from external experts, such as consultants.	Reflective item
OI5: We have the ability to continuously re-examine the value of information collected in previous studies.	Reflective item
<i>Information dissemination ability</i>	
OI6: We have formal information links established among all parties involved in a project.	Reflective item
OI7: We have informal networks that ensure all employees have the information they need.	Reflective item
OI8: Employees of the NPD team are able to educate each other during a project.	Reflective item
OI9: Employees of the NPD team are trained in new tasks relating to a project.	Reflective item

Construct/Dimension/Item	Type and Hierarchy
<i>Information implementation ability</i>	
OI10: We are able to summarise information, reducing its complexity.	Reflective item
OI11: We are able to organise information in meaningful ways.	Reflective item
OI12: We are able to process information in meaningful ways.	Reflective item
OI13: We are able to rely heavily upon information to make decisions relating to a project.	Reflective item
OI14: We are able to use information to solve specific problems encountered in a project.	Reflective item
OI15: We are able to provide information to effectively implement a project.	Reflective item
<i>Dimension 4: Creativity (13 items)</i>	<i>First-order reflective construct</i>
CR1: Our employees are able to suggest new ways to achieve goals or objectives.	Reflective item
CR2: Our employees are able to suggest new ways to increase quality.	Reflective item
CR3: Our employees are able to suggest new ways of performing work tasks.	Reflective item
CR4: Our employees often have new and innovative ideas.	Reflective item
CR5: Our employees often have a fresh approach to problems.	Reflective item
CR6: Our employees are able to come up with new and practical ideas to improve performance.	Reflective item
CR7: Our employees are able to come up with creative solutions to problems.	Reflective item
CR8: Our employees are able to search out new technologies, processes, techniques, and/or product ideas.	Reflective item
CR9: Our employees are able to promote and champion ideas to others.	Reflective item
CR10: Our employees are able to exhibit creativity on the job when given the opportunity.	Reflective item
CR11: Our employees are able to develop adequate plans and schedules for the implementation of new ideas.	Reflective item
CR12: Our employees are good sources of creative ideas.	Reflective item
CR13: Our employees are not afraid to take risks.	Reflective item
<i>Dimension 5: Structure and system (7 items)</i>	<i>First-order reflective construct</i>
SS1: Projects are developed using effective cross-functional teams.	Reflective item

Construct/Dimension/Item	Type and Hierarchy
SS2: Project teams are organic, flexible, and agile.	Reflective item
SS3: All team operations are driven by customer needs.	Reflective item
SS4: All team members are mutually accountable.	Reflective item
SS5: Team members are empowered to make decisions.	Reflective item
SS6: Virtual team members are equipped with effective ICT tools.	Reflective item
SS7: Team members' rewards are equitable.	Reflective item
<i>Dimension 6: Culture and climate (10 items)</i>	<i>First-order reflective construct</i>
CC1: There is a formal idea generation process in place.	Reflective item
CC2: All employees participate in generating ideas.	Reflective item
CC3: Failures and mistakes are tolerated and not punished.	Reflective item
CC4: Senior management is committed to risk-taking in product innovation.	Reflective item
CC5: The organisation permits the emergence of intrapreneurs or product champions.	Reflective item
CC6: The organisation provides support in terms of autonomy, time, and rewards.	Reflective item
CC7: Knowledge sharing is encouraged and rewarded.	Reflective item
CC8: Money is made available for internal projects.	Reflective item
CC9: Adequate resources are available and committed to achieving project goals.	Reflective item
CC10: All operations are driven by customer needs.	Reflective item
<i>Dimension 7: Management of technology (4 items)</i>	<i>First-order reflective construct</i>
MO1: Our company always attempts to stay on the leading edge of new technology in our industry.	Reflective item
MO2: We make an effort to anticipate the full potential of new practices and technologies.	Reflective item
MO3: We pursue long-range programmes in order to acquire technological capabilities in advance of our needs.	Reflective item
MO4: We are constantly thinking of the next generation of technology.	Reflective item

Source of item: Qualls and Spanjol (2011), Lahiri et al. (2012), Akgün et al. (2008), Zhou and George (2001), Cormican and O'Sullivan (2004), and Prajogo and Sohal (2006)

Table 7.11 shows that the measurement model of innovation capability (IC) was composed of 7 dimensions with 73 reflective items: strategic orientation (20 items), resource management (4 items), organisational intelligence (15 items), creativity (13 items), structure and system (7 items), culture and climate (10 items), and management of technology (4 items). To operationalise the items, the firms were asked to rate each item using a five-point Likert scale from one (strongly disagree) to five (strongly agree).

7.2.11 Control Variables

Other factors could also influence the relationships between constructs. To account for the effects of extraneous variables, firm size and firm age were included. Firm size was measured as the number of full-time employees (de Jong & Freel, 2010), and firm age was measured as the number of years since the firm was established.

7.3 Item Purification

The questions in the pilot survey were created based on the items discussed above (see Appendix 2). In the pilot survey, the questionnaire was sent by mail to 50 Thai dessert SMEs that agreed to participate. These participants were contacted to enquire about their willingness to take part in the survey before the questionnaires were sent (see Section 5.9.1). Data collected through the pilot survey were employed for the process of item purification. Item purification involves the examination of multicollinearity, which is critical for formative items. In this research, three constructs were measured using formative items: LSE, search breadth, and search depth. Thus, the formative items measuring these three constructs were assessed for multicollinearity. In particular, for the LSE construct, factor analysis (FA) was performed because the formative items measuring this construct were newly created for this research. Item purification involves testing an item's reliability through internal consistency. The unidimensionality of the reflective items was not tested through exploratory FA because the structure of factors in all the reflective constructs was determined from the basis of the literature. Confirmatory factor analysis (CFA) was conducted instead. CFA will also be employed in the SEM technique when testing the hypothesis in the survey, which will be presented in the next chapter (Chapter 8). The results of item purification with FA for the LSE construct, multicollinearity of formative items, and reliability of reflective items are presented in Sections 7.3.1, 7.3.2, and 7.3.3, respectively.

7.3.1 Principal Component Analysis: Local Search Experience

The LSE construct was subjected to FA through the principal component analysis (PCA) technique, rather than the CFA technique. The PCA technique was selected because the items within the construct relied on formative items. The PCA approach is appropriate for formative items, as it helps reduce the items into a smaller set of composite components while retaining the original items' variance as much as possible. FA through PCA was carried out with the SPSS Version 24 software program, and the results are presented below.

7.3.1.1 Factorability of Data

The factorability of data for the LSE construct was evaluated using three criteria: 1) a correlation matrix; 2) the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy; and 3) Bartlett's Test of Sphericity (BTS). The result of the correlation matrix revealed that all pairs of items, with the exception of the pair QS1 and MK4, showed a correlation of above 0.3, which was the cut-off value for correlation (Tabachnick, Fidell, & Osterlind, 2001). The KMO value was 0.800, exceeding the recommended value of 0.6 (Tabachnick et al., 2001). The BTS result was statistically significant ($p < 0.05$). The assessment results of these three criteria indicate that the data factorability for the construct is supported. Table 7.12 presents the results of the correlation matrix, and Table 7.13 displays the KMO value and the BTS result.

Table 7.12

Correlation Matrix: Local Search Experience

	MK1	MK2	MK3	MK4	MK5	QS1	QS2	QS3	QS4	QS5
MK1	1.000									
MK2	0.568	1.000								
MK3	0.382	0.622	1.000							
MK4	0.354	0.516	0.674	1.000						
MK5	0.453	0.716	0.585	0.449	1.000					
QS1	0.472	0.529	0.303	0.268	0.470	1.000				
QS2	0.573	0.480	0.460	0.468	0.412	0.782	1.000			
QS3	0.495	0.506	0.501	0.541	0.374	0.604	0.858	1.000		
QS4	0.567	0.569	0.401	0.357	0.462	0.627	0.619	0.686	1.000	
QS5	0.437	0.560	0.659	0.532	0.557	0.537	0.520	0.579	0.648	1.000

Table 7.13

Kaiser-Meyer-Olkin Value and Bartlett's Test of Sphericity: Local Search Experience

Issue		Criteria	Output
Kaiser-Meyer-Olkin (KMO) value		> 0.6	0.800
Bartlett's Test of Sphericity (BTS)	Approx. Chi square	N/A	344.418
	df	N/A	45
	Sig.	P < 0.05	P = 0.000

7.3.1.2 Results of Principal Component Analysis

If the data factorability is acceptable, the next step involves factor extraction through PCA. For this research, two criteria were adopted for retaining the number of factors: Kaiser's eigenvalue criterion and Catell's scree test. The eigenvalue of a factor is represented as the amount of total variance explained by that factor. As a rule, a factor with an eigenvalue of 1.0 or more is retained (Pallant, 2005, p. 174). The scree test is conducted by plotting the eigenvalues of each factor while retaining all the factors above the elbow or break in the plot (Pallant, 2005, p. 174).

The result of factor extraction for the LSE construct revealed the presence of two factors with eigenvalues exceeding 1, explaining 57.70% and 12.07% of variance. This implies that these two factors should be retained. Table 7.14 presents the eigenvalues based on the total variance explained for the LSE construct.

Table 7.14

Total Variance Explained for Local Search Experience

Component	Initial Eigenvalue			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.770	57.695	57.695	5.770	57.695	57.695
2	1.207	12.067	69.762	1.207	12.067	69.762
3	0.811	8.113	77.876			
4	0.579	5.791	83.667			
5	0.501	5.011	88.678			
6	0.340	3.396	92.074			
7	0.290	2.900	94.974			
8	0.263	2.632	97.606			

Component	Initial Eigenvalue			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
9	0.179	1.787	99.393			
10	0.061	0.607	100.000			

The results of the scree test are shown in Figure 7.1 and revealed a clear break after the first component, suggesting that one factor should be retained. However, considering the eigenvalue, the researcher decided to retain two factors. These two factors will be further investigated through CFA in the field survey.

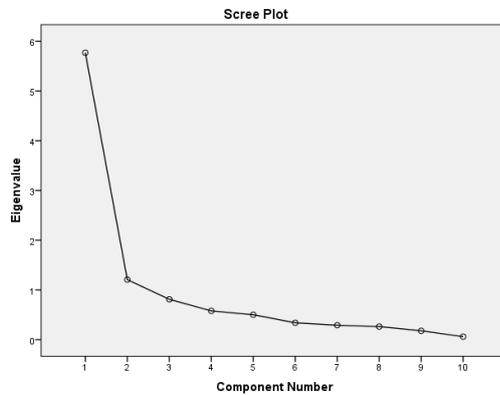


Figure 7.1. Results of the Scree Test.

Once the number of factors was determined, the next step was to conduct factor rotation to ensure that the factor structure could be easily interpreted (Pallant, 2005). In factor rotation, oblique rotation and orthogonal rotation are two key techniques with different approaches. Oblique rotation produces correlated factors, while orthogonal rotation creates uncorrelated factors (independent factors) (Osborne & Costello, 2009; Podsakoff, Podsakoff, MacKenzie, & Lee, 2003). Accordingly, oblique rotation is used when the factors are believed to be correlated, and orthogonal rotation is implemented when the factors are believed to be independent. However, oblique rotation is recommended, as it yields a more realistic statistical factor structure (Schmitt, 2011). Oblique rotation yields nearly identical results to orthogonal rotation, even if the factors being used are truly uncorrelated. However, this is not the case for orthogonal rotation. If the factors are truly correlated and orthogonal rotation is employed instead of oblique rotation, this will result in the loss of valuable data (Osborne & Costello, 2009). Consequently, oblique rotation was selected for application here. The output of the PCA, with oblique rotation through direct

oblamin, is presented in Table 7.15, representing the results of communality as variance in items accounting for common factors. Table 7.16 presents the pattern matrix, and Table 7.17 presents the interpretation of the pattern matrix through factor loading to sort items into two extracted factors.

Table 7.15

Results of Communalities: Local Search Experience

Item	Initial	Extraction
MK1	1.000	0.508
MK2	1.000	0.695
MK3	1.000	0.802
MK4	1.000	0.640
MK5	1.000	0.630
QS1	1.000	0.757
QS2	1.000	0.835
QS3	1.000	0.748
QS4	1.000	0.703
QS5	1.000	0.658

Note: Extraction method: Principal Component Analysis

Table 7.16

Pattern Matrix in Principal Component Analysis: Local Search Experience

Items	Factor loading	
	1	2
MK1: New packaging design	0.595	0.176
MK2: Improved raw materials to improve product quality	0.226	0.681
MK3: Customers' positive suggestions for product development	-0.110	0.956
MK4: Customers' negative comments for product improvement	-0.057	0.832
MK5: Current customers' consumption behaviour related to product	0.070	0.750
QS1: Application of GMP standard based on Thai FDA fitting with the company	0.941	-0.130
QS2: Application of Codex GMP standard fitting with the company	0.934	-0.035
QS3: Application of HACCP standard fitting with the company	0.802	0.100
QS4: New technology, including machines and equipment, to facilitate food quality and safety standards	0.786	0.084

Items	Factor loading	
	1	2
QS5: New packaging technology for extending the shelf life of products and maintaining product quality	0.323	0.577

Note: Extraction method: PCA. Rotation method: Oblimin with Kaiser Normalisation. Rotation converged in seven iterations.

Table 7.17

Results of Principal Component Analysis: Local Search Experience

Items	Factor loading	
	1	2
Dimension 1: Market-oriented knowledge (MK)		
MK1: New packaging design	0.595	
MK2: Improved raw materials to improve product quality		0.681
MK3: Customers' positive suggestions for product development		0.956
MK4: Customers' negative comments for product improvement		0.832
MK5: Current customers' consumption behaviour related to product		0.750
Dimension 2: Manufacturing-oriented knowledge with quality management system (QS)		
QS1: Application of GMP standard based on Thai FDA fitting with the company	0.941	
QS2: Application of Codex GMP standard fitting with the company	0.934	
QS3: Application of HACCP standard fitting with the company	0.802	
QS4: New technology, including machines and equipment, to facilitate food quality and safety standards	0.786	
QS5: New packaging technology for extending the shelf life of products and maintaining product quality		0.577
Eigen value	5.770	1.207
Variance explained (%)	57.70	12.07
Total variance explained (%)		69.77

In sum, the results of the PCA revealed a two-factor structure for the LSE construct. The first factor, market-oriented knowledge (MK), included five items: MK2, MK3, MK4, MK5, and QS5. The second factor, manufacturing-oriented knowledge with a quality management system (QS), included five items: QS1, QS2, QS3, QS4, and MK1.

7.3.2 Multicollinearity

Multicollinearity was examined for the formative items, measuring each of the three constructs: LSE, search breadth, and search depth. SPSS was used for the analysis of multicollinearity in this research. Multicollinearity was assessed through the variance inflation factor (VIF), which is the inverse of the tolerance value (see Section 5.10.3), by using a VIF cut-off value of 10 (Pallant, 2013). The VIF results for the LSE construct are presented in Table 7.18. No item displayed a VIF value of over 10, which means there was no appearance of multicollinearity.

Of note, the VIF results for search breadth and search depth were the same, as they relied on the same set of formative items. These results revealed two items, SB11 and SB12, that displayed a VIF value over 10, indicating the appearance of multicollinearity. However, as these two items were significant to the domain of the construct, they were retained at this stage. The VIF results for search breadth and search depth are presented in Tables 7.19 and 7.20, respectively.

Table 7.18

VIF Results: Local Search Experience

Variables	Tolerance	VIF
MK1	0.494	2.02
MK2	0.304	3.09
MK3	0.323	3.10
MK4	0.461	2.17
MK5	0.419	2.39
QS1	0.227	4.41
QS2	0.113	8.85
QS3	0.166	6.02
QS4	0.333	3.00
QS5	0.338	2.96

Table 7.19

VIF Results: Search Breadth

Variables	Tolerance	VIF
SB1	0.517	1.93
SB2	0.439	2.28
SB3	0.363	2.75
SB4	0.295	3.39
SB5	0.133	7.52

Variables	Tolerance	VIF
SB6	0.168	5.95
SB7	0.129	7.75
SB8	0.139	7.19
SB9	0.222	4.50
SB10	0.166	6.02
SB11	0.036	27.78
SB12	0.032	31.25
SB13	0.145	6.90
SB14	0.234	4.27
SB15	0.236	4.24
SB16	0.205	4.88
SB17	0.199	5.03

Table 7.20

VIF Results: Search Depth

Variables	Tolerance	VIF
SD1	0.517	1.93
SD2	0.439	2.28
SD3	0.363	2.75
SD4	0.295	3.39
SD5	0.133	7.52
SD6	0.168	5.95
SD7	0.129	7.75
SD8	0.139	7.19
SD9	0.222	4.50
SD10	0.166	6.02
SD11	0.036	27.78
SD12	0.032	31.25
SD13	0.145	6.90
SD14	0.234	4.27
SD15	0.236	4.24
SD16	0.205	4.88
SD17	0.199	5.03

7.3.3 Item Reliability

All the reflective items were examined for item reliability with internal consistency. Internal consistency was assessed using Cronbach's alpha (α) coefficient with a recommended value above 0.70 (Pallant, 2013, p. 104). The value of the corrected item-total correlation (CITC) should be greater than the recommended value of 0.5 (Nunnally, 1978). Thus, the items with a CITC below 0.5 were removed. SPSS was used to test item reliability in this research. The results of the item reliability test revealed that two dimensions – strategic orientation and organisational intelligence – could not be achieved through the first-run of SPSS, with the output displaying the determinant of the covariance matrix as zero. Consequently, these two dimensions were examined for multicollinearity. The results of the multicollinearity test revealed 9 items displaying a VIF value higher than 10, indicating the presence of multicollinearity (Pallant, 2013). Among the nine items, five items were from the SO set (SO4, SO13, SO15, SO16, and SO18), and four were from the OI set (OI10, OI11, OI12, and OI13). These nine items were removed. The results of the multicollinearity tests for strategic orientation and organisational intelligence are presented in Tables 7.21 and 7.22, respectively. After the removal of these nine items, the second run of the item reliability test for these two dimensions was carried out. The results of the item reliability analysis for all dimensions are presented in Table 7.23.

Table 7.21

VIF Results: Strategic Orientation

Variables	Tolerance	VIF
SO1	0.223	4.48
SO2	0.141	7.09
SO3	0.169	5.92
SO4	0.096	10.42
SO5	0.108	9.26
SO6	0.100	10.00
SO7	0.116	8.62
SO8	0.144	6.94
SO9	0.231	4.33
SO10	0.141	7.09
SO11	0.106	9.43
SO12	0.135	7.41
SO13	0.096	10.42
SO14	0.118	8.47
SO15	0.053	18.87

Variables	Tolerance	VIF
SO16	0.095	10.53
SO17	0.134	7.46
SO18	0.097	10.31
SO19	0.173	5.78
SO20	0.146	6.85

Table 7.22

VIF Results: Organisational Intelligence

Variables	Tolerance	VIF
OI1	0.184	5.43
OI2	0.147	6.80
OI3	0.253	3.95
OI4	0.354	2.82
OI5	0.237	4.22
OI6	0.176	5.68
OI7	0.222	4.50
OI8	0.216	4.63
OI9	0.193	5.18
OI10	0.096	10.42
OI11	0.036	27.78
OI12	0.045	22.22
OI13	0.072	13.89
OI14	0.134	7.46
OI15	0.185	5.41

Table 7.23

Results of Item Reliability Testing

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
Construct 1: Local search experience					
Added reflective items in MIMIC model	N/A	<u>0.887</u>	N/A		<u>0.887</u>
RI1: We have the ability to continuously collect information from customers.	0.752		0.858	0.752	
RI2: We have the ability to continuously collect information about competitors' activities.	0.827		0.839	0.827	
RI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	0.781		0.860	0.781	
RI4: We have the ability to continuously collect information from external experts, such as consultants.	0.643		0.892	0.643	
RI5: We have the ability to continuously re-examine the value of information collected in previous studies.	0.731		0.865	0.731	
Construct 2: Search breadth	N/A	N/A	N/A	N/A	N/A
Construct 3: Search depth	N/A	N/A	N/A	N/A	N/A
Construct 4: Potential absorptive capacity					
Dimension 1: Acquisition (AC) (3 items)	N/A	<u>0.844</u>	N/A	N/A	<u>0.844</u>
AC1: The search for relevant information concerning our industry is an every-day business in our company.	0.722		0.775	0.722	
AC2: Our management motivates the employees to use information sources within our industry.	0.669		0.828	0.669	

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
AC3: Our management expects the employees to deal with information beyond our industry.	0.770		0.751	0.770	
Dimension 2: Assimilation (AS) (4 items)	N/A	<u>0.930</u>	N/A	N/A	<u>0.930</u>
AS1: In our company, ideas and concepts are communicated on a cross-departmental basis.	0.912		0.882	0.912	
AS2: In our company, there is quick information flow, e.g. if a business unit obtains important information, it communicates this information promptly to all other business units or departments.	0.873		0.896	0.873	
AS3: Our management emphasises cross-departmental support to solve problems.	0.816		0.916	0.816	
AS4: Our management demands periodical cross-departmental meetings to share new developments, problems, and achievements.	0.752		0.937	0.752	
Construct 5: Realised absorptive capacity					
Dimension 1: Transformation (TS) (4 items)	N/A	<u>0.939</u>	N/A	N/A	<u>0.939</u>
TS1: Our employees have the ability to structure and use collected knowledge.	0.757		0.954	0.757	
TS2: Our employees are used to absorbing externally new knowledge as well as to prepare it for further purposes and make it available.	0.882		0.913	0.882	
TS3: Our employees successfully link internally existing knowledge with external insights.	0.906		0.904	0.906	
TS4: Our employees are able to apply new external knowledge in their practical work.	0.898		0.909	0.898	

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
Dimension 2: Exploitation (EX) (3 items)	N/A	<u>0.906</u>	N/A	N/A	<u>0.906</u>
EX1: Our management supports the development of prototypes.	0.781		0.905	0.781	
EX2: Our company regularly reconsiders technologies and adapts them according to new knowledge.	0.860		0.823	0.860	
EX3: Our company has the ability to work more effectively by adopting new technologies.	0.834		0.855	0.834	
Construct 6: Knowledge dissemination ability (KDA) (4 items)	N/A	<u>0.901</u>	N/A	N/A	<u>0.901</u>
KDA1: We have formal information links established among all parties involved in a project.	0.812		0.864		0.812
KDA2: We have informal networks that ensure all employees have the information they need.	0.749		0.885		0.749
KDA3: Employees of the NPD team are able to educate each other during a project.	0.848		0.846		0.848
KDA4: Employees of the NPD team are trained in new tasks relating to a project.	0.742		0.893		0.742
Construct 7: Knowledge breadth (KB) (4 items)	N/A	<u>0.871</u>	N/A	N/A	<u>0.871</u>
KB1: We possess market information from a wide-ranging customer portfolio.	0.599		0.881	0.599	
KB2: We possess market information from a diversified customer portfolio.	0.845		0.784	0.845	
KB3: We have accumulated knowledge of multiple market segments.	0.737		0.830	0.737	
KB4: Our R&D expertise consists of technical knowledge from a variety of backgrounds.	0.731		0.834	0.731	

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
Construct 8: Knowledge depth (KD) (3 items)	N/A	<u>0.860</u>	N/A	N/A	<u>0.860</u>
KD1: We have a thorough understanding and experience of current customers.	0.701		0.849	0.701	
KD2: We have accumulated in-depth knowledge of the key market segment that we focus on.	0.885		0.656	0.885	
KD3: Our R&D experts have thorough technical knowledge and skills within our specialised domain.	0.671		0.888	0.671	
Construct 9: New product performance (NPP) (6 items)	N/A	<u>0.848</u>	N/A	N/A	<u>0.890</u>
<i>NPP1: The quality of new products in our company is better than that of the major competitors.</i>	<i>0.244 (Deleted)</i>		<i>0.890</i>	<i><u>Deleted</u></i>	
NPP2: New products of our company can meet the needs of its customers.	0.653		0.821	0.611	
NPP3: The ratio of the successful NPD projects in our company is higher than that of major competitors.	0.813		0.789	0.817	
NPP4: New products of our company attain the goal of expected sales.	0.744		0.799	0.806	
NPP5: New products of our company attain the goal of expected profitability.	0.679		0.816	0.759	
NPP6: Overall performance of new products of our company is successful.	0.738		0.804	0.713	
Construct 10: Innovation capability (IC)					
Dimension 1: Strategic orientation (SO) (15 items)		<u>0.945</u>			<u>0.945</u>
<i>SO1: Our business objectives are driven primarily by customer satisfaction.</i>	<i>0.496 (Deleted)</i>		<i>0.945</i>	<i><u>Deleted</u></i>	
SO2: We constantly monitor our level of commitment and orientation to serve customer needs.	0.578		0.944	0.551	

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
SO3: Our strategy for competitive advantage is based on our understanding of customers' needs.	0.569		0.944	0.539	
SO5: We routinely or regularly measure our customer service.	0.515		0.946	0.514	
SO6: Our salespeople regularly share information within our business concerning competitors' strategies.	0.790		0.939	0.791	
SO7: We rapidly respond to competitors' actions that threaten us.	0.799		0.938	0.798	
SO8: Top management regularly discusses competitors' strengths and strategies.	0.741		0.940	0.742	
SO9: We target customers where we have an opportunity for competitive advantage.	0.700		0.941	0.684	
SO10: Our new products are always at the state-of-the-art of the technology.	0.819		0.938	0.831	
SO11: We have better technological knowledge than our competitors.	0.882		0.937	0.893	
SO12: Our R&D programmes are more ambitious than those of our competitors.	0.812		0.939	0.817	
SO14: Our strategic business unit (SBU) uses sophisticated technologies for its NPD.	0.713		0.942	0.730	
SO17: Our SBU has the will and the capacity to build and market a technological breakthrough.	0.779		0.939	0.769	
SO19: Our SBU has an aggressive technological patent strategy.	0.786		0.939	0.801	
SO20: Our SBU has better industrial methods than the competitors.	0.711		0.941	0.714	

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
Dimension 2: Resource management (RM) (4 items)	N/A	<u>0.881</u>	N/A	N/A	<u>0.881</u>
RM1: We manage our human resources efficiently.	0.763		0.840	0.763	
RM2: We manage our information systems efficiently.	0.837		0.813	0.837	
RM3: We manage various technology-related changes efficiently.	0.637		0.892	0.637	
RM4: We manage to satisfy most of our clients' requirements.	0.752		0.844	0.752	
Dimension 3: Organisational intelligence (OI) (11 items)	N/A	<u>0.930</u>	N/A	N/A	<u>0.930</u>
OI1: We have the ability to continuously collect information from customers.	0.776		0.920	0.776	
OI2: We have the ability to continuously collect information about competitors' activities.	0.777		0.921	0.777	
OI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	0.687		0.925	0.687	
OI4: We have the ability to continuously collect information from external experts, such as consultants.	0.669		0.927	0.669	
OI5: We have the ability to continuously re-examine the value of information collected in previous studies.	0.773		0.921	0.773	
OI6: We have formal information links established among all parties involved in a project.	0.680		0.925	0.680	
OI7: We have informal networks that ensure all employees have the information they need.	0.647		0.926	0.647	
OI8: Employees of the NPD team are able to educate each other during a project.	0.791		0.920	0.791	
OI9: Employees of the NPD team are trained in new tasks relating to a project.	0.813		0.918	0.813	

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
OI14: We are able to use information to solve specific problems encountered in a project.	0.563		0.929	0.563	
OI15: We are able to provide information to effectively implement a project.	0.719		0.923	0.719	
Dimension 4: Creativity (CR) (13 items)	N/A	<u>0.928</u>	N/A	N/A	<u>0.928</u>
CR1: Our employees are able to suggest new ways to achieve goals or objectives.	0.766		0.919	0.766	
CR2: Our employees are able to suggest new ways to increase quality.	0.806		0.918	0.806	
CR3: Our employees are able to suggest new ways of performing work tasks.	0.841		0.916	0.841	
CR4: Our employees often have new and innovative ideas.	0.748		0.920	0.748	
CR5: Our employees often have a fresh approach to problems.	0.674		0.923	0.674	
CR6: Our employees are able to come up with new and practical ideas to improve performance.	0.601		0.925	0.601	
CR7: Our employees are able to come up with creative solutions to problems.	0.626		0.924	0.626	
CR8: Our employees are able to search out new technologies, processes, techniques, and/or product ideas.	0.563		0.927	0.563	
CR9: Our employees are able to promote and champion ideas to others.	0.699		0.922	0.699	
CR10: Our employees are able to exhibit creativity on the job when given the opportunity.	0.659		0.924	0.659	
CR11: Our employees are able to develop adequate plans and schedules for the implementation of new ideas.	0.640		0.924	0.640	
CR12: Our employees are good sources of creative ideas.	0.661		0.923	0.661	
CR13: Our employees are not afraid to take risks.	0.571		0.926	0.571	

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
Dimension 5: Structure and system (SS) (7 items)	N/A	<u>0.927</u>	N/A	N/A	<u>0.927</u>
SS1: Projects are developed using effective cross-functional teams.	0.864		0.906	0.864	
SS2: Project teams are organic, flexible, and agile.	0.857		0.907	0.857	
SS3: All team operations are driven by customer needs.	0.836		0.909	0.836	
SS4: All team members are mutually accountable.	0.826		0.911	0.826	
SS5: Team members are empowered to make decisions.	0.647		0.927	0.647	
SS6: Virtual team members are equipped with effective ICT tools.	0.709		0.924	0.709	
SS7: Team members' rewards are equitable.	0.678		0.925	0.678	
Dimension 6: Culture and climate (CC) (10 items)	N/A	<u>0.934</u>	N/A	N/A	<u>0.934</u>
CC1: There is a formal idea generation process in place.	0.736		0.927	0.736	
CC2: All employees participate in generating ideas.	0.773		0.926	0.773	
CC3: Failures and mistakes are tolerated and not punished.	0.575		0.942	0.575	
CC4: Senior management is committed to risk-taking in product innovation.	0.764		0.926	0.764	
CC5: The organisation permits the emergence of intrapreneurs or product champions.	0.834		0.922	0.834	
CC6: The organisation provides support in terms of autonomy, time, and rewards.	0.845		0.921	0.845	
CC7: Knowledge sharing is encouraged and rewarded.	0.818		0.922	0.818	
CC8: Money is made available for internal projects.	0.812		0.923	0.812	
CC9: Adequate resources are available and committed to achieving project goals.	0.799		0.923	0.799	

Dimension/Item	Initial result		Cronbach's alpha if item deleted	Final result	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
CC10: All operations are driven by customer needs.	0.588		0.933	0.588	
Dimension 7: Management of technology (MO) (4 items)	N/A	<u>0.959</u>	N/A	N/A	<u>0.959</u>
MO1: Our company always attempts to stay on the leading edge of new technology in our industry.	0.901		0.945	0.901	
MO2: We make an effort to anticipate the full potential of new practices and technologies.	0.913		0.942	0.913	
MO3: We pursue long-range programmes in order to acquire technological capabilities in advance of our needs.	0.931		0.936	0.931	
MO4: We are constantly thinking of the next generation of technology.	0.851		0.960	0.851	

7.4 Revision of Questionnaire

The results of the item purification of the data set collected through the pilot survey led to the removal of 11 items: SO1, SO4, SO13, SO15, SO16, SO18, OI10, OI11, OI12, OI13, and NPP1. Consequently, the questionnaire from the pilot survey was revised (see Appendix 3) and will be used later for the survey phase in the field study as part of this research's second phase of investigation.

7.5 Summary

This chapter presented the development of items for the constructs as well as the purification of items from the data collected in the pilot survey. There were 50 Thai dessert SMEs used in the data analysis (with item purification) from the pilot survey. A sample size of 50 was initially targeted for the pilot survey because it was recommended as large enough for the item purification process. Thus, the sampling procedure was based on sending the questionnaires to 50 Thai dessert SMEs, which had been randomly selected and were willing to participate via the researcher's contact. The purpose of asking the randomly-selected Thai dessert SMEs about their willingness to participate before sending the questionnaires was to prevent the waste of samples. This is because the samples included in the pilot survey will be excluded from the survey phase. Consequently, the samples in the survey phase rely on the entire population of Thai dessert SMEs, excluding the 50 samples participating in the pilot survey. The results of the item purification led to the removal of 11 items from the questionnaire: SO1, SO4, SO13, SO15, SO16, SO18, OI10, OI11, OI12, OI13, and NPP1. The next chapter will present the results of data collection using the survey from the field study and the results of the hypothesis testing.

Chapter 8 : Analysis and Findings in Phase 2 – Survey

8.1 Introduction

In Chapter 7, the items (measures) for constructs were developed and purified via data collected in the pilot survey. The purified items were later used as questions contained in the questionnaires amended for the survey phase. This chapter presents the results of data collection and analysis of the data collected through the survey in order to test the research hypothesis as formulated in Chapter 4.

The chapter is organised into six main sections. Following this section, the next section provides an overview of the research questions related to the quantitative approach and the hypotheses to be tested. Section 8.3 presents the results of the survey data collection. Section 8.4 presents basic data about the Thai dessert SMEs participating in the survey of this research. Section 8.5 presents the data analysis and the results of hypothesis testing with the CB-SEM. Section 8.6 presents a summary of the chapter.

8.2 Research Questions and Formulated Hypotheses

For the current research, a quantitative approach was adopted in the second phase of the investigation, following the use of a qualitative approach. This approach was adopted to answer three research questions (RQ3-RQ5), as discussed in Chapter 5 (See Section 5.5.3). To determine the answers to these three research questions, hypotheses were formulated to be tested (See Chapter 4). The linkage between the research questions and hypotheses is presented in Table 8.1.

Table 8.1

Links between the Research Questions and Hypotheses

Research question	Hypothesis
RQ3: What is the effect of local search experience on PAC?	H1: Local search experience has a positive effect on PAC.
RQ4: How do search breadth and search depth affect PAC and RAC?	H2A: Search breadth is positively related to PAC.
	H2B: Search breadth is negatively related to RAC.
	H3A: Search depth is negatively related to PAC.
	H3B: Search depth is positively related to RAC.
	H4: Knowledge breadth positively moderates the relationship between search breadth and PAC.
RQ5: Does innovation capability have a moderating effect on the relationship between RAC and new product performance (NPP)?	H5: Knowledge depth positively mediates the relationship between search depth and RAC.
	H6: Knowledge dissemination ability positively moderates the relationship between PAC and RAC.
	H7: Innovation capability positively moderates the relationship between RAC and new product performance (NPP).

8.3 Results of Data Collection

Data was collected using a survey conducted between July and August 2015. Questionnaires, as amended in the pilot survey with the removal of unreliable items, were sent to 794 Thai dessert SMEs via post. This figure for Thai dessert SMEs is based on the population size of Thai dessert SMEs (844 firms), excluding the 50 Thai dessert SMEs that participated in the pilot survey. Following the initial response, two follow-up reminders with phone calls were conducted between two to six weeks after the initial mailing. Subsequently, 211 questionnaires were returned to the researcher, accounting for a response rate of 26.5 per cent. As a rule of thumb, analysing the data using CB-SEM requires a minimum of 200 cases (Barrett, 2007; Hoelter, 1983). Thus, the sample size of 211 samples was considered sufficient for use in data analysis.

8.4 Basic Data of Participating Thai Dessert SMEs

Based on the 211 questionnaires returned by Thai dessert SMEs, basic data about these SMEs was collected in relation to four key aspects: 1) the profile of firms; 2) the profile of respondents; 3) the profile of new product development (NPD) projects; 4) the access to external knowledge sources. Descriptive statistics representing these aspects are presented below.

8.4.1 Profile of Firms

Data regarding the profiles of the responding Thai dessert SMEs was collected: firm size, firm age, and the existence of a formal R&D department in an organisational chart. Table 8.2 presents the profile of Thai dessert SMEs that provided responses for this research.

Table 8.2

Profile of Thai Dessert SMEs Responding to the Survey

Profile	Number	Percentage (%)
Firm size (No. of employees)		
Less than 50 (Small-sized SME)	195	92.4
50-200 (Medium-sized SME)	16	7.6
Total	211	100%
Firm age		
Less than 5 years	3	1.4
5-10 years	19	9.0
11-15 years	74	35.1
16-20 years	95	45.0
Over 20 years	20	8.5
Total	211	100%
Formal R&D in the organisational chart		
Yes	74	35.1
No	137	64.9
Total	211	100%

Based on Table 8.2, the results of the survey revealed that 92.4% of Thai dessert SMEs that responded to this survey were small-sized firms, while 7.6% were medium-sized firms. The majority of Thai dessert SMEs responding to the survey had firm ages between 16-20 years (45.0%) and 11-15 years (35.1%), respectively. Only 1.4% of Thai dessert SMEs in this survey had a firm age of fewer than five years. Focusing on the existence of a formal R&D department, the survey results revealed that 64.9% of Thai dessert SMEs that responded to the survey had no formal R&D department in their organisational chart, while 35.1% did.

8.4.2 Profile of Respondents

The profiles of respondents were collected based on the following: 1) job title; 2) job department; 3) the role of respondents in the NPD team; and 4) the experience of being an NPD team in a firm. Table 8.3 presents the profile of respondents from the surveyed Thai dessert SMEs.

Table 8.3

Profile of Respondents

Profile of Respondent	Number	Percentage (%)
Job Title		
Owner	157	74.4
General manager	6	2.8
Departmental manager	45	21.3
Employee/staff	3	1.4
Total	211	100%
Job Department		
Owner	159	75.4
Production	5	2.4
Quality assurance	0	0
Marketing	45	21.3
R&D	2	0.9
Total	211	100%
Role of Respondent in NPD team		
Project manager	204	96.7
Member	7	3.3
Total	211	100%

Profile of Respondent	Number	Percentage (%)
Experience of being an NPD team in a firm		
Less than 5 years	7	3.3
5-10 years	18	8.5
11-15 years	69	32.7
Over 15 years	117	55.5
Total	211	100%

As seen in Table 8.3, the survey results revealed that the survey respondents mainly held the job titles of owner (74.4%) and departmental manager (21.3%). A small number of respondents held the job title of employee/staff (1.4%). Most respondents were owners (75.4%) and people in marketing departments (21.3%). A small number of respondents were from production departments (2.4%) and R&D departments (0.9%). Furthermore, the results of data collection revealed that no respondents from the quality assurance department participated in this survey.

Most respondents held roles as project managers in an NPD team (96.7%), while 3.3% were members of NPD teams. This may be because most respondents were owners and would therefore also have the responsibility of being project managers for NPD teams at the same time. The majority of respondents had over 15 years of experience (55.5%), while the respondents with fewer than five years of experience were the minority, at only 3.3%

8.4.3 Types of New Product Development

The Thai dessert SMEs who responded to this survey revealed the types of NPD that they had launched in the previous five years (2011-2015). Six types of NPD were specified in the survey: 1) new-to-the-world; 2) new product line; 3) line extension; 4) improvement; 5) repositioning; and 6) cost reduction. The results of the survey revealed two main types of NPDs being engaged in by Thai dessert SMEs: line extension (77.3%) and improvements (20.4%). There was no indication of Thai dessert SME involvement in NPDs classed as being new to the world and cost reduction. Table 8.4 presents the types of NPDs that Thai dessert SMEs engage in.

Table 8.4

Types of New Product Development in Thai Dessert SMEs

Category	Number	Percentage (%)
New-to-the-world	0	0
New product line	4	1.9
Line extension	163	77.3
Improvements	43	20.4
Repositioning	1	0.5
Cost reduction	0	0
Total	211	100%

8.4.4 Access to External Knowledge Sources

Based on external knowledge sources, as adapted from the work of Laursen and Salter (2006), Thai dessert SMEs responding to the survey were asked to indicate the degree to which they were using 17 external knowledge sources. The four degrees were as follows: not used, used to a low degree, used to a medium degree, and used to a high degree. Table 8.5 presents the percentage of external knowledge source use among Thai dessert SMEs.

Table 8.5

Percentage of External Knowledge Sources Use for Thai Dessert SMEs

Type	Knowledge Source	Not Used	Used			Total
			Low	Medium	High	
Market	Suppliers of equipment, materials, components, or software	4 (1.9%)	5 (2.4%)	61 (28.9%)	141 (66.8%)	<u>211</u> (100%)
	Clients or customers	1 (0.5%)	17 (8.1%)	91 (43.1%)	102 (48.3%)	<u>211</u> (100%)
	Competitors	2 (0.9%)	24 (11.4%)	126 (59.7%)	59 (28%)	<u>211</u> (100%)
	Consultants	107 (50.7%)	31 (14.7%)	64 (30.3%)	9 (4.3%)	<u>211</u> (100%)

Type	Knowledge Source	Not Used	Used			Total
			Low	Medium	High	
	Commercial laboratories/R&D enterprises	19 (9%)	54 (25.6%)	114 (54%)	24 (11.4%)	211 (100%)
Institutional	Universities or other higher education institutes	12 (5.7%)	51 (24.2%)	122 (57.8%)	26 (12.3%)	211 (100%)
	Government research organisations	15 (7.1%)	42 (69.9%)	122 (57.8%)	32 (15.2%)	211 (100%)
	Other public sectors, e.g. business links, government offices	25 (11.8%)	45 (21.3%)	111 (52.6%)	30 (14.2%)	211 (100%)
	Private research institutes	111 (57.6%)	60 (28.4%)	25 (11.8%)	15 (7%)	211 (100%)
Specialised	Technical standards	2 (0.9%)	14 (6.6%)	96 (45.5%)	99 (46.9%)	211 (100%)
	Health and safety standards and regulations	1 (0%)	3 (1.4%)	24 (11.4%)	184 (87.2%)	211 (100%)
	Environmental standards and regulations	0 (0%)	3 (1.4%)	28 (13.3%)	180 (85.3%)	211 (100%)
Other	Professional conferences, meetings	6 (2.8%)	20 (9.5%)	105 (49.8%)	80 (37.9%)	211 (100%)
	Trade associations	9 (4.3%)	26 (12.3%)	97 (46%)	79 (37.4%)	211 (100%)
	Technical/trade press	20 (9.5%)	81 (38.4%)	98 (46.4%)	12 (5.7%)	211 (100%)
	Computer databases	28 (13.3%)	74 (35.1%)	95 (45%)	14 (6.6%)	211 (100%)

Type	Knowledge Source	Not Used	Used			Total
			Low	Medium	High	
	Fairs, exhibitions	3 (1.4%)	11 (5.2%)	63 (29.9%)	134 (63.5%)	211 (100%)

As seen in Table 8.5, the degree of using external knowledge sources with the highest percentage in each source was considered as the degree of using that source. This is to categorise data as the degree of use for each source. Table 8.6 represents Thai dessert SMEs' degree of use for each external knowledge source.

Table 8.6

Thai Dessert SMEs' Degree of Use for Each External Knowledge Source

Degree of use	External knowledge source	Type of source	Number (%)
High	Health and safety standards and regulations	Specialised	184 (87.2%)
	Environmental standards and regulations	Specialised	180 (85.3%)
	Suppliers of equipment, materials, components, or software	Market	141 (66.8%)
	Fairs, exhibitions	Other	134 (63.5%)
	Clients or customers	Market	102 (48.3%)
	Technical standards	Specialised	99 (46.9%)
Medium	Competitors	Market	126 (59.7%)
	Universities or other higher education institutes	Institutional	122 (57.8%)
	Government research organisations	Institutional	122 (57.8%)
	Commercial laboratories/R&D enterprises	Market	114 (54.0%)
	Other public sectors, e.g. business links, government offices	Institutional	111 (52.6%)
	Professional conferences, meetings	Other	105 (49.8%)
	Technical/trade press	Other	98 (46.4%)
	Trade associations	Other	97 (46.0%)
	Computer databases	Other	95 (45.0%)

Degree of use	External knowledge source	Type of source	Number (%)
Low	N/A	N/A	N/A
Not used	Private research institutes	Institutional	111 (51.6%)
	Consultants	Market	107 (50.7%)
Total			211

As seen in Table 8.6, the results of organising the data revealed that there were six main sources that Thai dessert SMEs used to a high degree: 1) health and safety standards and regulations (87.2%); 2) environmental standards and regulations (85.3%); 3) suppliers of equipment, materials, components, or software (66.8%); 4) fairs and exhibitions (63.5%); 5) clients or customers (48.3%); 6) technical standards (46.9%). Furthermore, the results of organising the data revealed two key sources that were rarely used among Thai dessert SMEs: namely, consultants and private research institutes.

8.4.5 Breadth and Depth of External Search

The data collected from Thai dessert SMEs using the 17 external knowledge sources, as detailed in Section 8.4.4 above, was analysed to determine the degree of search breadth and search depth of the SMEs' access to external knowledge sources (see Chapter 7). The results of the analysis revealed that Thai dessert SMEs had an average (mean) search breadth of 15.27, while the mean search depth was 5.76. Table 8.7 presents the search breadth and search depth of external knowledge sources among Thai dessert SMEs.

Table 8.7

Search Breadth and Search Depth of Thai Dessert SMEs' Access to External Knowledge Source

Statistics	Search breadth			Search depth		
	Number of sources	Frequency	Percentage (%)	Level of depth in search	Frequency	Percentage (%)
	0	0	0	0	7	3.3
	1	0	0	1	11	5.2
	2	0	0	2	23	10.9
	3	0	0	3	26	12.3
	4	0	0	4	20	9.5
	5	1	0.5	5	32	15.2
	6	1	0.5	6	7	3.3
	7	2	0.9	7	18	8.5
	8	1	0.5	8	19	9.0
	9	1	0.5	9	15	7.1
	10	3	1.4	10	12	5.7
	11	5	2.4	11	8	3.8
	12	3	1.4	12	3	1.4
	13	16	7.6	13	4	1.9
	14	15	7.1	14	2	0.9
	15	56	26.5	15	2	0.9
	16	17	8.1	16	2	0.9
	17	90	42.7	17	0	0
Total		<u>211</u>	<u>100%</u>		<u>211</u>	<u>100%</u>
Maximum	17			16		
Minimum	5			0		
S.D.	2.19			3.54		
Average	15.27			5.76		

8.5 Data Analysis

Data from the 211 Thai dessert SMEs responding to the survey was used to test the hypotheses by means of covariance-based structural equation modelling (CB-SEM). To conduct the data analysis, the AMOS software program (version 24) was used. The results of the CB-SEM analysis are presented below.

8.5.1 Assessment of Multivariate Normal Distribution

Multivariate normal distribution was a required assumption for CB-SEM; thus, it was examined first. This assumption is required because the maximum-likelihood (ML) estimator, which is commonly used in CB-SEM, assumes that the data is multivariate normally distributed. A multivariate normal distribution is achieved when the conditions of the univariate normal distribution and multivariate normal distribution are met. Thus, an assessment of both the univariate distribution and multivariate distribution was performed.

A univariate normal distribution is assessed through skewness and kurtosis. Skewness is the measure of the symmetry of a distribution, while kurtosis is the measure of the peakedness or flatness of a distribution (Tabachnick et al., 2001). A univariate normal distribution is present when univariate skewness and kurtosis are equal to zero. It is important to note that while there is no consensus as to the acceptable degree of non-normality, cut-off values of 3.00 for univariate skewness and 7.00 for univariate kurtosis have been proposed (Finney & DiStefano, 2006). The results of the assessment of univariate normal distribution are presented in Table 8.8, revealing that the assumption of univariate normal distribution was not supported.

Table 8.8

Results of Skewness and Kurtosis of Items

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
RI1: We have the ability to continuously collect information from customers.	5	1	3.62	1.15	-0.138	-0.818	-1.292	-3.831
RI2: We have the ability to continuously collect information about competitors' activities.	5	1	3.58	1.15	-0.059	-0.350	-1.285	-3.809
RI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	5	1	3.54	1.13	-0.059	-0.348	-1.156	-3.427
RI4: We have the ability to continuously collect information from external experts, such as consultants.	5	1	2.78	1.53	0.195	1.155	-1.475	-4.375
RI5: We have the ability to continuously re-examine the value of information collected in previous studies.	5	1	3.62	1.01	-0.165	-0.978	-0.830	-2.460
MK1: New packaging design.	5	1	3.61	0.83	-0.634	-3.762	0.241	0.715
MK2: Improved raw materials to improve product quality.	5	2	4.80	0.52	-2.979	-17.665	9.723	28.830
MK3: Customers' positive suggestions for product development.	5	1	4.56	0.75	-2.092	-12.404	5.115	15.165
MK4: Customers' negative comments for product improvement.	5	1	2.67	1.77	0.384	2.276	-1.663	-4.930

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
MK5: Current customers' consumption behaviour related to product.	5	1	4.65	0.71	-2.839	-16.834	9.868	29.260
QS1: Application of GMP standard based on Thai FDA fitting with the company.	5	1	4.38	0.86	-1.726	-10.233	3.275	9.711
QS2: Application of Codex GMP standard fitting with the company.	5	1	2.57	1.58	0.281	1.665	-1.600	-4.745
QS3: Application of HACCP standard fitting with the company.	5	1	2.26	1.56	0.604	3.582	-1.382	-4.098
QS4: New technology, including machines and equipment, to facilitate food quality and safety standards.	5	1	3.94	1.01	-0.769	-4.559	-0.134	-0.397
QS5: New packaging technology for extending the shelf life of products and maintaining product quality.	5	1	4.38	0.80	-1.754	-10.404	4.124	12.228
Search breadth	17	5	15.27	2.20	-1.945	-11.533	4.742	14.062
Search depth	16	0	5.76	3.55	0.585	3.468	-0.193	-0.573
AC1: The search for relevant information concerning our industry is an every-day business in our company.	5	1	2.58	1.30	0.060	0.355	-1.457	-4.321
AC2: Our management motivates the employees to use information sources within our industry.	5	1	2.65	1.26	-0.077	-0.455	-1.390	-4.123
AC3: Our management expects the employees to deal with information beyond our industry.	5	1	2.67	1.24	-0.124	-0.735	-1.416	-4.198

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
AS1: In our company, ideas and concepts are communicated on a cross-departmental basis.	5	2	3.76	1.00	-0.171	-1.012	-1.124	-3.334
AS2: In our company, there is quick information flow, e.g. if a business unit obtains important information, it communicates this information promptly to all other business units or departments.	5	1	3.77	1.03	-0.250	-1.484	-1.017	-3.017
AS3: Our management emphasises cross-departmental support to solve problems.	5	2	4.23	0.81	-0.598	-3.544	-0.743	-2.204
AS4: Our management demands periodical cross-departmental meetings to share new developments, problems, and achievements.	5	1	3.40	1.45	-0.223	-1.322	-1.457	-4.321
TS1: Our employees have the ability to structure and use collected knowledge.	5	1	3.25	0.94	-0.300	-1.780	-0.409	-1.213
TS2: Our employees are used to absorbing externally new knowledge as well as to prepare it for further purposes and make it available.	5	1	3.21	0.95	-0.269	-1.594	-0.553	-1.640
TS3: Our employees successfully link internally existing knowledge with external insights.	5	1	3.25	1.02	-0.169	-1.002	-0.661	-1.959
TS4: Our employees are able to apply new external knowledge in their practical work.	5	1	3.29	0.93	-0.246	-1.460	-0.316	-0.936

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
EX1: Our management supports the development of prototypes.	5	1	3.34	0.85	-0.288	-1.710	-0.076	-0.225
EX2: Our company regularly reconsiders technologies and adapts them according to new knowledge.	5	1	3.09	1.06	-0.321	-1.904	-0.808	-2.396
EX3: Our company has the ability to work more effectively by adopting new technologies.	5	1	3.13	1.07	-0.289	-1.715	-0.698	-2.070
KDA1: We have formal information links established among all parties involved in a project.	5	1	3.30	1.04	-0.126	-0.745	-0.624	-1.851
KDA2: We have informal networks that ensure all employees have the information they need.	5	1	2.94	1.12	-0.110	-0.652	-0.981	-2.910
KDA3: Employees of the NPD team are able to educate each other during a project.	5	1	3.44	0.87	-0.395	-2.345	0.424	1.256
KDA4: Employees of the NPD team are trained in new tasks relating to a project.	5	1	3.28	0.87	-0.316	-1.875	-0.003	-0.009
KB1: We possess market information from a wide-ranging customer portfolio.	5	1	3.35	0.99	-0.310	-1.837	-0.723	-2.144
KB2: We possess market information from a diversified customer portfolio.	5	1	3.00	1.07	-0.079	-0.470	-1.033	-3.064
KB3: We have accumulated knowledge of multiple market segments.	5	1	3.02	1.06	-0.071	-0.422	-1.158	-3.433

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
KB4: Our R&D expertise consists of technical knowledge from a variety of backgrounds.	5	1	2.79	1.22	0.025	0.150	-1.172	-3.474
KD1: We have a thorough understanding and experience of current customers.	5	1	3.65	0.98	-0.177	-1.048	-0.725	-2.150
KD2: We have accumulated in-depth knowledge of the key market segment that we focus on.	5	1	3.42	1.11	-0.150	-0.889	-1.009	-2.992
KD3: Our R&D experts have thorough technical knowledge and skills within our specialised domain.	5	1	3.28	1.10	-0.277	-1.641	-0.648	-1.922
NPP2: New products of our company can meet the needs of its customers.	5	1	3.85	0.71	-0.871	-5.166	1.572	4.661
NPP3: The ratio of the successful NPD projects in our company is higher than that of major competitors.	5	1	3.73	0.76	-0.843	-4.999	1.240	3.678
NPP4: New products of our company attain the goal of expected sales.	5	2	4.20	0.68	-0.722	-4.283	0.998	2.960
NPP5: New products of our company attain the goal of expected profitability.	5	2	4.26	0.63	-0.597	-3.542	1.066	3.162
NPP6: Overall performance of new products of our company is successful.	5	1	4.24	0.65	-0.909	-5.393	2.789	8.271
SO2: We constantly monitor our level of commitment and orientation to serve customer needs.	5	1	4.12	0.99	-0.834	-4.949	-0.339	-1.005

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
SO3: Our strategy for competitive advantage is based on our understanding of customers' needs.	5	2	4.23	0.82	-0.648	-3.843	-0.629	-1.865
SO5: We routinely or regularly measure our customer service.	5	1	3.31	1.28	-0.385	-2.285	-1.035	-3.070
SO6: Our salespeople regularly share information within our business concerning competitors' strategies.	5	1	3.70	0.81	-0.981	-5.818	1.705	5.055
SO7: We rapidly respond to competitors' actions that threaten us.	5	1	3.82	0.77	-0.812	-4.817	1.963	5.820
SO8: Top management regularly discusses competitors' strengths and strategies.	5	1	4.01	0.74	-0.871	-5.165	1.967	5.831
SO9: We target customers where we have an opportunity for competitive advantage.	5	1	4.09	0.74	-0.850	-5.040	1.813	5.375
SO10: Our new products are always at the state-of-the-art of the technology.	5	1	2.55	1.31	0.115	0.683	-1.491	-4.421
SO11: We have better technological knowledge than our competitors.	5	1	2.56	1.29	0.057	0.336	-1.480	-4.389
SO12: Our R&D programmes are more ambitious than those of our competitors.	5	1	2.54	1.25	0.048	0.287	-1.487	-4.410
SO14: Our strategic business unit (SBU) uses sophisticated technologies for its NPD.	5	1	2.39	1.27	0.327	1.937	-1.279	-3.792

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
SO17: Our SBU has the will and the capacity to build and market a technological breakthrough.	5	1	2.73	1.13	0.177	1.049	-1.050	-3.114
SO19: Our SBU has an aggressive technological patent strategy.	5	1	2.44	1.28	0.205	1.217	-1.468	-4.353
SO20: Our SBU has better industrial methods than the competitors.	5	1	2.61	1.17	0.072	0.427	-1.281	-3.797
RM1: We manage our human resources efficiently.	5	1	4.42	0.70	-1.283	-7.608	2.596	7.696
RM2: We manage our information systems efficiently.	5	1	4.23	0.73	-0.904	-5.362	1.445	4.284
RM3: We manage various technology-related changes efficiently.	5	1	2.95	1.29	-0.005	-0.030	-1.223	-3.626
RM4: We manage to satisfy most of our clients' requirements.	5	1	3.93	1.01	-0.599	-3.553	-0.424	-1.257
OI1: We have the ability to continuously collect information from customers.	5	1	3.62	1.15	-0.138	-0.818	-1.292	-3.831
OI2: We have the ability to continuously collect information about competitors' activities.	5	1	3.58	1.15	-0.059	-0.350	-1.285	-3.809
OI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	5	1	3.54	1.13	-0.059	-0.348	-1.156	-3.427

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
OI4: We have the ability to continuously collect information from external experts, such as consultants.	5	1	2.78	1.53	0.195	1.155	-1.475	-4.375
OI5: We have the ability to continuously re-examine the value of information collected in previous studies.	5	1	3.62	1.10	-0.165	-0.978	-0.830	-2.460
OI6: We have formal information links established among all parties involved in a project.	5	1	3.23	0.95	-0.333	-1.972	-0.433	-1.285
OI7: We have informal networks that ensure all employees have the information they need.	5	1	2.99	1.14	-0.182	-1.082	-1.070	-3.174
OI8: Employees of the NPD team are able to educate each other during a project.	5	1	3.42	0.82	-0.541	-3.207	0.828	2.456
OI9: Employees of the NPD team are trained in new tasks relating to a project.	5	1	3.31	0.85	-0.350	-2.075	0.279	0.827
OI14: We are able to use information to solve specific problems encountered in a project.	5	1	3.49	0.83	-0.678	-4.021	0.393	1.164
OI15: We are able to provide information to effectively implement a project.	5	1	3.47	0.86	-0.803	-4.762	0.535	1.587
CR1: Our employees are able to suggest new ways to achieve goals or objectives.	5	1	3.01	1.10	-0.105	-0.622	-0.988	-2.931
CR2: Our employees are able to suggest new ways to increase quality.	5	1	3.03	1.12	-0.077	-0.454	-0.971	-2.879

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
CR3: Our employees are able to suggest new ways of performing work tasks.	5	1	3.03	1.12	-0.086	-0.509	-0.981	-2.910
CR4: Our employees often have new and innovative ideas.	5	1	2.68	1.28	0.089	0.530	-1.263	-3.744
CR5: Our employees often have a fresh approach to problems.	5	1	2.82	1.16	-0.022	-0.131	-0.992	-2.941
CR6: Our employees are able to come up with new and practical ideas to improve performance.	5	1	2.92	1.09	-0.027	-0.161	-0.876	-2.596
CR7: Our employees are able to come up with creative solutions to problems.	5	1	3.25	1.03	-0.347	-2.061	-0.455	-1.348
CR8: Our employees are able to search out new technologies, processes, techniques, and/or product ideas.	5	1	2.94	1.12	0.031	0.185	-1.061	-3.145
CR9: Our employees are able to promote and champion ideas to others.	5	1	2.97	1.05	-0.253	-1.500	-0.962	-2.853
CR10: Our employees are able to exhibit creativity on the job when given the opportunity.	5	1	3.30	1.02	-0.462	-2.738	-0.164	-0.487
CR11: Our employees are able to develop adequate plans and schedules for the implementation of new ideas.	5	1	2.98	1.11	-0.144	-0.852	-1.004	-2.977
CR12: Our employees are good sources of creative ideas.	5	1	3.23	0.97	-0.436	-2.584	-0.166	-0.491
CR13: Our employees are not afraid to take risks.	5	1	3.49	0.96	-0.859	-5.095	0.673	1.995

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
SS1: Projects are developed using effective cross-functional teams.	5	1	3.37	1.24	0.028	0.167	-1.294	-3.835
SS2: Project teams are organic, flexible, and agile.	5	1	3.46	1.22	-0.086	-0.512	-1.233	-3.656
SS3: All team operations are driven by customer needs.	5	1	3.78	1.05	-0.444	-2.636	-0.423	-1.255
SS4: All team members are mutually accountable.	5	1	3.86	1.03	-0.479	-2.839	-0.403	-1.195
SS5: Team members are empowered to make decisions.	5	1	3.61	0.93	-0.454	-2.694	0.267	0.792
SS6: Virtual team members are equipped with effective ICT tools.	5	1	3.13	1.28	0.059	0.347	-1.279	-3.793
SS7: Team members' rewards are equitable.	5	1	3.36	1.32	-0.196	-1.161	-1.191	-3.531
CC1: There is a formal idea generation process in place.	5	1	3.36	1.41	-0.137	-0.811	-1.468	-4.351
CC2: All employees participate in generating ideas.	5	1	3.38	1.40	-0.206	-1.224	-1.411	-4.184
CC3: Failures and mistakes are tolerated and not punished.	5	1	3.43	1.37	-0.238	-1.409	-1.216	-3.607
CC4: Senior management is committed to risk-taking in product innovation.	5	1	3.90	1.10	-0.949	-5.631	0.426	1.263
CC5: The organisation permits the emergence of intrapreneurs or product champions.	5	1	3.18	1.43	0.106	0.628	-1.437	-4.262
CC6: The organisation provides support in terms of autonomy, time, and rewards.	5	1	3.24	1.45	-0.026	-0.152	-1.450	-4.299
CC7: Knowledge sharing is encouraged and rewarded.	5	1	3.21	1.46	0.025	0.146	-1.499	-4.444
CC8: Money is made available for internal projects.	5	1	3.14	1.49	0.099	0.586	-1.540	-4.567

Construct/item	Max.	Min.	Means	S.D.	Skewness	C.R. skewness	Kurtosis	C.R. kurtosis
CC9: Adequate resources are available and committed to achieving project goals.	5	1	3.13	1.51	0.099	0.588	-1.544	-4.578
CC10: All operations are driven by customer needs.	5	1	3.85	1.22	-0.762	-4.520	-0.439	-1.301
MO1: Our company always attempts to stay on the leading edge of new technology in our industry.	5	1	3.01	1.04	-0.221	-1.313	-1.190	-3.528
MO2: We make an effort to anticipate the full potential of new practices and technologies.	5	1	2.96	1.11	-0.361	-2.140	-1.126	-3.340
MO3: We pursue long-range programmes in order to acquire technological capabilities in advance of our needs.	5	1	3.14	0.97	-0.414	-2.457	-0.728	-2.158
MO4: We are constantly thinking of the next generation of technology.	5	1	3.12	0.95	-0.413	-2.449	-0.719	-2.132

The multivariate normal distribution was assessed by considering multivariate kurtosis (Mardia's coefficient) (Finney & DiStefano, 2006, p. 272). A multivariate normal distribution is achieved when multivariate kurtosis is lower than 3.00. The results of the multivariate normal distribution test are presented in Table 8.9. Multivariate kurtosis in each construct was greater than 3.00, indicating that the assumption of multivariate normal distribution was not supported (Bentler, 2001; Ullman, 2006).

Table 8.9

Results of Multivariate Normal Distribution

Construct/item	Multivariate kurtosis	Critical ratio of multivariate kurtosis
Construct 1: Local search experience	168.080	54.056
Construct 2: Search breadth ^a	N/A	N/A
Construct 3: Search depth ^b	N/A	N/A
Construct 4: Potential absorptive capacity	37.604	24.331
Construct 5: Realised absorptive capacity	33.968	21.979
Construct 6: Knowledge dissemination ability	6.469	6.782
Construct 7: Knowledge breadth	23.871	25.025
Construct 8: Knowledge depth	9.008	11.944
Construct 9: New product performance	108.502	94.189
Construct 10: Innovation capability	898.482	72.107

Note: Search breadth^a and search depth^b are presented as formative constructs based on the summation of coded formative items. Thus, the multivariate normal distribution is not involved.

As presented in Tables 8.8 and 8.9, the results of assessing the normal distribution in both the univariate and multivariate analysis revealed that the data collected in the survey did not align with the assumption of multivariate normal distribution. Given that the data was multivariate non-normally distributed, the ML estimator was still robust against parameter estimates and standard errors (Marsh, Wen, & Hau, 2004); however, violating this assumption can result in biased results, leading to incorrect parameter estimates and affecting the model fit (Schumacker & Lomax, 2010, p. 61). Consequently, some techniques were adopted to reduce this effect, as will be discussed in the next section.

8.5.2 Handling Multivariate Non-Normally Distributed Data

To mitigate the effect of the assumption of multivariate normal distribution being violated, item parcelling and the use of factor scores were adopted in this research (Bandalos, 2002). Item parcelling is a technique involving reducing the number of items by combining items through their sum or average and using these combined items as observed variables (Nasser-Abu Alhija & Wisenbaker, 2006; Nasser & Takahashi, 2003). Item parcelling was applied in this research when testing the hypothesis in a structural model and is further outlined in Section 8.5.6.

8.5.3 Statistical Analysis at Item Level

After the assessment of multivariate normal distribution, the next step is to perform statistical analysis at an item level to screen for unreliable items. Unidimensionality and reliability were evaluated for reflective items, while multicollinearity was assessed for formative items.

8.5.3.1 Unidimensionality

Unidimensionality was examined before reliability, as suggested by Awang et al. (2015). Accordingly, all 98 reflective items were examined for unidimensionality through factor loading in each of the underlying constructs. The AMOS software program (version 24) was used to achieve this. Item loading should be significant and exceed 0.70 (Hair, 1998). The results of a unidimensionality test revealed that 12 items displayed a factor loading below 0.7: SO3, SO6, SO7, SO8, SO9, RM3, OI9, OI14, OI15, CR13, NPP2, and NPP3. Thus, these items were eliminated. Table 8.10 presents the factor loading of items in each of the related dimensions.

Table 8.10

Results of Factor Loading

Construct/dimension/item	Factor loading
Added reflective items in MIMIC model of local search experience (5 items)	
RI1: We have the ability to continuously collect information from customers.	0.987
RI2: We have the ability to continuously collect information about competitors' Activities.	0.988
RI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	0.979
RI4: We have the ability to continuously collect information from external experts, such as consultants.	0.800
RI5: We have the ability to continuously re-examine the value of information collected in previous studies.	0.842
Dimension: Acquisition (AC) (3 items)	
AC1: The search for relevant information concerning our industry is an every-day business in our company.	0.926
AC2: Our management motivates the employees to use information sources within our industry.	0.982
AC3: Our management expects the employees to deal with information beyond our industry.	0.982
Dimension: Assimilation (AS) (4 items)	
AS1: In our company, ideas and concepts are communicated on a cross-departmental basis.	0.965
AS2: In our company, there is quick information flow, e.g. if a business unit obtains important information, it communicates this information promptly to all other business units or departments.	0.975
AS3: Our management emphasises cross-departmental support to solve problems.	0.823
AS4: Our management demands periodical cross-departmental meetings to share new developments, problems, and achievements.	0.852
Dimension: Transformation (TS) (4 items)	
TS1: Our employees have the ability to structure and use collected knowledge.	0.942
TS2: Our employees are used to absorbing externally new knowledge as well as to prepare it for further purposes and make it available.	0.967

Construct/dimension/item	Factor loading
TS3: Our employees successfully link internally existing knowledge with external insights.	0.948
TS4: Our employees are able to apply new external knowledge in their practical work.	0.957
Dimension: Exploitation (EX) (3 items)	
EX1: Our management supports the development of prototypes.	0.853
EX2: Our company regularly reconsiders technologies and adapts them according to new knowledge.	0.978
EX3: Our company has the ability to work more effectively by adopting new technologies.	0.977
Dimension: Knowledge dissemination ability (KDA) (4 items)	
KDA1: We have formal information links established among all parties involved in a project.	0.921
KDA2: We have informal networks that ensure all employees have the information they need.	0.928
KDA3: Employees of the NPD team are able to educate each other during a project.	0.917
KDA4: Employees of the NPD team are trained in new tasks relating to a project.	0.849
Construct: Knowledge breadth (KB) (4 items)	
KB1: We possess market information from a wide-ranging customer portfolio.	0.844
KB2: We possess market information from a diversified customer portfolio.	0.888
KB3: We have accumulated knowledge of multiple market segments.	0.959
KB4: Our R&D expertise consists of technical knowledge from a variety of backgrounds.	0.776
Construct: Knowledge depth (KD) (3 items)	
KD1: We have a thorough understanding and experience of current customers.	0.936
KD2: We have accumulated in-depth knowledge of the key market segment that we focus on.	0.976
KD3: Our R&D experts have thorough technical knowledge and skills within our specialised domain.	0.791
Construct: New product performance (NPP) (5 items)	N/A
NPP2: New products of our company can meet the needs of its customers.	0.604 (Delete)

Construct/dimension/item	Factor loading
NPP3: The ratio of the successful NPD projects in our company is higher than that of major competitors.	0.573 (Delete)
NPP4: New products of our company attain the goal of expected sales.	0.915
NPP5: New products of our company attain the goal of expected profitability.	0.977
NPP6: Overall performance of new products of our company is successful.	0.968
Dimension: Strategic orientation (SO) (14 items)	
SO2: We constantly monitor our level of commitment and orientation to serve customer needs.	0.726
SO3: Our strategy for competitive advantage is based on our understanding of customers' needs.	0.687 (Delete)
SO5: We routinely or regularly measure our customer service.	0.717
SO6: Our salespeople regularly share information within our business concerning competitors' strategies.	0.455 (Delete)
SO7: We rapidly respond to competitors' actions that threaten us.	0.380 (Delete)
SO8: Top management regularly discusses competitors' strengths and strategies.	0.347 (Delete)
SO9: We target customers where we have an opportunity for competitive advantage.	0.283 (Delete)
SO10: Our new products are always at the state-of-the-art of the technology.	0.984
SO11: We have better technological knowledge than our competitors.	0.990
SO12: Our R&D programmes are more ambitious than those of our competitors.	0.968
SO14: Our strategic business unit (SBU) uses sophisticated technologies for its NPD.	0.918
SO17: Our SBU has the will and the capacity to build and market a technological breakthrough.	0.888
SO19: Our SBU has an aggressive technological patent strategy.	0.911
SO20: Our SBU has better industrial methods than the competitors.	0.906
Dimension: Resource management (RM) (4 items)	
RM1: We manage our human resources efficiently.	0.823
RM2: We manage our information systems efficiently.	0.967
RM3: We manage various technology-related changes efficiently.	0.532 (Delete)
RM4: We manage to satisfy most of our clients' requirements.	0.669 ¹

Construct/dimension/item	Factor loading
Dimension: Organisational intelligence (OI) (11 items)	
OI1: We have the ability to continuously collect information from customers.	0.989
OI2: We have the ability to continuously collect information about competitors' activities.	0.982
OI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	0.975
OI4: We have the ability to continuously collect information from external experts, such as consultants.	0.810
OI5: We have the ability to continuously re-examine the value of information collected in previous studies.	0.848
OI6: We have formal information links established among all parties involved in a project.	0.833
OI7: We have informal networks that ensure all employees have the information they need.	0.838
OI8: Employees of the NPD team are able to educate each other during a project.	0.765
OI9: Employees of the NPD team are trained in new tasks relating to a project.	0.699 (Delete)
OI14: We are able to use information to solve specific problems encountered in a project.	0.661 (Delete)
OI15: We are able to provide information to effectively implement a project.	0.659 (Delete)
Dimension: Creativity (CR) (13 items)	N/A
CR1: Our employees are able to suggest new ways to achieve goals or objectives.	0.989
CR2: Our employees are able to suggest new ways to increase quality.	0.998
CR3: Our employees are able to suggest new ways of performing work tasks.	0.995
CR4: Our employees often have new and innovative ideas.	0.894
CR5: Our employees often have a fresh approach to problems.	0.825
CR6: Our employees are able to come up with new and practical ideas to improve performance.	0.838
CR7: Our employees are able to come up with creative solutions to problems.	0.739
CR8: Our employees are able to search out new technologies, processes, techniques, and/or product ideas.	0.854
CR9: Our employees are able to promote and champion ideas to others.	0.845

Construct/dimension/item	Factor loading
CR10: Our employees are able to exhibit creativity on the job when given the opportunity.	0.751
CR11: Our employees are able to develop adequate plans and schedules for the implementation of new ideas.	0.868
CR12: Our employees are good sources of creative ideas.	0.814
CR13: Our employees are not afraid to take risks.	0.693 (Delete)
Dimension: Structure and system (SS) (7 items)	N/A
SS1: Projects are developed using effective cross-functional teams.	0.941
SS2: Project teams are organic, flexible, and agile.	0.953
SS3: All team operations are driven by customer needs.	0.885
SS4: All team members are mutually accountable.	0.872
SS5: Team members are empowered to make decisions.	0.857
SS6: Virtual team members are equipped with effective ICT tools.	0.889
SS7: Team members' rewards are equitable.	0.895
Dimension: Culture and climate (CC) (10 items)	N/A
CC1: There is a formal idea generation process in place.	0.936
CC2: All employees participate in generating ideas.	0.934
CC3: Failures and mistakes are tolerated and not punished.	0.870
CC4: Senior management is committed to risk-taking in product innovation.	0.772
CC5: The organisation permits the emergence of intrapreneurs or product champions.	0.958
CC6: The organisation provides support in terms of autonomy, time, and rewards.	0.981
CC7: Knowledge sharing is encouraged and rewarded.	0.988
CC8: Money is made available for internal projects.	0.983
CC9: Adequate resources are available and committed to achieving project goals.	0.982
CC10: All operations are driven by customer needs.	0.836
Dimension: Management of technology (MO) (4 items)	N/A
MO1: Our company always attempts to stay on the leading edge of new technology in our industry.	0.958
MO2: We make an effort to anticipate the full potential of new practices and technologies.	0.953

Construct/dimension/item	Factor loading
MO3: We pursue long-range programmes in order to acquire technological capabilities in advance of our needs.	0.966
MO4: We are constantly thinking of the next generation of technology.	0.971

Note: ¹ RM4 was retained because it had factor loading slightly lower than 0.7 and for the purpose of keeping at least three items in the construct in question.

8.5.3.2 Reliability

After the removal of the 12 items listed above (SO3, SO6, SO7, SO8, SO9, RM3, OI9, OI14, OI15, CR13, NPP2 and NPP3), all 86 remaining reflective items with factor loading exceeding 0.7 were assessed for reliability. Reliability was evaluated in terms of internal consistency through Cronbach's alpha. The results of the test revealed that the Cronbach's alpha value for all factors/dimensions exceeded the recommended cut-off level of 0.70 (Pallant, 2013, p. 104), which constituted a satisfactory Cronbach's alpha for each factor/dimension. Table 8.11 presents the results of the item reliability testing.

Table 8.11

Results of Item Reliability Testing

Construct/item	Initial		Cronbach's alpha if item deleted	Final	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
Added reflection on local search experience (5 items)	N/A	<u>0.958</u>	N/A	N/A	<u>0.958</u>
RI1: We have the ability to continuously collect information from customers.	0.957		0.935	0.957	
RI2: We have the ability to continuously collect information about competitors' activities.	0.942		0.938	0.942	
RI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	0.950		0.937	0.950	
RI4: We have the ability to continuously collect information from external experts, such as consultants.	0.802		0.973	0.802	
RI5: We have the ability to continuously re-examine the value of information collected in previous studies.	0.844		0.956	0.844	
Dimension: Acquisition (3 items)	N/A	<u>0.974</u>	N/A	N/A	<u>0.974</u>
AC1: The search for relevant information concerning our industry is an every-day business in our company.	0.916		0.982	0.916	
AC2: Our management motivates the employees to use information sources within our industry.	0.962		0.948	0.962	

Construct/item	Initial		Cronbach's alpha if item deleted	Final	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
AC3: Our management expects the employees to deal with information beyond our industry.	0.954		0.954	0.954	
Dimension: Assimilation (4 items)	N/A	<u>0.927</u>	N/A	N/A	<u>0.927</u>
AS1: In our company, ideas and concepts are communicated on a cross-departmental basis.	0.915		0.881	0.915	
AS2: In our company, there is quick information flow, e.g. if a business unit obtains important information, it communicates this information promptly to all other business units or departments.	0.931		0.874	0.931	
AS3: Our management emphasises cross-departmental support to solve problems.	0.794		0.928	0.794	
AS4: Our management demands periodical cross-departmental meetings to share new developments, problems, and achievements.	0.822		0.941	0.822	
Dimension: Transformation (4 items)	N/A	<u>0.975</u>	N/A	N/A	<u>0.975</u>
TS1: Our employees have the ability to structure and use collected knowledge.	0.925		0.970	0.925	
TS2: Our employees are used to absorbing externally new knowledge as well as to prepare it for further purposes and make it available.	0.951		0.963	0.951	
TS3: Our employees successfully link internally existing knowledge with external insights.	0.934		0.969	0.934	

Construct/item	Initial		Cronbach's alpha if item deleted	Final	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
TS4: Our employees are able to apply new external knowledge in their practical work.	0.941		0.966	0.941	
Dimension: Exploitation (3 items)	N/A	<u>0.951</u>	N/A	N/A	<u>0.951</u>
EX1: Our management supports the development of prototypes.	0.839		0.978	0.839	
EX2: Our company regularly reconsiders technologies and adapts them according to new knowledge.	0.944		0.893	0.944	
EX3: Our company has the ability to work more effectively by adopting new technologies.	0.938		0.896	0.938	
Construct: Knowledge dissemination Ability (4 items)	N/A	<u>0.943</u>	N/A	N/A	<u>0.943</u>
KDA1: We have formal information links established among all parties involved in a project.	0.882		0.920	0.882	
KDA2: We have informal networks that ensure all employees have the information they need.	0.889		0.921	0.889	
KDA3: Employees of the NPD team are able to educate each other during a project.	0.898		0.919	0.898	
KDA4: Employees of the NPD team are trained in new tasks relating to a project.	0.822		0.939	0.822	
Construct: Knowledge breadth (4 items)	N/A	<u>0.920</u>	N/A	N/A	<u>0.920</u>
KB1: We possess market information from a wide-ranging customer portfolio	0.791		0.905	0.791	

Construct/item	Initial		Cronbach's alpha if item deleted	Final	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
KB2: We possess market information from a diversified customer portfolio.	0.848		0.885	0.848	
KB3: We have accumulated knowledge of multiple market segments.	0.893		0.869	0.893	
KB4: Our R&D expertise consists of technical knowledge from a variety of backgrounds.	0.750		0.924	0.750	
Construct: Knowledge depth (3 items)	N/A	<u>0.920</u>	N/A	N/A	<u>0.920</u>
KD1: We have a thorough understanding and experience of current customers.	0.877		0.858	0.877	
KD2: We have accumulated in-depth knowledge of the key market segment that we focus on.	0.892		0.837	0.892	
KD3: Our R&D experts have thorough technical knowledge and skills within our specialised domain.	0.755		0.953	0.755	
Construct: New product performance (3 items)	N/A	<u>0.966</u>	N/A	N/A	<u>0.966</u>
NPP4: New products of our company attain the goal of expected sales.	0.899		0.973	0.899	
NPP5: New products of our company attain the goal of expected profitability.	0.950		0.935	0.950	
NPP6: Overall performance of new products of our company is successful.	0.937		0.943	0.937	
Dimension: Strategic orientation (9 items)	N/A	<u>0.974</u>	N/A	N/A	<u>0.974</u>
SO2: We constantly monitor our level of commitment and orientation to serve customer needs.	0.740		0.976	0.740	
SO5: We routinely or regularly measure our customer service.	0.730		0.977	0.730	
SO10: Our new products are always at the state-of-the-art of the technology.	0.947		0.967	0.947	

Construct/item	Initial		Cronbach's alpha if item deleted	Final	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
SO11: We have better technological knowledge than our competitors.	0.958		0.967	0.958	
SO12: Our R&D programmes are more ambitious than those of our competitors.	0.945		0.968	0.945	
SO14: Our strategic business unit (SBU) uses sophisticated technologies for its NPD.	0.907		0.969	0.907	
SO17: Our SBU has the will and the capacity to build and market a technological breakthrough.	0.893		0.970	0.893	
SO19: Our SBU has an aggressive technological patent strategy.	0.921		0.969	0.921	
SO20: Our SBU has better industrial methods than the competitors.	0.922		0.969	0.922	
Dimension: Resource management (3 items)	N/A	<u>0.821</u>	N/A	N/A	<u>0.821</u>
RM1: We manage our human resources efficiently.	0.698		0.751	0.698	
RM2: We manage our information systems efficiently.	0.805		0.644	0.805	
RM4: We manage to satisfy most of our clients' requirements.	0.603		0.891	0.603	
Dimension: Organisational intelligence (8 items)		<u>0.965</u>			<u>0.965</u>
OI1: We have the ability to continuously collect information from customers.	0.947		0.955	0.947	
OI2: We have the ability to continuously collect information about competitors' activities.	0.923		0.956	0.923	
OI3: We have the ability to continuously collect information about relevant public other than customers and competitors.	0.925		0.956	0.925	

Construct/item	Initial		Cronbach's alpha if item deleted	Final	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
OI4: We have the ability to continuously collect information from external experts, such as consultants.	0.818		0.968	0.818	
OI5: We have the ability to continuously re-examine the value of information collected in previous studies.	0.843		0.961	0.843	
OI6: We have formal information links established among all parties involved in a project.	0.879		0.960	0.879	
OI7: We have informal networks that ensure all employees have the information they need.	0.886		0.958	0.886	
OI8: Employees of the NPD team are able to educate each other during a project.	0.809		0.964	0.809	
Dimension: Creativity (12 items)	N/A	<u>0.981</u>	N/A	N/A	<u>0.981</u>
CR1: Our employees are able to suggest new ways to achieve goals or objectives.	0.937		0.979	0.937	
CR2: Our employees are able to suggest new ways to increase quality.	0.935		0.979	0.935	
CR3: Our employees are able to suggest new ways of performing work tasks.	0.931		0.979	0.931	
CR4: Our employees often have new and innovative ideas.	0.895		0.980	0.895	
CR5: Our employees often have a fresh approach to problems.	0.895		0.980	0.895	
CR6: Our employees are able to come up with new and practical ideas to improve performance.	0.910		0.979	0.910	
CR7: Our employees are able to come up with creative solutions to problems.	0.790		0.982	0.790	

Construct/item	Initial		Cronbach's alpha if item deleted	Final	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
CR8: Our employees are able to search out new technologies, processes, techniques, and/or product ideas.	0.916		0.979	0.916	
CR9: Our employees are able to promote and champion ideas to others.	0.897		0.979	0.897	
CR10: Our employees are able to exhibit creativity on the job when given the opportunity.	0.820		0.981	0.820	
CR11: Our employees are able to develop adequate plans and schedules for the implementation of new ideas.	0.922		0.979	0.922	
CR12: Our employees are good sources of creative ideas.	0.880		0.980	0.880	
Dimension: Structure and System (7 items)		<u>0.966</u>			<u>0.966</u>
SS1: Projects are developed using effective cross-functional teams.	0.902		0.959	0.902	
SS2: Project teams are organic, flexible, and agile.	0.919		0.957	0.919	
SS3: All team operations are driven by customer needs.	0.873		0.961	0.873	
SS4: All team members are mutually accountable.	0.864		0.962	0.864	
SS5: Team members are empowered to make decisions.	0.859		0.963	0.859	
SS6: Virtual team members are equipped with effective ICT tools.	0.883		0.960	0.883	
SS7: Team members' rewards are equitable.	0.895		0.960	0.895	
Dimension: Culture and Climate (10 items)	N/A	<u>0.985</u>	N/A	N/A	<u>0.985</u>
CC1: There is a formal idea generation process in place.	0.950		0.982	0.950	
CC2: All employees participate in generating ideas.	0.951		0.982	0.951	

Construct/item	Initial		Cronbach's alpha if item deleted	Final	
	CITC	Cronbach's alpha		CITC	Cronbach's alpha
CC3: Failures and mistakes are tolerated and not punished.	0.896		0.984	0.896	
CC4: Senior management is committed to risk-taking in product innovation.	0.800		0.987	0.800	
CC5: The organisation permits the emergence of intrapreneurs or product champions.	0.943		0.983	0.943	
CC6: The organisation provides support in terms of autonomy, time, and rewards.	0.970		0.982	0.970	
CC7: Knowledge sharing is encouraged and rewarded.	0.969		0.982	0.969	
CC8: Money is made available for internal projects.	0.952		0.982	0.952	
CC9: Adequate resources are available and committed to achieving project goals.	0.953		0.982	0.953	
CC10: All operations are driven by customer needs.	0.859		0.985	0.859	
Dimension: Management of technology (4 items)	N/A	<u>0.979</u>	N/A	N/A	<u>0.979</u>
MO1: Our company always attempts to stay on the leading edge of new technology in our industry.	0.953		0.971	0.953	
MO2: We make an effort to anticipate the full potential of new practices and technologies.	0.948		0.974	0.948	
MO3: We pursue long-range programmes in order to acquire technological capabilities in advance of our needs.	0.946		0.973	0.946	
MO4: We are constantly thinking of the next generation of technology.	0.952		0.972	0.952	

8.5.3.3 Multicollinearity

All 44 formative items measuring three formative constructs (local search experience (LSE), search breadth (SB), and search depth (SD)) were examined for multicollinearity through analysis of the value of the variance inflation factor (VIF). As a rule of thumb, multicollinearity appears when the VIF value is higher than 10 (Pallant, 2013). The results of the multicollinearity test using the SPSS software package (version 24) revealed that multicollinearity was not a serious problem in these three constructs. The VIF value of the formative items measuring the LSE construct was between 1.53 and 6.29. Moreover, the VIF value of the formative items measuring the SB construct and the SD construct was between 1.49 and 7.81. It must be noted here that the VIF results of the formative items in the SB and the SD constructs were the same because the same set of formative items was applied. Tables 8.12, 8.13, and 8.14 represent the VIF results for the three constructs (LSE, SB, and SD), respectively.

Table 8.12

VIF Results: Local Search Experience

Variables	Tolerance	VIF
MK1	0.587	1.70
MK2	0.652	1.53
MK3	0.554	1.81
MK4	0.232	4.31
MK5	0.512	1.95
QS1	0.404	2.48
QS2	0.249	4.02
QS3	0.159	6.29
QS4	0.514	1.95
QS5	0.374	2.67

Table 8.13

VIF Results: Search Breadth

Variables	Tolerance	VIF
SB1	0.673	1.49
SB2	0.332	3.01
SB3	0.480	2.08
SB4	0.326	3.07
SB5	0.373	2.68

Variables	Tolerance	VIF
SB6	0.216	4.63
SB7	0.170	5.88
SB8	0.234	4.27
SB9	0.338	2.96
SB10	0.526	1.90
SB11	0.192	5.21
SB12	0.189	5.29
SB13	0.129	7.75
SB14	0.128	7.81
SB15	0.232	4.31
SB16	0.219	4.57
SB17	0.363	2.75

Table 8.14

VIF Results: Search Depth

Variables	Tolerance	VIF
SD1	0.673	1.49
SD2	0.332	3.01
SD3	0.480	2.08
SD4	0.326	3.07
SD5	0.373	2.68
SD6	0.216	4.63
SD7	0.170	5.88
SD8	0.234	4.27
SD9	0.338	2.96
SD10	0.526	1.90
SD11	0.192	5.21
SD12	0.189	5.29
SD13	0.129	7.75
SD14	0.128	7.81
SD15	0.232	4.31
SD16	0.219	4.57
SD17	0.363	2.75

8.5.4 Fitness Assessment of Measurement Model

After statistical analysis at the item level, CB-SEM was used for further analysis (see Section 5.9.5 of Chapter 5). The first step is to assess the measurement model, which is followed by an evaluation of the structural model for testing the hypothesis. The measurement model was examined using confirmatory factor analysis (CFA) to confirm construct validity through the fitness of the model (see acceptable criteria in Table 5.13, Chapter 5). Relying on this operation, the factor structure of each measurement model as specified in Chapter 7 was used for assessment. When beginning the analytical procedure, CFA analysis was conducted on the set of items remaining after the removal of unreliable items (see Section 8.5.3). CFA was conducted using the AMOS software package (version 24), via a maximum likelihood (ML) estimator. The results of the CFA for each construct are presented below.

8.5.4.1 Construct 1: Local Search Experience

For this research, local search experience (LSE) is conceptualised as a formative construct created as a MIMIC model. The CFA results of the hypothesised model revealed its unsatisfactory fitness: $\chi^2 = 95.674$ (df = 13, p= 0.000), $\chi^2/df = 7.360$, GFI = 0.885, TLI = 0.934, CFI = 0.959, and RMSEA = 0.174. Thus, the modification index was examined to facilitate improving the fitness by removing cross-loading items. Following the removal of three items (RI2, RI4, and RI5), the CFA results of this modified model revealed satisfactory fitness: $\chi^2 = 3.563$ (df = 1, p= 0.059), $\chi^2/df = 3.563$, GFI = 0.992, TLI = 0.980, CFI = 0.997, and RMSEA = 0.110. Figure 8.1 presents the CFA results of the LSE model.

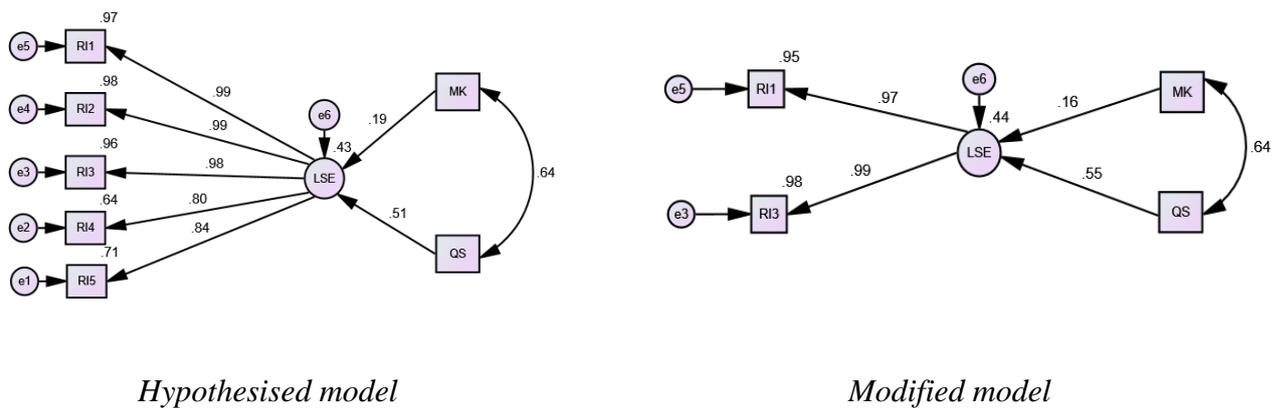


Figure 8.1. CFA results for local search experience.

8.5.4.2 Construct 2: Search Breadth

For this research, search breadth is conceptualised as formative items that are transformed into dummy codes and then summed. Thus, there is no factor structure to test for CFA for this construct.

8.5.4.3 Construct 3: Search Depth

As with search breadth, search depth is conceptualised as formative items that are transformed into dummy codes and then summed. Thus, there is no factor structure to test for CFA for this construct.

8.5.4.4 Construct 4: Potential Absorptive Capacity

In this research, potential absorptive capacity (PAC) is conceptualised as a multidimensional construct comprising a structure with two factors: acquisition and assimilation. First-order CFA results of the hypothesised model revealed unsatisfactory fitness: $\chi^2 = 93.211$ ($df = 13$, $p = 0.000$), $\chi^2/df = 7.170$, $GFI = 0.901$, $TLI = 0.941$, $CFI = 0.963$, and $RMSEA = 0.171$). Thus, the modification index was examined in order to improve the fitness of the model by removing cross-loading items. First-order CFA results for the modified model following the removal of the AS4 item revealed satisfactory fitness: $\chi^2 = 19.630$ ($df = 8$, $p = 0.012$), $\chi^2/df = 2.454$, $GFI = 0.972$, $TLI = 0.988$, $CFI = 0.994$, and $RMSEA = 0.083$. Figure 8.2 presents the first-order CFA results of the PAC model.

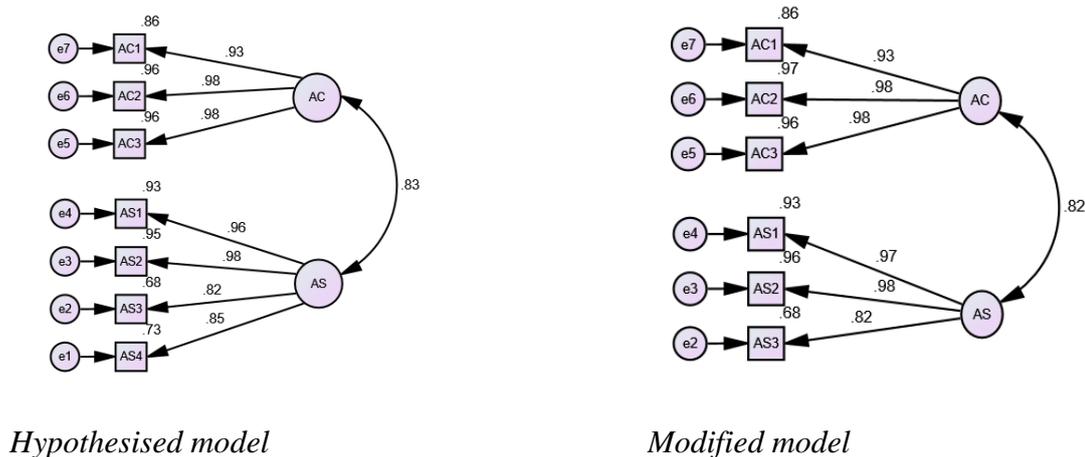


Figure 8.2. First-order CFA results of potential absorptive capacity.

The first-order modified model was assessed for fitness at the second-order level, as shown in Figure 8.3. Second-order CFA results revealed satisfactory fitness: $\chi^2 = 19.630$ (df = 8, p= 0.012), $\chi^2/\text{df}=2.454$, GFI = 0.972, TLI = 0.988, CFI = 0.994, and RMSEA = 0.083.

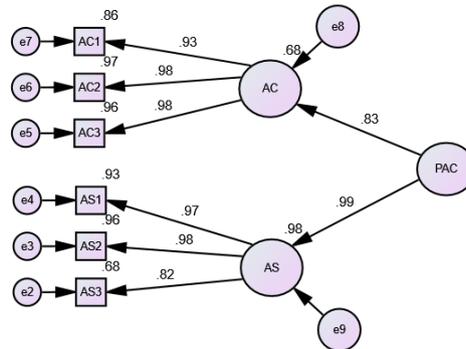
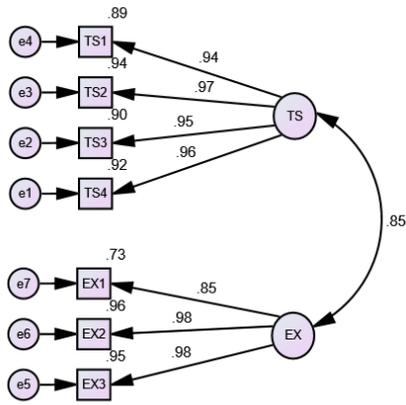


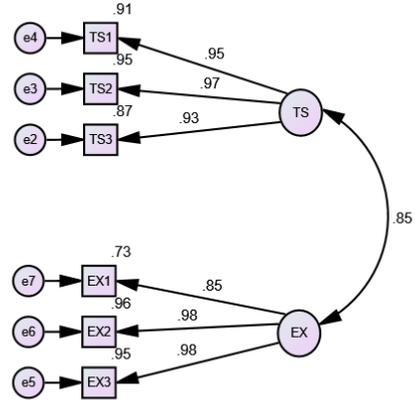
Figure 8.3. Second-order CFA results of potential absorptive capacity.

8.5.4.5 Construct 5: Realised Absorptive Capacity

For this research, realised absorptive capacity (RAC) is conceptualised as a multidimensional construct comprising a structure with two factors: transformation and exploitation. First-order CFA results of the hypothesised model revealed unsatisfactory fitness: $\chi^2 = 51.046$ (df = 13, p= 0.000), $\chi^2/\text{df} = 3.927$, GFI = 0.935, TLI = 0.973, CFI = 0.983, and RMSEA = 0.118. Thus, the modification index was examined to improve the fitness of the model by removing cross-loading items. First-order CFA results of the modified model following the removal of the TS4 item revealed satisfactory fitness: $\chi^2 = 19.993$ (df = 8, p= 0.010), $\chi^2/\text{df} = 2.499$, GFI = 0.971, TLI = 0.988, CFI = 0.993, and RMSEA = 0.084. Figure 8.4 presents the first-order CFA results of the RAC model.



Hypothesised model



Modified model

Figure 8.4. First-order CFA results of realised absorptive capacity.

The first-order modified model was assessed for fitness at the second-order level, as shown in Figure 8.5. Second-order CFA results revealed satisfactory fitness: $\chi^2 = 19.993$ (df = 8, p = 0.010), $\chi^2/\text{df} = 2.499$, GFI = 0.971, TLI = 0.988, CFI = 0.993, and RMSEA = 0.084.

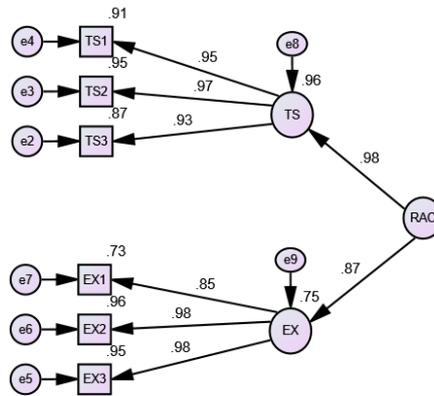


Figure 8.5. Second-order CFA results of realised absorptive capacity.

8.5.4.6 Construct 6: Knowledge Dissemination Ability

In this research, knowledge dissemination ability (KDA) is conceptualised as a unidimensional construct. Thus, only one level of CFA testing was required. The CFA results of the hypothesised model revealed unsatisfactory fitness: $\chi^2 = 54.131$ (df = 2, p = 0.000), $\chi^2/\text{df} = 27.066$, GFI = 0.878, TLI = 0.822, CFI = 0.941, and RMSEA = 0.352. Thus, the modification index was examined to

improve the fitness of the model by removing cross-loading items. The CFA results for the modified model following the removal of the KDA4 item revealed satisfactory fitness: $\chi^2 = 4.094$ ($df = 1, p=0.043$), $\chi^2/df = 4.094$, GFI = 0.987, TLI = 0.984, CFI = 0.995, and RMSEA = 0.121. Figure 8.6 presents the CFA results of the KDA model.

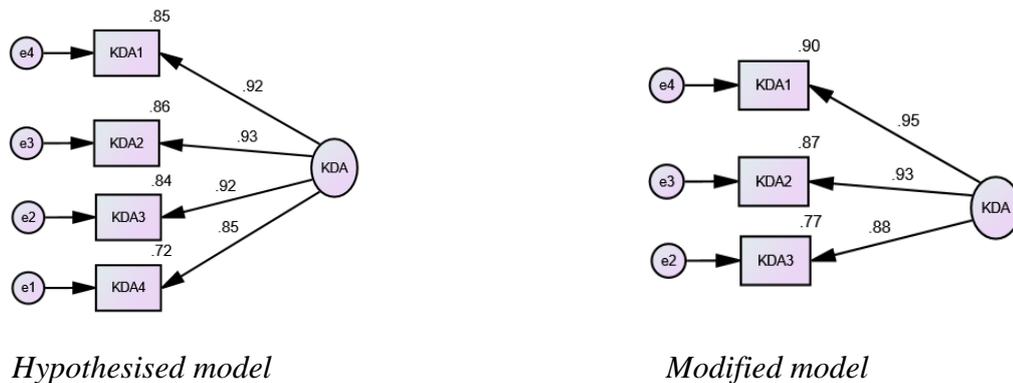


Figure 8.6. CFA results of knowledge dissemination ability.

8.5.4.7 Construct 7: Knowledge Breadth

In this research, knowledge breadth (KB) is conceptualised as a unidimensional construct. Thus, only one level of CFA testing was required. The CFA results of the hypothesised model are presented in Figure 8.7, revealing satisfactory fitness: $\chi^2 = 3.641$ ($df = 2, p = 0.162$), $\chi^2/df = 1.820$, GFI = 0.991, TLI = 0.993, CFI = 0.998, and RMSEA = 0.063. Thus, the hypothesised model was acceptable.

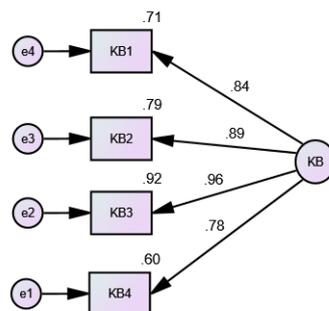


Figure 8.7. CFA results of knowledge breadth.

8.5.4.8 Construct 8: Knowledge Depth

In this research, knowledge depth (KD) is conceptualised as a unidimensional construct. Thus, one level of CFA testing was required. The CFA results of the hypothesised model are presented in Figure 8.8, revealing satisfactory fitness: $\chi^2 = 1.884$ (df = 1, p = 0.170), $\chi^2/df = 1.884$, GFI = 0.994, TLI = 0.995, CFI = 0.998, and RMSEA = 0.065. Thus, the hypothesised model was acceptable.

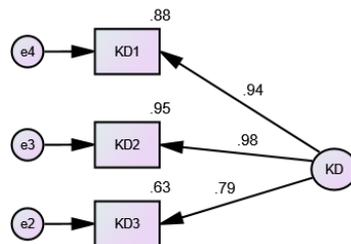


Figure 8.8. CFA results of knowledge depth.

8.5.4.9 Construct 9: New Product Performance

In this research, new product performance (NPP) is conceptualised as a unidimensional construct. Thus, one level of CFA testing was required. The CFA results of the hypothesised model are presented in Figure 8.9, revealing satisfactory fitness: $\chi^2 = 0.055$ (df = 1, p = 0.815), $\chi^2/df = 0.055$, GFI = 1.000, TLI = 1.003, CFI = 1.000, and RMSEA = 0.000. Thus, the hypothesised model was acceptable.

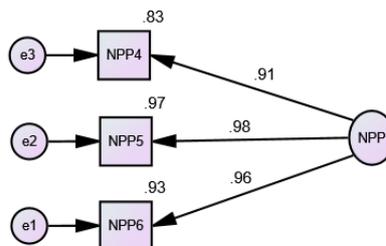


Figure 8.9. CFA results of new product performance.

8.5.4.10 Construct 10: Innovation Capability

In this research, innovation capability (IC) is conceptualised as a multidimensional construct with a seven-factor structure consisting of the following: 1) strategic orientation; 2) resource management; 3) organisational intelligence; 4) creativity; 5) structure and system; 6) culture and climate; and 7) management of technology. Items measuring each of these seven factors

(dimensions) were created with reference to the literature. However, none of them has been validated before in terms of the overall seven-factor structure of innovation capability in previous studies. Consequently, the measurement model for each of these seven dimensions needed to be validated in terms of model fitness prior to the assessment of all dimensions. The results of the assessment of model fitness led to the removal of 34 items (see Table 8.15). First-order CFA results of the modified model of innovation capability revealed satisfactory fitness: $\chi^2 = 398.115$ (df = 132, p= 0.000), $\chi^2/df=3.016$, GFI = 0.843, TLI = 0.948, CFI = 0.960, and RMSEA = 0.098. Figure 8.10 presents the first-order CFA results of the modified innovation capability model.

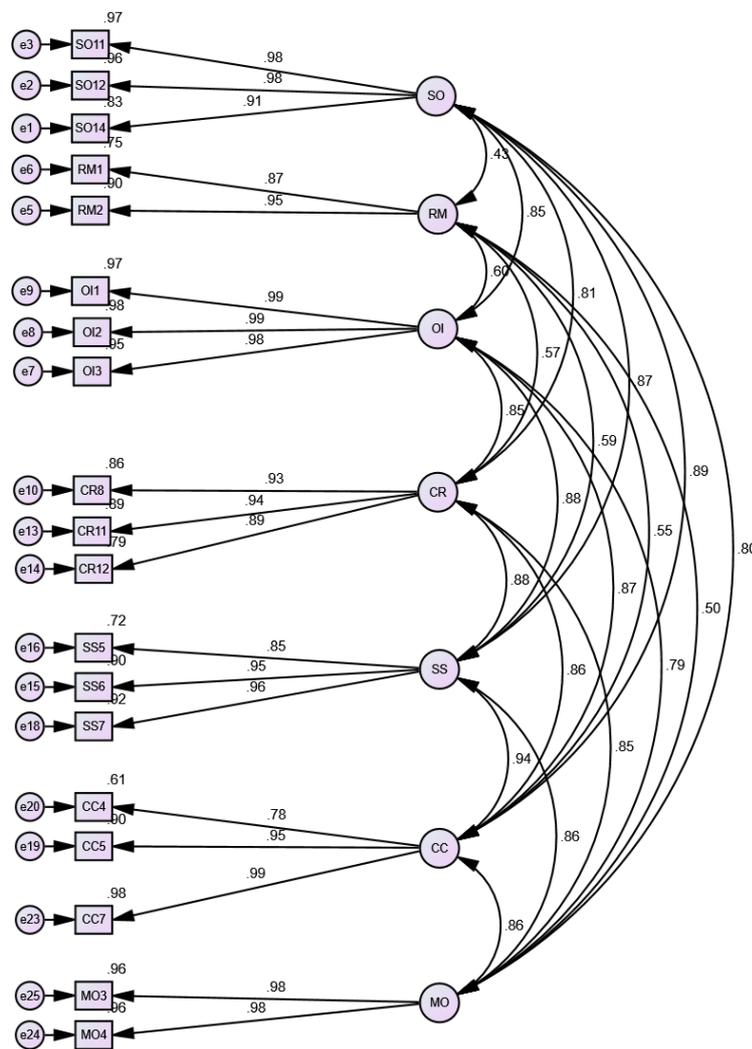


Figure 8.10. First-order CFA results of innovation capability (modified model).

The first-order modified model of innovation capability was assessed for fitness at the second-order level. The second-order CFA results are presented in Figure 8.11, revealing satisfactory fitness: $\chi^2 = 450.878$ (df = 146, p= 0.00), $\chi^2/df = 3.088$, GFI = 0.820, TLI = 0.947, CFI = 0.954, and RMSEA = 0.100.

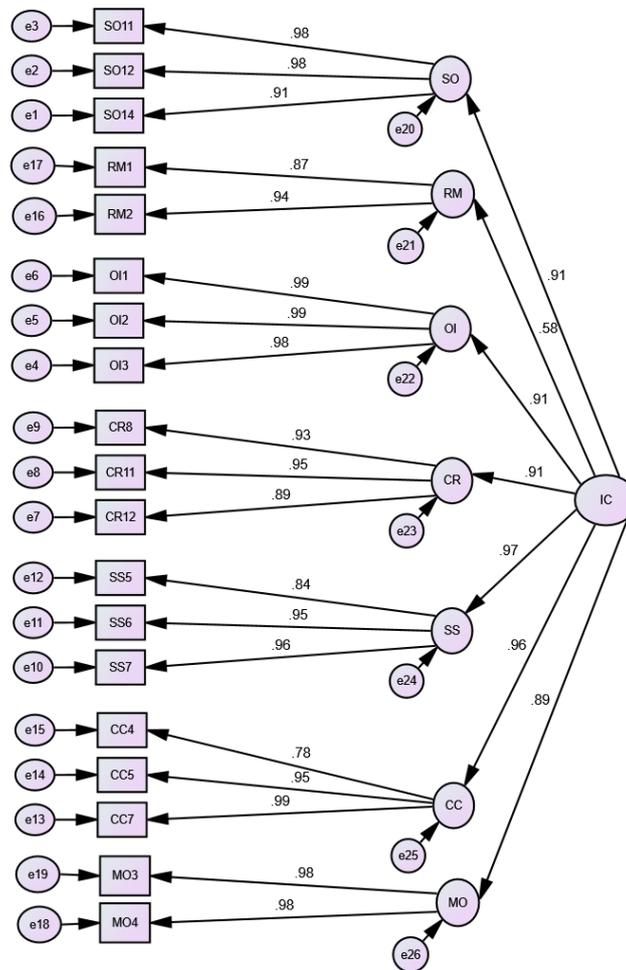


Figure 8.11. Second-order CFA results of innovation capability.

8.5.4.11 Summary of Final Items

The measurement models of all constructs were validated in terms of construct validity, as presented in the above section. Most measurement models were modified in order to achieve acceptable model fitness. The modification of the measurement models was mainly based on the removal of cross-loading items. The set of final items representing satisfactory fitness for each measurement model is summarised in Table 8.15.

Table 8.15

The Set of Final Items in Measurement Model Fitness

<i>Construct/dimension</i>	<i>Initial item</i>	<i>Final item</i>
Construct 1: Local search experience (LSE)		
Dimension 1: Market-oriented knowledge (MK)	MK2, MK3, MK4, MK5, QS5	Same as initial items
Dimension 2: Manufacturing-oriented knowledge with quality management system (QS)	QS1, QS2, QS3, QS4, MK1	Same as initial items
Added reflective items	RI1, RI2, RI3, RI4, RI5	RI1, RI3
Construct 2: Search breadth (SB)	SB1, SB2, SB3, SB4, SB5, SB6, SB7, SB8, SB9, SB10, SB11, SB12, SB13, SB14, SB15, SB16, SB17	Same as initial items
Construct 3: Search depth (SD)	SD1, SD2, SD3, SD4, SD5, SD6, SD7, SD8, SD9, SD10, SD11, SD12, SD13, SD14, SD15, SD16, SD17	Same as initial items
Construct 4: Potential absorptive capacity (PAC)		
Dimension 1: Acquisition (AC)	AC1, AC2, AC3	Same as initial items
Dimension 2: Assimilation (AS)	AS1, AS2, AS3, AS4	AS1, AS2, AS3
Construct 5: Realised absorptive capacity (RAC)		
Dimension 1: Transformation (TS)	TS1, TS2, TS3, TS4	TS1, TS2, TS3
Dimension 2: Exploitation (EX)	EX1, EX2, EX3	Same as initial items
Construct 6: Knowledge dissemination ability (KDA)	KDA1, KDA2, KDA3, KDA4	KDA1, KDA2, KDA3
Construct 7: Knowledge breath (KB)	KB1, KB2, KB3, KB4	Same as initial items
Construct 8: Knowledge depth (KD)	KD1, KD2, KD3	Same as initial items
Construct 9: New product performance (NPP)	NPP4, NPP5, NPP6	Same as initial items

<i>Construct/dimension</i>	<i>Initial item</i>	<i>Final item</i>
Construct 10: Innovation capability (IC)		
Dimension 1: Strategic orientation	SO2, SO5, SO10, SO11, SO12, SO14, SO17, SO19, SO20	SO11, SO12, SO14
Dimension 2: Resource management	RM1, RM2, RM4	RM1, RM2
Dimension 3: Organisational intelligence	OI1, OI2, OI3, OI4, OI5, OI6, OI7, OI8	OI1, OI2, OI3
Dimension 4: Creativity	CR1, CR2, CR3, CR4, CR5, CR6, CR7, CR8, CR9, CR10, CR11, CR12	CR8, CR11, CR12
Dimension 5: Structure and system	SS1, SS2, SS3, SS4, SS5, SS6, SS7	SS5, SS6, SS7
Dimension 6: Culture and climate	CC1, CC2, CC3, CC4, CC5, CC6, CC7, CC8, CC9, CC10	CC4, CC5, CC7
Dimension 7: Management of technology	MO1, MO2, MO3, MO4	MO3, MO4
Summary of the number of items		
Formative items	27*	27
Reflective items	86	46
Total	113	73

Note: * The sets of formative items in SB and SD were regarded as the same set of data.

8.5.5 Statistical Analysis at Construct Level

After the measurement model of each construct was deemed to have satisfactory fitness, the next step involved the assessment of construct reliability and construct validity. The results of this assessment are presented below.

8.5.5.1 Construct Reliability and Convergent Validity

The final 46 reflective items measuring the underlying construct (see Table 8.15) were assessed for construct reliability and convergent validity. The results for construct reliability revealed that composite reliability (CR) in all constructs was greater than 0.70, indicating that construct

reliability was supported (Fornell & Larcker, 1981). Convergent validity was assessed through factor loading and average variance extract (AVE). The results revealed that all factor loadings exceeded 0.7 and were significant. Furthermore, the AVEs of each construct were all greater than 0.5, indicating that convergent validity was achieved. Table 8.16 presents the values of the CR and AVE of each construct.

Table 8.16

Composite Reliability (CR) and Average Variance Extract (AVE) of Constructs

Construct/dimension/item	Factor loading	CR	AVE
Construct 1: Local search experience (LSE)¹	N/A	N/A	N/A
Construct 2: Search breadth (SB)	N/A	N/A	N/A
Construct 3: Search depth (SD)	N/A	N/A	N/A
Construct 4: Potential absorptive capacity (PAC)		0.890	0.802
<i>Dimension 1: Acquisition (AC) (3 items)</i>		0.975	0.928
AC1: The search for relevant information concerning our industry is an every-day business in our company	0.925 ^{***}		
AC2: Our management motivates the employees to use information sources within our industry	0.982 ^{***}		
AC3: Our management expects the employees to deal with information beyond our industry	0.982 ^{***}		
<i>Dimension 2: Assimilation (AS) (3 items)</i>		0.946	0.855
AS1: In our company, ideas and concepts are communicated on a cross-departmental basis	0.965 ^{***}		
AS2: In our company, there is quick information flow, e.g. if a business unit obtains important information, it communicates this information promptly to all other business units or departments	0.978 ^{***}		
AS3: Our management emphasises cross-departmental support to solve problems	0.823 ^{***}		
Construct 5: Realised absorptive capacity (RAC)		0.911	0.837
<i>Dimension 1: Transformation (TS) (3 items)</i>		0.968	0.908
TS1: Our employees have the ability to structure and use collected knowledge	0.953 ^{***}		

Construct/dimension/item	Factor loading	CR	AVE
TS2: Our employees are used to absorbing externally new knowledge as well as to prepare it for further purposes and make it available	0.973 ^{***}		
TS3: Our employees successfully link internally existing knowledge with external insights	0.933 ^{***}		
<i>Dimension 2: Exploitation (EX) (3 items)</i>		0.956	0.880
EX1: Our management supports the development of prototypes	0.853 ^{***}		
EX2: Our company regularly reconsiders technologies and adapts them according to new knowledge	0.979 ^{***}		
EX3: Our company has the ability to work more effectively by adopting new technologies	0.977 ^{***}		
Construct 6: Knowledge dissemination ability (KDA) (3 items)		0.944	0.850
KDA1: We have formal information links established among all parties involved in a project	0.948 ^{***}		
KDA2: We have informal networks that ensure all employees have the information they need	0.937 ^{***}		
KDA3: Employees of the NPD team are able to educate each other during a project	0.879 ^{***}		
Construct 7: Knowledge breadth (KB) (4 items)		0.926	0.758
KB1: We possess market information from a wide-ranging customer portfolio	0.849 ^{***}		
KB2: We possess market information from a diversified customer portfolio	0.879 ^{***}		
KB3: We have accumulated knowledge of multiple market segments	0.958 ^{***}		
KB4: Our R&D expertise consists of technical knowledge from a variety of backgrounds	0.788 ^{***}		
Construct 8: Knowledge depth (KD) (3 items)		0.930	0.816
KD1: We have a thorough understanding and experience of current customers	0.943 ^{***}		
KD2: We have accumulated in-depth knowledge of the key market segment that we focus on	0.964 ^{***}		
KD3: Our R&D experts have thorough technical knowledge and skills within our specialised domain	0.794 ^{***}		

Construct/dimension/item	Factor loading	CR	AVE
Construct 9: New product performance (NPP) (3 items)		0.968	0.910
NPP4: New products of our company attain the goal of expected sales	0.913 ^{***}		
NPP5: New products of our company attain the goal of expected profitability	0.982 ^{***}		
NPP6: Overall performance of new products of our company is successful	0.965 ^{***}		
Construct 10: Innovation Capability (IC)		0.952	0.746
<i>Dimension 1: Strategic Orientation (SO) (3 items)</i>		0.972	0.919
SO11: We have better technological knowledge than our competitors	0.985 ^{***}		
SO12: Our R&D programmes are more ambitious than those of our competitors	0.978 ^{***}		
SO14: Our strategic business unit (SBU) uses sophisticated technologies for its NPD	0.912 ^{***}		
<i>Dimension 2: Resource management (RM) (2 items)</i>		0.904	0.824
RM1: We manage our human resources efficiently	0.865 ^{***}		
RM2: We manage our information systems efficiently	0.949 ^{***}		
<i>Dimension 3: Organisational intelligence (OI) (3 items)</i>		0.990	0.970
OI1: We have the ability to continuously collect information from customers	0.987 ^{***}		
OI2: We have the ability to continuously collect information about competitors' activities	0.990 ^{***}		
OI3: We have the ability to continuously collect information about relevant public other than customers and competitors	0.977 ^{***}		
<i>Dimension 4: Creativity (CR) (3 items)</i>		0.943	0.847
CR8: Our employees are able to search out new technologies, processes, techniques, and/or product ideas	0.928 ^{***}		
CR11: Our employees are able to develop adequate plans and schedules for the implementation of new ideas	0.941 ^{***}		
CR12: Our employees are good sources of creative ideas	0.891 ^{***}		
<i>Dimension 5: Structure and system (SS) (3 items)</i>		0.943	0.846
SS5: Team members are empowered to make decisions	0.846 ^{***}		

Construct/dimension/item	Factor loading	CR	AVE
SS6: Virtual team members are equipped with effective ICT tools	0.949 ^{***}		
SS7: Team members' rewards are equitable	0.960 ^{***}		
<i>Dimension 6: Culture and climate (CC) (3 items)</i>		0.935	0.830
CC4: Senior management is committed to risk-taking in product innovation	0.783 ^{***}		
CC5: The organisation permits the emergence of intrapreneurs or product champions	0.949 ^{***}		
CC7: Knowledge sharing is encouraged and rewarded	0.988 ^{***}		
<i>Dimension 7: Management of technology (MO) (2 items)</i>		0.979	0.959
MO3: We pursue long-range programmes in order to acquire technological capabilities in advance of our needs	0.980 ^{***}		
MO4: We are constantly thinking of the next generation of technology	0.979 ^{***}		

Note: ¹ Reflective items in the MIMIC model of local search experience (LSE) construct were not computed for CR and AVE because it is regarded as a formative construct.

^{***} significant at $p < 0.001$

8.5.5.2 Discriminant Validity

The discriminant validity of the constructs was assessed by examining the square root of the AVE and the correlations among constructs. Discriminant validity is deemed to be achieved when the square root of the AVE is higher than the correlations among constructs (Fornell & Larcker, 1981). The results for discriminant validity, which are presented in Table 8.17, revealed that the square root of the AVE of all constructs (with the exception of PAC) was greater than the correlations among constructs. One possible explanation for this is that the 'efficiency factor' representing the ratio of RAC to PAC is high in the context of Thai dessert SMEs (see Section 2.7.2 of Chapter 2).

Table 8.17

Discriminant Validity of Constructs

	PAC	RAC	KDA	KB	KD	NPP	IC	SB	SD	LSE
PAC	0.895									
RAC	0.950	0.915								
KDA	0.867	0.888	0.922							
KB	0.900	0.856	0.750	0.871						
KD	0.795	0.832	0.725	0.775	0.904					
NPP	-0.006	0.117	0.118	-0.016	0.086	0.954				
IC	0.969	0.905	0.903	0.830	0.771	0.066	0.864			
SB	0.599	0.613	0.669	0.567	0.449	0.240	0.713	N/A		
SD	0.497	0.584	0.566	0.490	0.463	0.250	0.603	0.547	N/A	
LSE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: Diagonal elements are the square roots of the AVE; off-diagonal elements are correlations between constructs

8.5.6 Results of Hypothesis Testing

After the measurement model of each construct was validated using confirmatory factor analysis (CFA), the next step was to specify the structural models for testing the hypothesis. As mentioned above, the item parcelling technique and factor score were applied at this stage to alleviate the effect of the assumption of multivariate normal distribution being violated. Item parcelling can be applied with legitimacy when the relationships among constructs, rather than the relationships among scale items, are the focus of modelling (Little, Cunningham, Shahar, & Widaman, 2002). Furthermore, item parcelling may be applied if a measurement model with individual items for each construct has already been proven to have an acceptable fit (Hair Jr, Babin, & Krey, 2017). Thus, item parcelling was applied to three constructs in the structural model: PAC, RAC, and KB. The factor score was applied to the LSE construct.

In this research, hypothesis testing was largely involved with the testing of moderating effects: knowledge breadth (KB), knowledge dissemination ability (KDA), and innovation capability (IC). As these three moderators are based on continuous scales, the approach of using interaction terms to test moderating effects was adopted. An interaction term is a cross-product term acting as the multiplicative of a predictor construct and a moderator construct. To test the interaction effect, a two-step procedure of estimation was followed (Liao, Fei, & Liu, 2008; Maslowsky, Jager, &

Hemken, 2015). The first step is to assess the estimation path of the main effect as the relationship between the independent variable and dependent variable without the inclusion of moderators and interaction terms. In this step, the fitness of the model and the path estimate of the main effect were assessed. The second step is to estimate the interaction effect by incorporating the moderators and interaction terms into the structural model (Maslowsky et al., 2015). In this second step, the interaction effect was assessed to determine whether it was significant. The results of the examinations performed at each step are presented below.

8.5.6.1 Main Effect

The structural model of the main effect was examined for model fitness using the AMOS software package (version 24). The structural model of the main effect is presented in Figure 8.12, revealing the fitness: $\chi^2 = 373.087$ ($df = 56$, $p = 0.00$), $\chi^2/df = 6.662$, GFI = 0.817, TLI = 0.848, CFI = 0.891, and RMSEA = 0.164. Based on this fitness, the GFI and CFI could be seen to be slightly lower than the cut-off for acceptability. The results of path estimation in relation to the main effect are presented in Table 8.18.

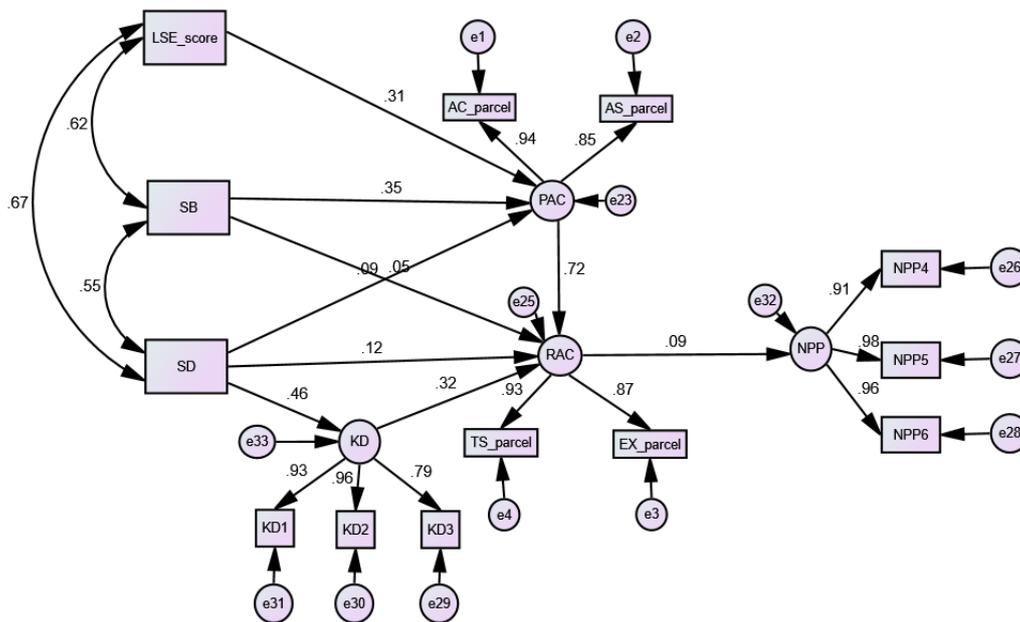


Figure 8.12. Structural model of main effect.

Table 8.18

Path Coefficient of Main Effect

Path/hypothesis	Path coefficient (standard β)	Proposed effect	P-value	Result
<i>Control Variable</i>				
Firm Size \rightarrow NPP	0.011	N/A	n.s.	N/A
Firm Age \rightarrow NPP	-0.024	N/A	n.s.	N/A
<i>Main Effect</i>				
H1: LSE \rightarrow PAC	0.307	+	***	Supported
H2A: SB \rightarrow PAC	0.346	+	***	Supported
H2B: SB \rightarrow RAC	0.054	-	n.s.	Not supported
H3A: SD \rightarrow PAC	0.094	-	n.s.	Not supported
H3B: SD \rightarrow RAC	0.119	+	*	Supported
H5: SD \rightarrow KD \rightarrow RAC				Supported
H5-1: SD \rightarrow RAC	0.119	+	*	Supported
H5-2: SD \rightarrow KD	0.464	+	***	Supported
H5-3: KD \rightarrow RAC	0.316	+	***	Supported
H6-1: PAC \rightarrow RAC	0.715	+	***	Supported
H7A: RAC \rightarrow NPP	0.094	+	n.s.	Not supported

Note * significant at $P < 0.05$; ** significant at $p < 0.01$; *** significant at $p < 0.001$; n.s. non-significant

As can be seen from Table 8.18, the parameter estimates of the hypothesised relationships between LSE and PAC were positive and significant; thus, H1 is supported. The relationship between SB and PAC was positive and significant; thus, H2A is supported. However, the relationship between SB and RAC was found to be non-significant; thus, H2B is not supported. Based on the effect of SD on PAC and RAC, the findings revealed that the relationship between SD and RAC was positive and significant; thus, H3B is supported. However, the relationship between SD and PAC was found to be non-significant; thus, H3A is not supported.

Subsequently, the relationship between search (SB, SD) and absorptive capacity (PAC, RAC), linked to KB and KD, was further examined. As hypothesised, the relationship between SB and PAC was moderated by KB, while the relationship between SD and RAC was mediated by KD. The results revealed that parameter estimates of three pairs (SD-RAC, SD-KD, and KD-RAC)

were significant. Thus, the hypothesis that KD acts as the mediator between SD and RAC (H5) is supported. The moderating effect of KB is examined in the next section. Focusing on the relationship between PAC and RAC, the results revealed that the parameter estimates were significant ($p < 0.001$), indicating that H6-1 is supported. However, the relationship between RAC and NPP was found to be non-significant (i.e. H7A is not supported).

8.5.6.2 Moderating Effect

After the estimation of the main effect, the next step was to assess the interaction effect (moderating effect) by including the moderator and interaction terms in the structural model (Maslowsky et al., 2015). To estimate the interaction effect, Ping's (1995) procedure was followed: Ping (1995) suggested the use of a single indicator as an indicator of the interaction terms for this purpose. Following Ping (1995), firstly, all items of the predictor construct (X) and moderator construct (Z) were mean-centred, determined by subtracting the mean (average) of X and Z from each individual's raw score on that variable (Jaccard, Wan, & Turrisi, 1990; Wu & Zumbo, 2008). Secondly, a single indicator of interaction terms was created by computing $(x1 + x2) * (z1 + z2)$, where $x1$, $x2$ and $z1$, $z2$ were mean-centred indicators of the predictor construct and moderator construct, respectively. Thirdly, the computing factor loading and error variance of a single indicator of interaction terms from measurement model parameter estimates were calculated, and the calculated values in the structural model were fixed (Ping, 1995). In testing the interaction effect, each of the three moderators (KB, KDA, and IC) were tested separately in a structural model. The interaction effect of the moderators KB, KDA, and IC are presented in Table 8.19 as models 1, 2, and 3, respectively.

Table 8.19

Results of Moderating Effect

	Model 0	Model 1	Model 2	Model 3
Main effect				
H1: LSE → PAC	0.307***	-0.018 ^{n.s}	0.309***	0.308***
H2A: SB → PAC	0.346***	0.161*	0.343***	0.347***
H2B: SB → RAC	0.054 ^{n.s.}	0.069 ^{n.s.}	-0.065 ^{n.s.}	0.057 ^{n.s.}
H3A: SD → PAC	0.094 ^{n.s.}	0.025 ^{n.s.}	0.092 ^{n.s.}	0.094 ^{n.s.}
H3B: SD → RAC	0.119*	0.131*	0.128*	0.124**
H5-1: SD → RAC	0.119*	0.131*	0.128*	0.124**
H5-2: SD → KD	0.464***	0.465***	0.466***	0.465***
H5-3: KD → RAC	0.316***	0.293***	0.312***	0.317***
H6-1: PAC → RAC	0.715***	0.708***	0.694***	0.708***
H7A: RAC → NPP	0.094 ^{n.s.}	0.087 ^{n.s.}	0.090 ^{n.s.}	0.239***
Moderating effect				
KB → PAC	N/A	0.771***	N/A	N/A
H4: KB * SB → PAC	N/A	0.070 ^{n.s.}	N/A	N/A
KDA → RAC	N/A	N/A	0.355***	N/A
H6: KDA* PAC → RAC	N/A	N/A	0.210*	N/A
IC → NPP	N/A	N/A	N/A	-0.164*
H7: IC * RAC → NPP	N/A	N/A	N/A	0.036***

Notes: Model 0: main effect; model 1: KB moderator; model 2: KDA moderator; model 3: IC moderator

*significant at $P < 0.05$; **significant at $p < 0.01$; ***significant at $p < 0.001$; ^{n.s.}non-significant

Table 8.19 presents the results of the moderating effect. The parameter estimates of interaction terms between SB and KB in relation to PAC were non-significant; thus, the hypothesis that KB acts as a moderator in the relationship between SB and PAC (H4) is not supported. On the other hand, the findings revealed that parameter estimates of interaction terms between KDA and PAC in relation to RAC were positive and significant; thus, H6 is supported. Moreover, focusing on the moderating effect of IC, the findings revealed that the path estimate between RAC and NPP in relation to the main effect was non-significant (H7A); thus, the hypothesis that IC acts as a moderator between RAC and NPP (H7) is not supported.

8.6 Summary

This chapter presented the results of the testing of the hypotheses as formulated in Chapter 4. In testing the hypotheses, this research employs the AMOS software (version 24) as a tool to facilitate analysis by evaluating the model. The results of hypothesis testing revealed a positive relationship between SB and PAC, although the relationship between SB and RAC was found to be non-significant. Moreover, SD was found to exhibit a positive relationship with RAC, while the relationship between SD and PAC was found to be non-significant. Furthermore, the findings also revealed that KB does not have a moderating effect on the relationship between SB and PAC, while KD does play a mediating role between SD and RAC. In terms of the relationship between PAC and RAC, the results of hypothesis testing revealed that KDA positively moderates the relationship between these variables.

In addition, the relationship between LSE and PAC was found to be significantly positive. However, surprisingly, the findings also revealed that the relationship between RAC and NPP was non-significant. Consequently, the notion of the moderating effect played by IC on the relationship between RAC and NPP was not supported.

These findings will be further discussed in the next chapter, together with qualitative findings as presented in Chapter 6.

Chapter 9 : Discussion

9.1 Introduction

The findings of this research relied on two approaches: qualitative and quantitative, which were presented in Chapter 6 and Chapter 8, respectively. This chapter discusses the findings of these approaches by integrating and linking them to the literature. The structure of the chapter is organised into four main sections. Following this section, section 9.2 presents an overview of the findings gained from the two approaches. Section 9.3 discusses the findings, answering each of the five research questions posed in this research – RQ1 to RQ5 – respectively. Lastly, section 9.4 outlines the chapter summary.

9.2 Overview of Findings

The aim of this research was to study PAC and RAC in ‘low-medium-tech’ (LMT) SME, using Thai dessert SMEs as the case. In sum, this study had five research questions to address, RQ1-RQ5. To handle these research questions, the mixed methods approach was adopted. Mixed methods entail the use of both quantitative and qualitative approaches in order to investigate a research area of interest in a single study. It was tailored in this research using exploratory design, i.e. it started with the qualitative approach, followed by the quantitative approach. The qualitative approach was adopted to address the first two research questions, RQ1 and RQ2, whereas the quantitative approach was implemented to tackle the latter three research questions, RQ3-RQ5. The findings from the two approaches answering each of the five research questions are summarised in Figure 9.1.

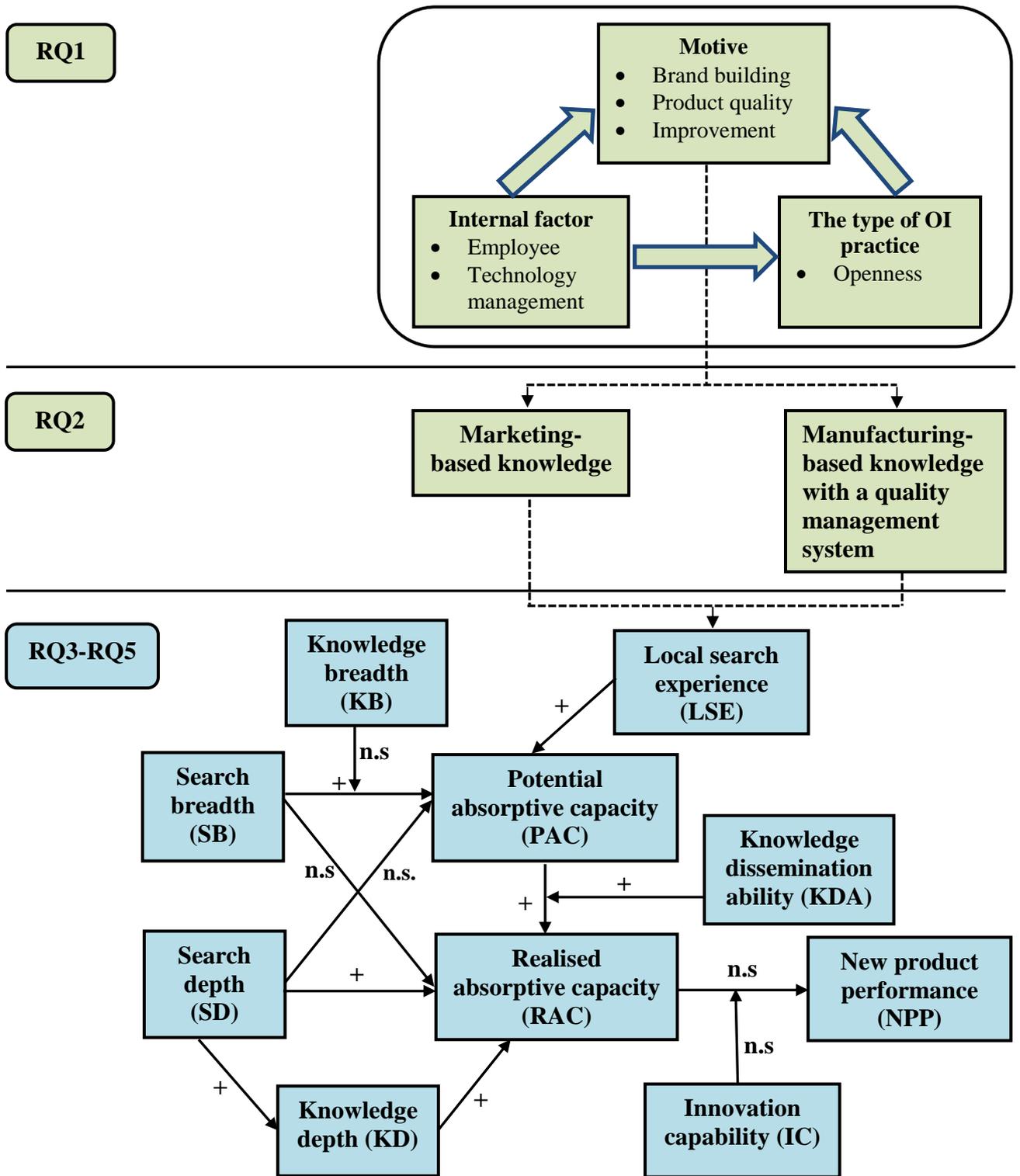


Figure 9.1. Summary of findings.

Note: refers to qualitative approach refers to quantitative approach
 → refers to direct effect -----> refers to the source of construct
 ⇨ refers to underlying relationship

As seen in Figure 9.1, the findings of RQ1 revealed three primary motives engaging Thai dessert SMEs in the inbound OI access in support of NPD, i.e. brand building, product quality, and improvement. In addition, the findings also revealed that internal factors (employee and technology management) and the type of OI practice (openness) are two key components that Thai dessert SMEs engaged, along with the motives in the inbound OI access. To answer RQ2, RQ1's three revealing motives – brand building, product quality, and improvement – were interpreted into the knowledge domain. Based on this research, the knowledge domain was scoped, relying on three types of the firms' functional areas: R&D, manufacturing, and marketing. The findings revealed that Thai dessert SMEs are oriented towards two kinds of knowledge domains: marketing-based knowledge and manufacturing-based knowledge with a quality management system. As for R&D-based knowledge, Thai dessert SMEs do not have an approach towards this type of knowledge domain. However, as a key note, this finding does not reflect that Thai dessert SMEs do not have R&D activities. In contrast, Thai dessert SMEs employ externally-oriented knowledge, focusing on marketing-based knowledge and manufacturing-based knowledge with a quality management system, to support their NPD activities that rely on in-house R&D activities.

Focusing on the quantitative approach for the three related research questions, RQ3-RQ5, the findings revealed that there was a positive relationship between local search experience (LSE) and PAC. In this research, LSE was measured using the frequent search behaviour of the knowledge domain within the industry. Two types of knowledge domains that the Thai dessert SMEs orient towards as revealed in RQ2, i.e. marketing-based knowledge and manufacturing-based knowledge with a quality management system, were used as the dimensions of LSE construct.

Significantly, the findings revealed a positive relationship between SB and PAC, while the relationship with RAC was found to be non-significant. On the other hand, SD was found to have a positive relationship with RAC, while its relationship with PAC was discovered to be non-significant. As for the PAC-RAC relationship, KDA was found to have a positive moderating effect on this relationship. Furthermore, as to the effects of KB and KD, the findings revealed that KB does not have a moderating effect on the SB-PAC relationship, while KD was found to have a mediating effect on the SD-RAC relationship. Surprisingly, the relationship of RAC and NPP was found to be non-significant. Consequently, the notion of IC as a moderator of the RAC-NPP

relationship was not supported in this research. These findings will be further discussed in the following section, organised by the research questions RQ1 to RQ5.

9.3 Findings in Relation to Research Questions

As mentioned above, this study addressed five research questions, RQ1-RQ5. The findings answering each of these related research questions will be discussed in order.

9.3.1 RQ1: What are Thai dessert SMEs' motives in the inbound OI access in support of NPD?

For RQ1, the findings of the qualitative approach revealed that there are three key motives engaging Thai dessert SMEs in the inbound OI access in support of NPD: brand building, product quality, and improvement. Furthermore, the findings also revealed that internal factors (employee and technology management) and the type of OI practice (openness) are two key components that Thai dessert SMEs are concerned with alongside the motives engaging them in the inbound OI access. These three issues – motives, internal factors, and the type of OI practice – will be discussed as follows:

9.3.1.1 Motive

The motives revealed in relation to RQ1 were brand building, product quality, and improvement, all of which act as incentives regarding the development of product targeting to customer satisfaction, which eventually leads to customer loyalty (see Section 6.6 in Chapter 6). In other words, these three motives act as incentives related to marketing. This finding is consistent with the study of van de Vrande et al. (2009), which explored SMEs' motives in the implementation of OI and perceived management. Their results revealed that OI in SMEs is primarily spurred by market-related motives, e.g. meeting customer demands or keeping up with competitors. In terms of the food industry, particularly, this finding is consistent with those of Baregheh, Rowley, Sambrook, and Davies (2012), suggesting that food SMEs innovate not only in terms of products and processes but also in terms of marketing (e.g. launch of a new website) and business strategies (e.g. establishment of a constant search for innovative ideas). Likewise, Tripl et al. (2011), who studied the Vienna food sector, revealed that food firms engage in NPD as well as in process and marketing innovations. This finding strongly relates to the Thai dessert SMEs' marketing approach. As claimed by Sciascia et al. (2006), market orientation is the main

determinant of entrepreneurial orientation in SMEs. Thus, the discovery of the market-related motives in the Thai dessert SMEs' inbound OI access in support of NPD reflects their entrepreneurial orientation.

Brand Building – Product Quality – Improvement

Focusing on the three motives found in RQ1 individually, the reveal of brand building is consistent with Abimbola and Kocak (2007), which revealed that entrepreneurial SMEs try to maintain their brand as a key to their reputation. The finding of product quality is in line with Fernando, Ng, and Yusoff (2014) that used the food industry in the northern region of Peninsular Malaysia as its case and revealed that product quality was the primary motive for implementing a food safety system within firms. It also determined that the majority of these food companies believed that implementing basic hygiene procedures would improve food safety in their businesses.

As for improvement, this reflects incremental innovation (see Section 6.6—Linkage of Themes) and is consistent with a study by Garcia Martinez and Briz (2000) that revealed that Spanish food firms concentrate on product-oriented innovations towards incremental innovations. Beckeman, Bournlakis, and Olsson (2013) through 21 in-depth interviews with food firm representatives in Sweden, revealed that very few innovations in the Swedish market are radical. Furthermore, Trippel et al. (2011) highlighted different forms of innovation and revealed that Viennese food firms often engage with incremental innovation by nature.

As Lefebvre, De Steur, and Gellynck (2015) claimed, incremental innovation tends to contribute to the food industry. Likewise, Massa and Testa (2009) found that food producers are inclined to focus primarily on continuous improvements of products (often line extensions or me-too products) rather than on change. Thus, this finding is in line with those revealed in the study regarding the food industry. As determined in this research, improvement is propelled by two major reasons: business survival and customer satisfaction. These two reasons are common in marketing and innovation management literature, implying that innovative activities are a cornerstone for increasing the market share, market value, and long-term survival of firms (Banbury & Mitchell, 1995). Banbury and Mitchell (1995) revealed that only firms that are able to both keep abreast of incremental innovations and convince customers that their products are desirable have a realistic chance of survival.

The summary of findings revealing the three previously-mentioned motives confirmed that Thai dessert SMEs primarily focus on market-based motives in the inbound OI access in support of NPD. The motives are closely related to a firm's product development being oriented towards customer satisfaction, leading to customer loyalty. The results from the qualitative evidence with market-based motives confirmed that Thai dessert SMEs have NPD activities focusing on continuous product development with a marketing approach.

9.3.1.2 Internal Factors

In relation to RQ1, the research results also revealed key qualitative evidence that internal factors are engaged alongside the motives attracting Thai dessert SMEs in the inbound OI access in support of NPD. This finding emerged unexpectedly in this study and was considered a significant facilitator to a firm's NPD activity. Based on the findings, internal factors include two main elements: employees and technology management.

Employees

As revealed in the research, this factor is concerned with three key characteristics in support of NPD activity: employees' participation, employees' skills and knowledge, and employers' trust of employees in NPD activity. The discovery of these key characteristics indicated that Thai dessert SMEs are concerned about employee involvement in their firm's NPD activity. Regarding employees' participation, this finding is consistent with Forsman (2008) that revealed that successful projects concerning the business development of SMEs included participative and highly motivated employees. Axtell et al. (2000) revealed a positive relationship between employees' participation and employees' innovative behaviour. Additionally, as Chiva and Alegre (2008) claimed, employees' participative decision-making is one of the aspects of employee involvement that can facilitate learning. In terms of employees' skills and knowledge, this finding is consistent with Lund Vinding (2006) that revealed that staff with high levels of education and technical qualifications are more receptive to assimilation and transformation of external knowledge. As Daghfous (2004) asserted, an employee's education level influences their AC in assimilating knowledge. Similarly, Grimpe and Sofka (2009) claimed that employees' expertise through their college education is a key measure of AC. Thus, the reveal of employees' characteristics relying on their skills and knowledge reflects their ability to absorb external knowledge and exploit that knowledge to mix with existing internal knowledge.

Technology Management

In addition to employees, technology management was revealed as another internal factor. This reveal regarding technology management is in line with Lawson and Samson (2001) that revealing the shift toward external networks and leveraging the entire corporate knowledge base reflects that technology management within the overall organisation should be concerned rather than research and development, per se.

9.3.1.3 The Type of OI Practice

In relation to RQ1, the type of OI practice as a finding emerged unexpectedly alongside the internal factors. Similarly, it was considered a significant facilitator to the firms' NPD. As revealed in this study, the type of OI practice was primarily supported by one element—openness, which is defined as the access of external sources in order to gain new ideas and knowledge for the improvement of production processes and new products. To operate with the inbound OI, the firms employ search practices to scan for external knowledge. Thus, this finding confirms that Thai dessert SMEs are concerned with external searches (openness) to adopt and apply external knowledge to support their internal NPD activity.

Openness

As revealed in this study, openness – in which Thai dessert SMEs have access to external knowledge – involves four key external sources: 1) customers; 2) suppliers; 3) knowledge/ideas/technology; and 4) business alliances. Openness to customers and openness to suppliers involve access to external sources based on customers and suppliers, respectively. Openness to knowledge/ideas/technology involves access to external sources related to institutions or other channels containing data or knowledge, e.g. meetings, the internet, and computer databases. Finally, openness to business alliances involves cooperation with external agents.

Regarding openness to customers and openness to suppliers, this finding is consistent with Lefebvre et al. (2015), which revealed that collaborating with customers is positively associated with the introduction of product innovations in food SMEs. As Amara and Landry (2005) stated, collaborating with clients could be beneficial when the aim is to develop more novel or complex innovations. In terms of supplier-based external sources, Kim and Seungwha (2003) claimed that the use of suppliers as external knowledge sources can help manufacturers gain knowledge being

shared about the product and customers' requirements. Furthermore, collaborating with suppliers enables a firm to reduce the risks and lead times of product development while enhancing flexibility, product quality, and market adaptability. Greco, Grimaldi, and Cricelli (2015) revealed that the involvement of suppliers can be beneficial with regard to reducing the time-to-market of new products and development costs. Similarly, Lasagni (2012) revealed that suppliers help reduce costs, including during the design support and development process.

The Thai dessert SMEs' basic data of using external sources, which was collected via the quantitative approach of a survey (see Table 8.6 in Chapter 8), supported the qualitative findings, as well. The survey data revealed that customers and suppliers are external sources of knowledge with a high degree of use by Thai dessert SMEs. This is consistent with a study by Vahter, Love, and Roper (2015), which claimed that supply-chain linkages (i.e. with customers and suppliers) are the most common forms of innovation linkage for small firms and have the largest positive effect on innovation performance. This finding is also consistent with Lefebvre et al. (2015) who revealed that market-based actors (e.g. suppliers, customers, competitors, and firms from other sectors) play a more distinct role in the innovation of both SMEs and food firms, while science-based actors (including universities/public research institutes, private research institutes, training institutes, and consultants) are not associated with the introduction of innovation in food SMEs.

The reliance on knowledge/ideas/technology as revealed in support of openness reflects access to external sources related to institutions or other channels containing data or knowledge. The survey data (as mentioned above) supported this finding. Although the usage level of institution-based sources was lower than that of using the source relying on customers and suppliers, the use of institution-based sources was at a satisfactory level (medium) (see Table 8.6 in Chapter 8). Institution-based sources that Thai dessert SMEs use at a medium level include sources such as universities and other higher education institutes, government research organisations, and other public sectors (e.g. business links, government offices). Interestingly, the survey data revealed one institution-based source with low-level use: private research institutes. Additionally, the channel of professional conferences, meetings, and trade associations, including technical/trade press, was also revealed as having medium-level use.

The three issues relating to RQ1 were motives, internal factors, and the type of OI practice, and the findings confirmed that Thai dessert SMEs are primarily concerned with marketing-related motives, which is in line with most LMT-based SMEs, including food sector SMEs. Furthermore, the results suggested that internal factors (employees and technology management) and the type of OI practice (openness) are two key elements that Thai dessert SMEs are concerned with alongside motives in the inbound OI access to lead to the firms' successful NPD activity. This qualitative finding was significant, as it revealed the three main components facilitating the conceptual framework of inbound OI application in the context of Thai dessert SMEs in order to lead to successful implementation of inbound OI.

9.3.2 RQ2: What kinds of knowledge domain do Thai dessert SMEs orient in the inbound OI access in support of NPD?

Regarding RQ2, this research scoped the knowledge domain relying on three functional areas—R&D, manufacturing, and marketing. To answer RQ2, themes regarding the motives found in RQ1 were interpreted into the knowledge domain (see Section 6.7 in Chapter 6). The findings revealed that Thai dessert SMEs are oriented towards two types of knowledge domains: marketing-oriented knowledge and manufacturing-oriented knowledge with a quality management system. As revealed in this research, R&D-based knowledge is not a type of knowledge domain oriented for Thai dessert SMEs.

This study's reveal of the marketing-oriented knowledge of Thai dessert SMEs is consistent with Grimpe and Sofka (2009) that revealed that search patterns of inbound OI in low-technology industries mainly focus on market knowledge, which differs from high-technology industries focusing on search activities concerning technology sourcing. A study by Sciascia, D'Oria, Bruni, and Larrañeta (2014) revealed that the LMT sector tends to focus on knowledge that is more market-based than technology-based, more practical than scientific, and more tacit than explicit. Lichtenthaler (2009) investigated the context of medium- and large-sized industrial firms and revealed that market knowledge is an essential complement to technological knowledge. As Maes and Sels (2014) claimed, market or customer knowledge is an important external knowledge type used to broaden SMEs' knowledge base in an attempt to innovate.

Regarding the manufacturing-oriented knowledge with a quality management system, this finding is consistent with Utterback and Abernathy (1975) that revealed that the production process is the system of process equipment, work force, task specifications, material inputs, work and information flow, and so on employed to produce a product or service (Utterback & Abernathy, 1975). Thus, this finding confirms the approach of a production process focusing on products or services with excellent quality. As revealed in this study, manufacturing-oriented knowledge with a quality management system mainly focuses on the approach of product quality reliant on a quality management system and supplier management. A quality management system is a processing-oriented standard rather than a product-oriented standard (Trienekens & Zuurbier, 2008). A quality management system is designed to assure customers that the products are produced with specific practices to maintain both quality and safety. This is different from a product-oriented standard, which is designed to only focus on product safety through a certification verified by a third party (Zhou, Helen, & Liang, 2011). In the food industry, several QA systems have been adopted for application, e.g. good manufacturing practices (GMP), hazard analysis critical control points (HACCP), the international organisation for standardisation 22000 (ISO 22000), and the British retail consortium's global food safety standards (BRC) (Mensah & Julien, 2011; van der Spiegel, Luning, Ziggers, & Jongen, 2003).

Regarding the data collected via the quantitative approach of a survey, with the results of item responses for QS1-QS3 regarding manufacturing-based knowledge with a quality management system (see Table 8.8 in Chapter 8), the item response results are in line with the qualitative findings revealed above. The item responses – varying from a score of 1 to 5 – revealed that Thai dessert SMEs utilise GMP standards based on Thai FDA (QS1) at an average of 4.38, Codex GMP standards (QS2) at an average of 2.57, and HACCP standards (QS3) at an average of 2.56. The quantitative data reflected that Thai dessert SMEs approach GMP standards based on the Thai FDA at a higher level than the other standards (i.e. Codex GMP and HACCP standards). This reveal was unsurprising, as Thailand's food industry is basically regulated by the Thai FDA, which implements GMP standards in Thailand. The Codex GMP and HACCP standards are more advanced and therefore might be only applicable in SMEs with higher potent, especially those prepared to approach exportation.

Drawing on the summary of RQ2's findings, this research revealed two main types of knowledge domains that Thai dessert SMEs are oriented towards, i.e. marketing-oriented knowledge and manufacturing-oriented knowledge with a quality management system. This is significant to fulfil further knowledge of Thai dessert SMEs' local search in the focused knowledge domain relying on functional areas—R&D, manufacturing, and marketing. For marketing-oriented knowledge, the reveal of this finding confirmed that the local search focus of most SMEs mainly relies on marketing knowledge. As for manufacturing-oriented knowledge with a quality management system, this finding confirmed that Thai dessert SMEs focus on production processes based on QA systems in order to lead to excellent product quality.

9.3.3 RQ3: What is the effect of local search experience on PAC?

In RQ3, the research findings with the quantitative approach of hypothesis testing revealed that LSE, which is measured by the frequent search behaviour of the oriented-knowledge domain within the industry, has a positive effect on PAC. This finding is consistent with Fosfuri and Tribó (2008), which measured knowledge search experience by using a firm's stock of non-expired patents and revealed that R&D cooperation, external knowledge acquisition, and knowledge search experience are key antecedents of a firm's PAC.

To provide an explanation for this finding, this might be described through experiential learning. As suggested by Fosfuri and Tribó (2008), knowledge search experience is related to the experiential learning that an organisation has accumulated through prior innovation activity. In a local search, innovations are often re-combinations of existing ideas and practices (Kogut & Zander, 1992). A reason for this is that learning begins with experience (Argote & Miron-Spektor, 2011).

Drawing on the summary of RQ3's findings, this research revealed a significant positive effect of LSE on PAC, suggesting that frequent searches in knowledge domains within the industry facilitate LSE, which subsequently facilitates the development of PAC.

9.3.4 RQ4: How do search breadth and search depth affect PAC and RAC?

In RQ4, the results of the quantitative approach of hypothesis testing revealed that SB has a positive relationship with PAC, while its relationship with RAC was found to be non-significant. On the other hand, SD was found to have a positive relationship with RAC, while its relationship with PAC was found to be non-significant. The findings also revealed that KB does not have a moderating effect on the SB-PAC relationship, while KD displays a significant mediating effect on the SD-RAC relationship. These findings are in line with a theoretical lens of exploration and exploitation organisational learning, which will be discussed as follows:

Relationship of SB-PAC and SB-RAC

Regarding the relationship of SB-PAC and SB-RAC, this research revealed that SB was positively related to PAC, while its relationship with RAC was found to be non-significant. This is consistent with Mennens, Van Gils, Odekerken-Schröder, and Letterie (2018) study of Dutch manufacturing firms based on SMEs, which found that SB has a positive effect on an organisation's PAC. In addition, their findings also revealed that employee collaboration has positive effects on an organisation's PAC and reinforces RAC. The relationship of SB-PAC and SB-RAC, as revealed in this research, can be explained through the exploration organisational learning theory.

Exploration organisational learning involves broad and general search in contrast with exploitation organisational learning, which involves deep search. Broad search results in the acquisition of knowledge. Consequently, SB has a positive effect on PAC and does not display a significant relationship with RAC.

Influence of KB on SB-PAC

Surprisingly, the results of the hypothesis testing revealed that KB does not have a moderating effect on the SB-PAC relationship. However, an interesting finding of the hypothesis testing was that KB was found to have a positive relationship with PAC (see Table 8.9 in Chapter 8). This confirms that KB does not have a moderating effect on the SB-PAC relationship but, rather, has a positive direct effect on PAC. Similar to the explanation for the SB-PAC relationship, exploration organisational learning theory was spotlighted as an explanation for this result. Tracing back to exploration organisational learning, it involves broad search. Hence, exploration organisational learning corresponds to PAC rather than RAC because it requires the firms to continuously scan

the environment to identify and collect industry information, observe technological trends, and identify sources of new knowledge (Tzokas et al., 2015). The AC depends on prior related knowledge to acquire and assimilate knowledge from external sources. Therefore, PAC – which directly serves to contact with the external environment to capture knowledge - is highly involved with prior related knowledge (Lichtenthaler, 2009; Szulanski, 1996). Consequently, KB seems to have more influence than KD on exploration organisational learning because KB reflects a variety of knowledge in different domains. As such, it extends the chance that knowledge is related to existing knowledge and increases the commonality of knowledge. Furthermore, it enables the firms to evaluate and understand the value of local knowledge in more adjacent fields (van Wijk, Jansen, Van Den Bosch, & Volberda, 2012). Consequently, KB was assumed to have a positive moderating effect on the SB-PAC. However, this assumption was not supported by the research findings. This deviant result might be explained through the organisational learning mechanism.

Organisational learning is the process of change in individual and shared thought and action, which is affected by and embedded in the institutions of the organisation. When individual and group learning becomes institutionalised, organisational learning occurs, and knowledge is embedded in repositories such as routines, systems, structures, culture, and strategy (Vera, Crossan, & Apaydin, 2011). When organisational learning occurs, knowledge is already embedded in the repositories of the organisation. Regarding the findings of this research, the non-significant moderating effect of KB on the SB-PAC relationship can be explained as follows: when firms broadly search (SB) for external sources of knowledge, this results in exploration learning in which KB as a result from SB is proceeded and embedded into the firm's exploration learning (i.e. PAC) via the organisational learning mechanism. It is important to clarify that although search practice in breadth is operated at an individual level, KB from individuals is institutionalised and embedded into the repositories of the organisation, i.e. organisation learning occurs. Consequently, the relationship of SB and PAC is strong through the organisational learning process which the KB was accumulately embedded into PAC. As Argote and Miron-Spektor (2011) claimed, this embedded knowledge affects future learning. Consequently, the SB-PAC relationship does not necessarily rely on the moderating effect of KB because KB is already embedded into PAC through exploration organisational learning.

Regarding the explanation above, it is vital to emphasise that this research does not argue to the notion of Cohen and Levinthal (1990), who suggested that prior related knowledge is an antecedent of the AC. In contrast, this research strongly confirmed that prior related knowledge influences PAC from supporting evidence that KB has a significant positive effect on PAC. However, an explanation of the research findings was viewed through the lens of the organisational learning mechanism rather than through the perspective of knowledge transfer mainly relying on the influence of prior related knowledge to PAC to absorb external knowledge.

Relationship of SD-PAC and SD-RAC

Regarding the relationship of SD-PAC and SD-RAC, the findings were in contrast with the relationship of SB-PAC and SB-RAC. That is, SD was found to be non-significant to PAC, while the relationship with RAC was discovered to be positive. Drawing on the relationship of SD-PAC and SD-RAC, as revealed in this research, the findings can be explained through exploitation of the organisational learning theory. This is contrary to the explanation for the relationship of SB-PAC and SB-RAC, as previously discussed, with using the exploration organisational learning theory.

Exploitation organisational learning involves deep search and the search for and use of solutions to customer problems in the neighbourhood of the firm's current experience (March 1991). Thus, SD has a positive effect on RAC, involving the exploitation of external knowledge and internal knowledge in combination, but it does not display a significant relationship with PAC.

Influence of KD on SD-RAC

Regarding the mediating effect of KD on the SD-RAC relationship, the findings of the hypothesis testing supported this assumption, revealing that KD has a moderating effect on this relationship. The exploitation organisational learning theory was spotlighted as an explanation, similar to the SD-RAC relationship.

Tracing back to exploitation organisational learning, it involves deep search. Deep search facilitates the firms to transform knowledge into performance. Thus, exploitation organisational learning corresponds to RAC rather than PAC because it is an ability to exploit knowledge absorbed from external sources. As van Wijk et al. (2012) suggested, exploitative innovations that

involve the development of products, services, or processes that are refined and derived from existing ones are mainly influenced by depth of knowledge. Depth of knowledge is generally associated with repeated usage and increased experience (van Wijk et al., 2012).

The findings revealed a significant mediating effect of KD on the SD-RAC relationship. Likewise, the organisational learning mechanism was used as an explanation in the same way it was for the non-significant moderating effect of KB to the SB-PAC relationship. As previously discussed, organisational learning occurs from learning at the individual and group levels, leading to organisational learning through institutionalisation. It transpires when knowledge is embedded in the repositories of the organisation, such as routines, systems, structures, culture, and strategies (Vera et al., 2011). When the firms have deep search (SD), this results in knowledge in depth (KD), which fundamentally builds on existing knowledge and therefore enables routinisation and nourishes the efficiency of the activities it is applied to (van Wijk et al., 2012). In other words, deep knowledge facilitates enhancement of RAC. Consequently, KD displays a mediating effect on the SD-RAC relationship, as revealed in this study.

The summary of RQ4's results confirmed the different effects of SB and SD on PAC and RAC, respectively. It was determined that SB corresponding to exploration organisational learning is positively related to PAC, while its relationship with RAC is non-significant. On the other hand, SD corresponding to exploitation organisational learning was found to have a positive relationship with RAC, while its relationship with PAC is non-significant. This finding fulfils further knowledge connecting the link between SB and PAC, as well as that of SD and RAC, having the same corresponding to exploration organisational learning and exploitation organisational learning, respectively. This suggests that balance between SB and SD is necessary, as this will lead to a balance between PAC and RAC.

Regarding the effect of KB and KD, the research findings confirmed that KB does not have a moderating effect on the SB-PAC relationship but, rather, has a direct effect on PAC. This result significantly supported further knowledge on the relationship occurring between SB and PAC through the theoretical lens of exploration organisational learning underlied by the organisational learning mechanism. In addition, this confirmed a positive effect of KB on PAC. Therefore, it supported the notion of prior related knowledge influencing AC, particularly with PAC. For KD,

the finding confirmed its mediating effect on the SD-RAC relationship, which is in line with exploitation organisational learning. The result suggested that both KB and KD are necessary for the firms' balance, as they facilitate positive effects to the AC, particularly with PAC and RAC, respectively.

9.3.5 RQ5: Does innovation capability have a moderating effect on the relationship between RAC and new product performance (NPP)?

Regarding RQ5, the findings of this research with quantitative approach by hypothesis testing revealed that the relationship between RAC and NPP is non-significant. Therefore, the assumption of innovation capability as a moderator of the RAC-NPP relationship is not supported. This finding was surprising and deviated from the anticipation to find a positive relationship between RAC and NPP as determined in most previous studies. For example, the studies of Cohen and Levinthal (1990), Leonard-Barton (1995), Tsai (2001), and Zahra and George (2002) found a positive relationship of AC and firm performance. Additionally, viewing RAC as exploitation learning, the findings of this research were not consistent with Jansen et al. (2005), which found a positive effect of exploitation learning and NPP. A possible explanation for this deviant result is that the relationship between RAC and NPP might be the patterns being not be linearity. In terms of the AC literature, the relationship of AC and NPP was not consensus. Among various studies, the pattern of the AC-NPP relationship can be found with both linearity and non-linearity, e.g. u-shaped or inverted u-shaped.

Relationship of RAC-NPP

Viewing the AC in more depth by distinguishing between PAC and RAC through a theoretical lens of exploration and exploitation organisational learning, PAC is as exploration organisational learning, while RAC is as exploitation organisational learning. Regarding RAC as exploitation organisational learning, the research findings revealing a non-linear relationship of RAC and NPP was consistent with the studies of Li, Wei, Zhao, Zhang, and Liu (2013), which investigated manufacturing firms in China and found a non-linear relationship of exploitation learning and NPP, or, more specifically, a u-shaped pattern suggesting that there are diminishing returns for RAC. However, for PAC, they found a positive effect on NPP. Likewise, Brettel, Greve, and Flatten (2011) determined a non-linear relationship in the u-shaped pattern of RAC and performance (market performance and financial performance). However, for PAC, Brettel et al.

(2011) discovered a similar PAC-NPP relationship as Li et al. (2013), i.e. a positive linear relationship.

Significantly, it is vital to remember that the PAC-NPP relationship was not examined in this study because it is not in line with the assumption underlying the conceptual framework proposed in this research. In more detail, the focus of the conceptual framework of this research was that PAC and RAC are two distinct units serving separate functions but complementary roles, which is consistent with Zahra and George's (2002) original concept of differentiating between PAC and RAC: PAC serves as the function of absorbing external knowledge, while RAC serves as the function of performance. Following this notion, only RAC was examined in association with NPP in this research.

Moderating Effect of Innovation Capability

In this study, innovation capability was hypothesised to display a moderating effect on the RAC-NPP relationship. It was also anticipated that the RAC-NPP relationship would be positive and that innovation capability positively moderates the RAC-NPP relationship. However, as previously discussed, this assumption of the moderating effect of innovation capability was rejected as the linear relationship of RAC and NPP was found to be non-significant.

Although the research findings disappointingly revealed that the moderating effect of innovation capability on the RAC-NPP relationship was not supported, they did reveal interesting evidence that innovation capability displays a negative effect on NPP. However, when it interacted with RAC, an interaction term being as the product of both turns to displays a positive effect on NPP (see Table 8.9 in Chapter 8). This suggests that innovation capability and RAC must work together to have a positive effect on NPP. With an interaction term, it is actually as a product being as the multiplicative of independent variable (here, RAC) and moderator variable (here, innovation capability) to use for testing a moderating effect to dependent variable (here, NPP). The reveal of significance of interaction terms of innovation capability and RAC to NPP suggests that there is moderating effect on NPP. However, it is vital to emphasise that this does not necessarily mean that innovation capability displays a moderating effect. As previously summarised, innovation capability does not have a moderating effect on the RAC-NPP relationship, as the condition of moderating effect was rejected due to key evidence that there is no relationship between RAC and

NPP. Thus, a possible explanation is that RAC might be a moderator in the relationship between innovation capability and NPP, instead. However, this is only anticipation and not a summary of this research, due to the lack of supporting evidence from empirical testing. Clearly, this research strongly confirmed that there is a positive effect of interaction term being a product of innovation capability and RAC on NPP. As a result, the results suggested that both innovation capability and RAC are required to work together to display a positive effect on NPP. The lack of either might be insufficient on the effectiveness of NPP.

Drawing on the summary of RQ5's results, this research confirmed the non-linear relationship of RAC and NPP. Subsequently, the notion of the effect of innovation capability to positively moderate the RAC-NPP relationship was not supported. However, it is important to note that this research did not further prove what the pattern of the non-linear relationship of RAC and NPP should be (e.g. u-shaped, inverted u-shaped, or so on.). Moreover, the findings confirmed that the interaction of innovation capability and RAC has a significant positive effect on NPP. This suggests that innovation capability and RAC must work together to enhance NPP. This summary is strongly supported by evidence that suggested that innovation capability displays a negative effect on NPP, while RAC was found to display a non-significant linear relationship with NPP.

9.4 Summary

This chapter discussed the findings of this study's five research questions, RQ1 to RQ5. The findings were based on evidence gained from two approaches: qualitative and quantitative. The qualitative approach was adopted to discover the answers to RQ1 and RQ2, whereas the quantitative approach was used to find the answers for RQ3-RQ5. Based on this research, two approaches were designed using different phases relying on exploratory design, i.e. the qualitative approach, followed by the quantitative approach.

In the author's opinion, the use of the mixed methods approach designed with two different phases relying on qualitative and quantitative phases facilitated the findings' unique, meaningful, and timely results. Based on this research, the results from these two phases led to further knowledge regarding the application of inbound OI and the enhancement of PAC and RAC in the context of Thai dessert SMEs. Use of the qualitative approach enabled a deep understanding of the

phenomenon of Thai dessert SMEs' inbound OI access in the real world due to the limited knowledge of Thai dessert SMEs' application of inbound OI. However, the quantitative approach enabled the cross-checking of the results from the qualitative approach and employed the results in creating the measure or items (here, for LSE construct) to be further tested through the quantitative approach. The qualitative findings were used in combination in the conceptual framework established on the basis of theoretical perspective gathered from the literature. In this research, the connecting point between the qualitative and quantitative approaches was based on RQ3, adopting the findings of RQ2, for further study through the proposed conceptual framework.

Based on the results from the two different phases, the qualitative and quantitative approaches complemented each other and led to meaningful findings in the application of inbound OI and enhancement of PAC and RAC in the context of Thai dessert SMEs. This suggests that LSE and SB positively enhance PAC, whereas SD positively facilitates RAC. In addition, innovation capability is necessarily required to work together with RAC to lead to a significant positive effect on NPP. These findings revealed 'so what' we gained from this study and significantly provided a new insight supporting broader knowledge of enhancing PAC and RAC, aside from the sole approach of R&D investment suggested in the literature. Moreover, the findings from this research will be beneficial to SMEs – especially LMT-based SMEs with limited resources in R&D investment – by revealing new alternatives in enhancing PAC and RAC in a firm's inbound OI access through search practice.

The next chapter presents the conclusions and implications of this research.

Chapter 10 : Conclusion and Implication

10.1 Introduction

This chapter provides a summary of the key findings of the research and the practical implications for managers. Following this, section 10.2 delineates the summary of key findings in the research. Section 10.3 merits the contributions of the research. Section 10.4 suggests managerial implications. Section 10.5 outlines the limitations of the study in this research. Finally, section 10.6 provides suggestions for future research.

10.2 Summary of Key Findings

This research aims to study PAC and RAC in ‘low-medium-tech’ (LMT) SMEs, using Thai dessert SME as the case. The research has two main objectives. First, to explore Thai dessert SMEs’ motives and oriented-knowledge domains of the inbound OI access in support of NPD. Second, to understand the effect of search breadth and search depth, local search experience and innovation capability on PAC and RAC. It aims to answer the main research question as posed in this research:

How do search breadth and search depth, local search experience, and innovation capability affect PAC and RAC in Thai dessert SMEs’ inbound OI access, in support of NPD?

The main research question as posed above is crucial from a managerial perspective in that it helps to provide a guideline to managers/owners of Thai dessert SMEs towards improving the PAC and the RAC. To answer the main research question, five sub-research questions (RQ1-RQ5) were generated:

- RQ1: What are Thai dessert SMEs’ motives in the inbound OI access in support of NPD?
- RQ2: What kinds of knowledge domain do Thai dessert SMEs orient in the inbound OI access in support of NPD?
- RQ3: What is the effect of local search experience on PAC?
- RQ4: How do search breadth and search depth affect PAC and RAC?

RQ5: Does innovation capability have a moderating effect on the relationship between RAC and new product performance (NPP)?

To five research questions above, this research provides significant qualitative and quantitative evidence of the improvement of PAC and RAC in the context of Thai dessert SMEs. Relying on qualitative evidence, this research revealed three market-related motives: brand building, product quality and improvement, engaging Thai dessert SMEs in inbound OI access in support of NPD. Besides, it also revealed that internal factors (employee and technology management) and the type of OI practice (openness) are two key components which Thai dessert SMEs engaged in along with the motives. The reveal of marketing-related motives, internal factors and the type of OI practice significantly supports the provision of the framework of the inbound OI application in the context of Thai dessert SMEs. Furthermore, the qualitative evidence also suggests that Thai dessert SMEs have oriented for a knowledge domain relying on functional areas of two types: marketing-oriented knowledge, and manufacturing-oriented knowledge with a quality management system. This is a significant qualitative finding as it helps to provide a framework of local search related to a focused knowledge domain in the inbound OI access, in the context of Thai dessert SMEs.

Quantitative evidence supports the provision of a guideline in developing PAC and RAC. Quantitative evidence suggest that search breadth has a significantly positive effect on PAC, whereas search depth has a significantly positive effect on RAC. However, the relationship of search breadth-RAC and search depth-PAC was found to be non-significant. The findings also suggest that local search experience (LSE) has a positive effect on PAC, while the relationship between PAC and RAC was found to be stronger with a moderating effect of knowledge dissemination ability (KDA).

The quantitative findings revealed that the KB does not have a significant moderating effect to PAC, but it displays a direct effect in positive way to PAC instead. In contrast, the KD was found to have a mediating effect to the SD-RAC relationship. This suggests that SD results in the enhancement of RAC through KD, while search breadth results in the enhancement of PAC through the KB, proceeded by organisational learning mechanism embedding KB into an organisation's repositories.

Surprisingly, the finding in this research revealed that the relationship between RAC and new product performance was non-significant. Consequently, the notion of innovation capability as the moderating effect to the relationship between the RAC and NPP was not supported in this research.

10.3 Contributions of Research

This research contributes to existing literature in three ways. First, it advances the research on absorptive capacity by linking the concept of PAC and RAC with two distinct dimensions of organisational learning: exploration learning and exploitation learning. Drawing from March's (1991) exploration and exploitation organisational learning framework, search breadth has been related to exploratory learning, while search depth is related more to exploitative learning. This research suggests that search breadth positively relates to PAC, while search depth positively relates to RAC. This is the first study examining the effects of search breadth and depth on PAC and RAC by linking the theory of exploration-exploitation learning.

Second, it contributes to the research on absorptive capacity by examining the moderating role of innovation capability in the relationship between RAC and new product performance. Prior research has never examined the interaction effect of innovation capability and the RAC on new product performance. This is the first study examining this interaction effect.

Third, the study contributes to the knowledge of the implementation of inbound OI, particularly within the context of low-medium-tech (LMT) SMEs. The studies regarding inbound OI access of low-medium-tech SMEs are scarce. This research bridges this gap in knowledge by providing qualitative evidence of motives and knowledge of inbound OI access.

10.4 Managerial Implications

This research can give advice on industry best practice to the managers. First, the managers of Thai dessert SMEs should realise the critical importance of interacting with the external environment. In doing so, the concept of open innovation should be adopted. Managers of Thai dessert SMEs must understand the rapidly changing environment where firms cannot rely only on their own ideas to advance their business. SMEs are known for having limited resources and a high investment of R&D; therefore, the managers of Thai dessert SMEs should be aware of the access of external knowledge to respond to the dynamics of the marketplace and understand that the

adoption of inbound OI helps the survival of a business. In doing so, managers of Thai dessert SMEs must operate with the practice of ‘search’ daily.

Second, the managers of Thai dessert SMEs should try to create balance between search breadth and search depth. Keeping the balance between search breadth and search depth helps to maintain the firm’s learning to reach a balance in both exploration organisational learning and exploitation organisational learning. Consequently, this results in the balance of PAC and RAC to access dynamic capabilities.

Third, at the same time, the managers of Thai dessert SMEs must help employees to gain various skills that are relevant to their daily work. Employees with various skills facilitate the successful access of inbound OI as they can acquire and assimilate knowledge from external sources successfully. In other words, employees with various skills enhance PAC. The various skills of employees are significant to PAC necessarily required in the access of inbound OI. However, for employees’ focused skills on expert in particular side, this can be enhanced via SD.

Fourth, the managers of Thai dessert SMEs should realise in the activities fostering ‘social integration mechanism’ to foster the firms’ knowledge dissemination ability (KDA). KDA helps the process of knowledge sharing amongst members of the firms, and lead to mutual understanding amongst the members. As a result, the firm’s capability in transforming external knowledge and integrating it with its existing knowledge and the exploitation of the assimilated knowledge will be more effective.

10.5 Limitations of the Study

This research has some limitations that need to be noted. First, this research empirically tested the hypotheses in one industry. Although focusing on a single industry allows to control for industry effects across firms, it can also limit the findings’ generalisability to firms outside the population studied. Second, another limitation of this research is that in the translation process of the interview transcripts, the translation was not sent to a professional Thai translator. This is the reason for research ethics: the researcher made an agreement with participants through a consent form that their data would not be revealed without their agreement.

Third, due to the population size of Thai dessert SMEs in this research being limited to 844, at the pilot survey stage, a sampling procedure was conducted to determine the target samples of 50 Thai dessert SMEs based on prior contact to ensure their willingness to participate. This is to prevent the waste of samples in the pilot survey as those samples will not be included in the survey.

10.6 Suggestions for Future Research

The findings of this research point to some interesting directions for future study. Based on the limitations as presented above, the following ways for additional research are suggested. This thesis represents the first attempt for applying the measures (items) to measure innovation capabilities, based on using all aspects of an organisation covering seven dimensions: strategic orientation, resource management, organisational intelligence, creativity, structure and system, culture and climate, and management of technology. However, the measures (items) applied for measuring each of the dimensions to form the concept of innovation capability seems to be inconsistent with a theoretical perspective, although all of them were from the literature. This might be considered as evidence from the measurement model of the construct ‘innovation capability’ that needs to be modified by removing many items. Thus, a future study might focus on the validation of measures (items) based on the aspects of an organisation for this construct. This will help to develop the measures (items) as a holistic view in all dimensions for the measurement model for innovation capability.

Moreover, it would be interesting to compare the differences of this research in other contexts, either sectors or countries. Future research can benefit from multiple industrial sectors.

Appendices

Appendix 1: Interview Guide

- 1) What concept of organisation management do you use to administer employees in the current? What are the results?
- 2) Which characteristics of innovation of Thai dessert do you present to trading market now?
- 3) What is activity in your enterprise to activate to innovation within the firm?
- 4) Please explain the adoption of process innovation and product innovation in your business
- 5) How do you think about adoption of innovation from outside to use in your firm?
- 6) Do you think that creation of innovation should come from employees in your enterprise, not from outside? What are your reasons?
- 7) Do you think how adopted technology helps to support innovation? Does it have disadvantage for adopted technology?
- 8) What is advantage and disadvantage of adopted technology to create innovation in Thai dessert production?
- 9) Do you think that technology is an influential tool to improvement of innovation? If not, What is the most influential elements?
- 10) Between technology and management, Do you think what is the most important concept to create innovation in your business?

- 11) Do you have alliances in your business?
- 12) Do you use concept of quality management in enterprise?
- 13) What are results of using quality management tools?
- 14) Do you think that quality management tools can use together with innovation management concept?
- 15) Do you think what should do in your future plan to increase competitive capability to Thai dessert business?

Appendix 2: Questionnaire (Pilot Survey)

Questionnaire

The Study of External Search, Absorptive Capacity, and Innovation Capability in New Product Development: Case of Thai Dessert SMEs

Instruction

1. Questionnaire is composed of six main sections

Section A: General Information

Section B: External Knowledge Access

Section C: New Product Development

Section D: Knowledge Base

Section E: Absorptive Capacity

Section F: Innovation Capability

2. Required respondent must be as staff or member in the firm's new product development team. Given data will be anonymous and used for only the research.

3. Product referred in the questionnaire means 'Thai dessert product'

Section A :	General Information
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1.1 Firm Size (No. of employees)

- Less than 50
- 51-200

1.2 Firm Age

- Less than 5 years 5-10 years 11-15 years 16-20 years
- Over 20 years

1.3 Formal R&D in organisational chart

- Yes No

1.4 Job Title

- Owner General Manager Departmental manager
- Employee/staff

1.5 Job Department

- Owner Production Quality assurance
- Marketing R&D

1.6 Role of Respondents in NPD team

- Project manager Member

1.7 Experience of being an NPD team in a firm

- Less than 5 years 5-10 years 10-15 years Over 15 years

Section B :	External Knowledge Access
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2.1 Oriented-Knowledge Domain

1 = Never 2 = Seldom 3 = Sometimes 4 = Often 5 = Always

Knowledge	Frequency				
	1	2	3	4	5
Marketing-based knowledge					
MK1: New packaging design	<input type="checkbox"/>				
MK2: Improved raw materials to improve product quality	<input type="checkbox"/>				
MK3: Customers' positive suggestions for product development	<input type="checkbox"/>				
MK4: Customers' negative comments for product improvement	<input type="checkbox"/>				

Knowledge	Frequency				
	1	2	3	4	5
MK5: Current customers' consumption behaviour related to product	<input type="checkbox"/>				
Manufacturing-based knowledge with quality management system					
QS1: Application of GMP standard based on Thai FDA fitting with the company	<input type="checkbox"/>				
QS2: Application of Codex GMP standard fitting with the company	<input type="checkbox"/>				
QS3: Application of HACCP standard fitting with the company	<input type="checkbox"/>				
QS4: New technology, including machines and equipment, to facilitate food quality and safety standards	<input type="checkbox"/>				
QS5: New packaging technology for extending the shelf life of products and maintaining product quality	<input type="checkbox"/>				

2.2 External Knowledge Access

1 = Not relevant at all 2 = Low relevant 3 = Medium relevant 4 = Most relevant

External Knowledge Source	Level of Use			
	1	2	3	4
Market				
SB1: Suppliers of equipment, materials, components, or software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB2: Clients or customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB3: Competitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB4: Consultants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB5: Commercial laboratories/R&D enterprises	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Institutional				
SB6: Universities or other higher education institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB7: Government research organisations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB8: Other public sectors, e.g. business links, government offices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB9: Private research institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specialised				
SB10: Technical standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB11: Health and safety standards and regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

External Knowledge Source	Level of Use			
	1	2	3	4
SB12: Environmental standards and regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other				
SB13: Professional conferences, meetings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB14: Trade associations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB15: Technical/trade press	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB16: Computer databases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB17: Fairs, exhibitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section C:	New Product Development
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3.1 Type of Product

- Please indicate the successful project of new product development during the year 2011-2015, with using external knowledge to support

- 1 New-to-the-World
- 2 New Product Line
- 3 Line extension
- 4 Improvements in
- 5 Repositioning
- 6 Cost Reduction

3.2 New Product Performance

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree

New Product Performance	Level				
	1	2	3	4	5
NPP1: The quality of new products in our company is better than that of the major competitors	<input type="checkbox"/>				
NPP2: New products of our company can meet the needs of its customers	<input type="checkbox"/>				

New Product Performance	Level				
	1	2	3	4	5
NPP3: The ratio of the successful NPD projects in our company is higher than that of major competitors	<input type="checkbox"/>				
NPP4: New products of our company attain the goal of expected sales	<input type="checkbox"/>				
NPP5: New products of our company attain the goal of expected profitability	<input type="checkbox"/>				
NPP6: Overall performance of new products of our company is successful	<input type="checkbox"/>				

Section D:	Knowledge Base
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1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree

Knowledge Breadth	Level				
	1	2	3	4	5
KB1: We possess market information from a wide-ranging customer portfolio	<input type="checkbox"/>				
KB2: We possess market information from a diversified customer portfolio	<input type="checkbox"/>				
KB3: We have accumulated knowledge of multiple market segments	<input type="checkbox"/>				
KB4: Our R&D expertise consists of technical knowledge from a variety of backgrounds	<input type="checkbox"/>				
Knowledge Depth					
KD1: We have a thorough understanding and experience of current customers	<input type="checkbox"/>				
KD2: We have accumulated in-depth knowledge of the key market segment that we focus on	<input type="checkbox"/>				
KD3: Our R&D experts have thorough technical knowledge and skills within our specialised domain	<input type="checkbox"/>				

Section E:	Absorptive Capacity
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1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree
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	Level				
	1	2	3	4	5
Acquisition					
AC1: The search for relevant information concerning our industry is an every-day business in our company	<input type="checkbox"/>				
AC2: Our management motivates the employees to use information sources within our industry	<input type="checkbox"/>				
AC3: Our management expects the employees to deal with information beyond our industry	<input type="checkbox"/>				
Assimilation					
AS1: In our company, ideas and concepts are communicated on a cross-departmental basis	<input type="checkbox"/>				
AS2: In our company, there is quick information flow, e.g. if a business unit obtains important information, it communicates this information promptly to all other business units or departments	<input type="checkbox"/>				
AS3: Our management emphasises cross-departmental support to solve problems	<input type="checkbox"/>				
AS4: Our management demands periodical cross-departmental meetings to share new developments, problems, and achievements	<input type="checkbox"/>				
Transformation					
TS1: Our employees have the ability to structure and use collected knowledge	<input type="checkbox"/>				
TS2: Our employees are used to absorbing externally new knowledge as well as to prepare it for further purposes and make it available	<input type="checkbox"/>				
TS3: Our employees successfully link internally existing knowledge with external insights	<input type="checkbox"/>				
TS4: Our employees are able to apply new external knowledge in their practical work	<input type="checkbox"/>				
Exploitation					
EX1: Our management supports the development of prototypes	<input type="checkbox"/>				
EX2: Our company regularly reconsiders technologies and adapts them according to new knowledge	<input type="checkbox"/>				

	Level				
	1	2	3	4	5
EX3: Our company has the ability to work more effectively by adopting new technologies	<input type="checkbox"/>				

Section F: Innovation Capability

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree
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	Level				
	1	2	3	4	5
<i>Strategic orientation</i>					
<i>Customer orientation</i>					
SO1: Our business objectives are driven primarily by customer satisfaction	<input type="checkbox"/>				
SO2: We constantly monitor our level of commitment and orientation to serve customer needs	<input type="checkbox"/>				
SO3: Our strategy for competitive advantage is based on our understanding of customers' needs	<input type="checkbox"/>				
SO4: We measure customer satisfaction systematically and frequently	<input type="checkbox"/>				
SO5: We routinely or regularly measure our customer service	<input type="checkbox"/>				
<i>Competitor orientation</i>					
SO6: Our salespeople regularly share information within our business concerning competitors' strategies	<input type="checkbox"/>				
SO7: We rapidly respond to competitors' actions that threaten us	<input type="checkbox"/>				
SO8: Top management regularly discusses competitors' strengths and strategies	<input type="checkbox"/>				
SO9: We target customers where we have an opportunity for competitive advantage	<input type="checkbox"/>				
<i>Technology orientation</i>					
SO10: Our new products are always at the state-of-the-art of the technology	<input type="checkbox"/>				
SO11: We have better technological knowledge than our competitors	<input type="checkbox"/>				
SO12: Our R&D programmes are more ambitious than those of our competitors	<input type="checkbox"/>				
SO13: Our firm is always the first one to use a new technology for NPD	<input type="checkbox"/>				

	Level				
	1	2	3	4	5
SO14: Our strategic business unit (SBU) uses sophisticated technologies for its NPD	<input type="checkbox"/>				
SO15: Our SBU is very proactive in the development of new technologies	<input type="checkbox"/>				
SO16: Our SBU is very proactive in the construction of new technical solutions to address users' needs	<input type="checkbox"/>				
SO17: Our SBU has the will and the capacity to build and market a technological breakthrough	<input type="checkbox"/>				
SO18: Our SBU has built a large and strong network of relationships with suppliers of technological equipment	<input type="checkbox"/>				
SO19: Our SBU has an aggressive technological patent strategy	<input type="checkbox"/>				
SO20: Our SBU has better industrial methods than the competitors	<input type="checkbox"/>				
<i>Resource management</i>					
RM1: We manage our human resources efficiently	<input type="checkbox"/>				
RM2: We manage our information systems efficiently	<input type="checkbox"/>				
RM3: We manage various technology-related changes efficiently	<input type="checkbox"/>				
RM4: We manage to satisfy most of our clients' requirements	<input type="checkbox"/>				
<i>Organisational intelligence</i>					
<i>Information acquisition ability</i>					
OI1: We have the ability to continuously collect information from customers	<input type="checkbox"/>				
OI2: We have the ability to continuously collect information about competitors' activities	<input type="checkbox"/>				
OI3: We have the ability to continuously collect information about relevant public other than customers and competitors	<input type="checkbox"/>				
OI4: We have the ability to continuously collect information from external experts, such as consultants	<input type="checkbox"/>				
OI5: We have the ability to continuously re-examine the value of information collected in previous studies	<input type="checkbox"/>				
<i>Information dissemination ability</i>					
OI6: We have formal information links established among all parties involved in a project	<input type="checkbox"/>				
OI7: We have informal networks that ensure all employees have the information they need	<input type="checkbox"/>				

		Level				
		1	2	3	4	5
OI8:	Employees of the NPD team are able to educate each other during a project	<input type="checkbox"/>				
OI9:	Employees of the NPD team are trained in new tasks relating to a project	<input type="checkbox"/>				
<i>Information implementation ability</i>						
OI10:	We are able to summarise information, reducing its complexity	<input type="checkbox"/>				
OI11:	We are able to organise information in meaningful ways	<input type="checkbox"/>				
OI12:	We are able to process information in meaningful ways	<input type="checkbox"/>				
OI13:	We are able to rely heavily upon information to make decisions relating to a project	<input type="checkbox"/>				
OI14:	We are able to use information to solve specific problems encountered in a project	<input type="checkbox"/>				
OI15:	We are able to provide information to effectively implement a project	<input type="checkbox"/>				
<i>Creativity</i>						
CR1:	Our employees are able to suggest new ways to achieve goals or objectives	<input type="checkbox"/>				
CR2:	Our employees are able to suggest new ways to increase quality	<input type="checkbox"/>				
CR3:	Our employees are able to suggest new ways of performing work tasks	<input type="checkbox"/>				
CR4:	Our employees often have new and innovative ideas	<input type="checkbox"/>				
CR5:	Our employees often have a fresh approach to problems	<input type="checkbox"/>				
CR6:	Our employees are able to come up with new and practical ideas to improve performance	<input type="checkbox"/>				
CR7:	Our employees are able to come up with creative solutions to problems	<input type="checkbox"/>				
CR8:	Our employees are able to search out new technologies, processes, techniques, and/or product ideas	<input type="checkbox"/>				
CR9:	Our employees are able to promote and champion ideas to others	<input type="checkbox"/>				
CR10:	Our employees are able to exhibit creativity on the job when given the opportunity	<input type="checkbox"/>				
CR11:	Our employees are able to develop adequate plans and schedules for the implementation of new ideas	<input type="checkbox"/>				
CR12:	Our employees are good sources of creative ideas	<input type="checkbox"/>				
CR13:	Our employees are not afraid to take risks	<input type="checkbox"/>				

	Level				
	1	2	3	4	5
<i>Structure and system</i>					
SS1: Projects are developed using effective cross-functional teams	<input type="checkbox"/>				
SS2: Project teams are organic, flexible, and agile	<input type="checkbox"/>				
SS3: All team operations are driven by customer needs	<input type="checkbox"/>				
SS4: All team members are mutually accountable	<input type="checkbox"/>				
SS5: Team members are empowered to make decisions	<input type="checkbox"/>				
SS6: Virtual team members are equipped with effective ICT tools	<input type="checkbox"/>				
SS7: Team members' rewards are equitable	<input type="checkbox"/>				
<i>Culture and climate</i>					
CC1: There is a formal idea generation process in place	<input type="checkbox"/>				
CC2: All employees participate in generating ideas	<input type="checkbox"/>				
CC3: Failures and mistakes are tolerated and not punished	<input type="checkbox"/>				
CC4: Senior management is committed to risk-taking in product innovation	<input type="checkbox"/>				
CC5: The organisation permits the emergence of intrapreneurs or product champions	<input type="checkbox"/>				
CC6: The organisation provides support in terms of autonomy, time, and rewards	<input type="checkbox"/>				
CC7: Knowledge sharing is encouraged and rewarded	<input type="checkbox"/>				
CC8: Money is made available for internal projects	<input type="checkbox"/>				
CC9: Adequate resources are available and committed to achieving project goals	<input type="checkbox"/>				
CC10: All operations are driven by customer needs	<input type="checkbox"/>				
<i>Management of technology</i>					
MO1: Our company always attempts to stay on the leading edge of new technology in our industry	<input type="checkbox"/>				
MO2: We make an effort to anticipate the full potential of new practices and technologies	<input type="checkbox"/>				
MO3: We pursue long-range programmes in order to acquire technological capabilities in advance of our needs	<input type="checkbox"/>				
MO4: We are constantly thinking of the next generation of technology	<input type="checkbox"/>				

แบบสอบถาม (ชุด Pilot Survey)

เรื่อง การค้นหาความรู้ภายนอก ความสามารถในการเรียนรู้ และความสามารถด้านนวัตกรรมของ
องค์กรในการพัฒนาผลิตภัณฑ์ใหม่ : กรณีวิสาหกิจขนาดกลางและขนาดย่อมอุตสาหกรรม
ขนมไทย

คำแนะนำในการกรอกแบบสอบถาม

1. แบบสอบถามในงานวิจัยนี้ ประกอบด้วย 6 ส่วน คือ

ส่วนที่ 1 : ข้อมูลเกี่ยวกับบริษัทและผู้กรอกแบบสอบถาม

ส่วนที่ 2 : การเข้าสู่แหล่งความรู้ภายนอกของบริษัท

ส่วนที่ 3 : สมรรถนะของโครงการการพัฒนาผลิตภัณฑ์ใหม่

ส่วนที่ 4 : โครงสร้างฐานความรู้ในบริษัท

ส่วนที่ 5 : ความสามารถในการใช้ข้อมูลจากแหล่งภายนอก

ส่วนที่ 6 : ความสามารถทางด้านนวัตกรรม

2. ผู้ให้ข้อมูลแบบสอบถาม ควรเป็นสมาชิกทีมงานโครงการการพัฒนาผลิตภัณฑ์ใหม่ของบริษัท

3. คำว่า “ผลิตภัณฑ์” ในแบบสอบถามนี้ หมายถึง “ผลิตภัณฑ์ขนมไทย”

ส่วนที่ 1 :	ข้อมูลเกี่ยวกับบริษัทและผู้ให้ข้อมูล
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โปรดให้ข้อมูลด้วยเครื่องหมาย ✓ ในคำถามต่อไปนี้

- 1.1 จำนวนพนักงานลูกจ้างในบริษัท/ (เฉพาะลูกจ้างประจำเท่านั้น)
 ไม่เกิน 50 คน 51-200 คน
- 1.2 จำนวนปีของการก่อตั้งบริษัท
 น้อยกว่า 5 ปี 5-10 ปี 11-15 ปี 16-20 ปี
 มากกว่า 20 ปี
- 1.3 บริษัทมีแผนวิจัยและพัฒนา (R&D) ตามผังโครงสร้างองค์กรหรือไม่
 มี ไม่มี
- 1.4 ตำแหน่งงานของท่านในบริษัท
 เจ้าของ ผู้จัดการทั่วไป ผู้จัดการแผนก
 พนักงาน
- 1.5 แผนงานของท่านในบริษัท (เลือกข้อเดียว)
 เจ้าของ แผนกผลิต แผนกประกันคุณภาพ
 แผนกการตลาด แผนกการวิจัยและพัฒนา
- 1.6 บทบาทของท่านในทีมงานพัฒนาผลิตภัณฑ์ใหม่ของบริษัทนี้
 ผู้จัดการโครงการ สมาชิกทีมงาน
- 1.7 ประสบการณ์การทำงานของท่านในการเป็นทีมงานพัฒนาผลิตภัณฑ์ใหม่ของบริษัทนี้
 น้อยกว่า 5 ปี 5-10 ปี 10-15 ปี มากกว่า 15 ปี

ส่วนที่ 2 :	การเข้าสู่แหล่งความรู้ภายนอกของบริษัท
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2.1 ความรู้และเทคโนโลยีภายนอกที่บริษัทค้นหา

โปรดระบุความถี่ด้วยเครื่องหมาย ✓ ในการค้นหาความรู้และเทคโนโลยีภายนอกที่บริษัทได้ดำเนินการ (ทำทุกข้อ)

1 = ไม่เคยค้นหาเลย 2 = ค้นหานานๆ ครั้ง 3 = ค้นหาบางครั้ง บางคราว 4 = ค้นหาบ่อยๆ 5 = ค้นหาสม่ำเสมอ

ประเภทข้อมูลความรู้ภายนอก/	ระดับความถี่				
	1	2	3	4	5
ความรู้ที่มุ่งสู่การตลาด					
รูปแบบบรรจุภัณฑ์ใหม่ๆ ที่จะนำมาใช้กับผลิตภัณฑ์	<input type="checkbox"/>				
คุณสมบัติของวัตถุดิบการผลิตที่มีการพัฒนาในด้านต่างๆ ในการช่วยเพิ่มคุณภาพให้ผลิตภัณฑ์	<input type="checkbox"/>				
ข้อเสนอแนะเชิงบวกของลูกค้าในการพัฒนาผลิตภัณฑ์	<input type="checkbox"/>				
ข้อวิจารณ์เชิงลบของลูกค้าในการปรับปรุงผลิตภัณฑ์	<input type="checkbox"/>				
พฤติกรรมผู้บริโภคของลูกค้าในปัจจุบันที่เกี่ยวข้องกับผลิตภัณฑ์	<input type="checkbox"/>				
ความรู้ที่มุ่งสู่มาตรฐานคุณภาพและความปลอดภัยของอาหาร					
แนวทางการประยุกต์ใช้ภายในบริษัท ตามข้อปฏิบัติของมาตรฐาน GMP อย.	<input type="checkbox"/>				
แนวทางการประยุกต์ใช้ภายในบริษัท ตามข้อปฏิบัติของมาตรฐาน GMP สากล (Codex GMP)	<input type="checkbox"/>				
แนวทางการประยุกต์ใช้ภายในบริษัท ตามข้อปฏิบัติของมาตรฐาน HACCP	<input type="checkbox"/>				
เทคโนโลยีเครื่องจักรหรืออุปกรณ์การผลิตใหม่ๆ ที่สนับสนุนต่อมาตรฐาน/คุณภาพและความปลอดภัยของอาหาร	<input type="checkbox"/>				
เทคโนโลยีบรรจุภัณฑ์ใหม่ๆ ที่ช่วยยืดอายุและรักษาคุณภาพของผลิตภัณฑ์	<input type="checkbox"/>				

2.2 การเข้าสู่แหล่งข้อมูลภายนอก

- โปรดระบุระดับการเข้าสู่ข้อมูลของบริษัทจากแหล่งความรู้ภายนอกต่อไปนี้ ด้วยเครื่องหมาย ✓ (ทำทุกข้อโดย (

1 = ไม่ได้เกี่ยวข้องเลย 2 = เกี่ยวข้องน้อย 3 = เกี่ยวข้องปานกลาง 4 = เกี่ยวข้องมาก

แหล่งข้อมูลจากภายนอก	ระดับความเกี่ยวข้อง			
	1	2	3	4
การตลาด				
1 ผู้จำหน่ายซัพพลายเออร์ อุปกรณ์ วัตถุดิบ ส่วนประกอบหรือซอฟต์แวร์/	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 ลูกค้า	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 คู่แข่งขันทางธุรกิจ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 บริษัทที่ปรึกษา	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

แหล่งข้อมูลจากภายนอก	ระดับความเกี่ยวข้อง			
	1	2	3	4
5 ห้องปฏิบัติการทดสอบทางพาณิชย์ด้านการวิจัยและพัฒนา/ สถาบันการศึกษา	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 มหาวิทยาลัยสถาบันอุดมศึกษา/ 7 หน่วยงานวิจัยของภาครัฐ 8 หน่วยงานภาครัฐอื่นๆ เช่น เครือข่ายทางธุรกิจ 9 สถาบันวิจัยภาคเอกชน	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
แหล่งข้อมูลด้านมาตรฐาน				
10 มาตรฐานทางเทคนิค 11 มาตรฐานและข้อบังคับด้านสุขภาพและความปลอดภัย 12 มาตรฐานและข้อบังคับด้านสิ่งแวดล้อม	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
แหล่งความรู้อื่นๆ				
13 งานประชุมวิชาชีพ 14 สมาคมการค้าต่างๆ 15 ข้อมูลวิชาการจากการตีพิมพ์ผ่านสื่อสิ่งพิมพ์ 16 ฐานข้อมูลคอมพิวเตอร์จากเว็บไซต์ต่างๆ 17 งานแสดงสินค้าและนิทรรศการ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ส่วนที่ 3 :	การพัฒนาผลิตภัณฑ์ใหม่
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3.1 ชนิดของโครงการ

- โปรดชี้บ่งลักษณะโครงการที่บริษัทได้ดำเนินการแล้วประสบความสำเร็จ โดยเป็นโครงการที่ได้ดำเนินการในช่วง 5 ปีที่ผ่านมา (พ.ศ. 2554 - 2558) และมีการใช้ข้อมูลจากแหล่งภายนอกมาสนับสนุน
- 1 ผลิตภัณฑ์ที่ใหม่ต่อทั้งบริษัทและตลาด : เช่น ผลิตภัณฑ์ขนมแช่แข็ง
- 2 ผลิตภัณฑ์ในสายการผลิตใหม่ : เป็นผลิตภัณฑ์ใหม่ที่บริษัทผลิตเป็นครั้งแรก แต่อาจจะมีการผลิตอยู่แล้วโดยบริษัทอื่น
- 3 ผลิตภัณฑ์เสริมในสายผลิตภัณฑ์เดิม : เป็นผลิตภัณฑ์ใหม่ที่ต่อยอดมาจากสายการผลิตของบริษัทที่มีอยู่ เช่น การเปลี่ยนรสชาติใหม่, ใช้ไส้ขนมแบบใหม่, เปลี่ยนรูปร่างขนม หรือเปลี่ยนขนาดของบรรจุภัณฑ์
- 4 ผลิตภัณฑ์เดิมที่ได้รับการปรับปรุง : เช่น การเปลี่ยนชนิดของบรรจุภัณฑ์เพื่อเพิ่มคุณภาพให้ผลิตภัณฑ์ยึด/

อายุขณม, การลดปริมาณแคลอรีในขณม

- 5 การวางตำแหน่งผลิตภัณฑ์ใหม่ในตลาด : เป็นการกำหนดตำแหน่งผลิตภัณฑ์ขึ้นมาใหม่
- 6 ผลิตภัณฑ์ตัดราคา : เป็นผลิตภัณฑ์รูปแบบเดิม แต่บริษัทมีต้นทุนการผลิตที่ลดลงสำหรับผลิตภัณฑ์นี้

3.2 : สมรรถนะของผลิตภัณฑ์ใหม่

- โปรดให้ระดับความสำเร็จของโครงการฯ ดังกล่าว ด้วยเครื่องหมาย ✓ โดย

1 = ไม่เห็นด้วยอย่างยิ่ง, 2 = ไม่เห็นด้วย, 3 = ไม่แน่ใจ, 4 = เห็นด้วย, 5 = เห็นด้วยอย่างยิ่ง

ความสำเร็จของผลิตภัณฑ์ใหม่	ระดับ				
	1	2	3	4	5
1 คุณภาพของผลิตภัณฑ์ใหม่ดีกว่าคู่แข่งชั้นหลักๆ ในตลาด	<input type="checkbox"/>				
2 ผลิตภัณฑ์ใหม่ของบริษัทสามารถตอบสนองต่อความต้องการของลูกค้า	<input type="checkbox"/>				
3 สัดส่วนของโครงการพัฒนาผลิตภัณฑ์ใหม่ของบริษัทที่ประสบความสำเร็จมีมากกว่าคู่แข่งชั้นหลัก	<input type="checkbox"/>				
4 ผลิตภัณฑ์ใหม่ของบริษัทบรรลุยอดขายตามเป้าหมายที่คาดหวัง	<input type="checkbox"/>				
5 ผลิตภัณฑ์ใหม่ของบริษัทบรรลุผลกำไรตามเป้าหมายที่คาดหวัง	<input type="checkbox"/>				
6 สมรรถนะของผลิตภัณฑ์ใหม่ในภาพรวมถือว่าประสบความสำเร็จ	<input type="checkbox"/>				

ส่วนที่ 4 : โครงสร้างฐานความรู้ในบริษัท

โปรดให้ระดับความคิดเห็นด้วยเครื่องหมาย ✓ ในคำถามต่อไปนี้ เกี่ยวกับโครงสร้างฐานความรู้ในบริษัท โดย

1 = ไม่เห็นด้วยอย่างยิ่ง, 2 = ไม่เห็นด้วย, 3 = ไม่แน่ใจ, 4 = เห็นด้วย, 5 = เห็นด้วยอย่างยิ่ง

A : ความกว้างของฐานความรู้	ระดับ				
	1	2	3	4	5
1 บริษัทมีข้อมูลกลุ่มลูกค้าหลายๆ กลุ่มในอุตสาหกรรมนี้	<input type="checkbox"/>				
2 บริษัทมีข้อมูลลูกค้าในกลุ่มที่บริษัทได้แตกแขนงธุรกิจออกไปจากอุตสาหกรรมนี้	<input type="checkbox"/>				
3 บริษัทมีความรู้สะสมในเรื่องภาคส่วนการตลาดย่อย โดยสามารถจำแนกกลุ่มลูกค้าเป็นภาคส่วนการตลาดย่อยตามความชอบผลิตภัณฑ์	<input type="checkbox"/>				

		ระดับ
4	ทีมวิจัยและพัฒนาผลิตภัณฑ์ของบริษัทประกอบไปด้วยสมาชิกที่มีความรู้ทางเทคนิคในสาขาที่หลากหลาย	□ □ □ □ □
B : ความลึกของฐานความรู้		
1	บริษัทมีประสบการณ์และความเข้าใจในลูกค้าปัจจุบันของบริษัท	□ □ □ □ □
2	บริษัทมีความรู้สะสมเชิงลึกในภาคส่วนการตลาดหลักที่บริษัทเน้นเจาะกลุ่ม	□ □ □ □ □
3	ทีมวิจัยและพัฒนาผลิตภัณฑ์ของบริษัทมีความรู้ทางเทคนิคและทักษะเฉพาะทางที่เกี่ยวข้องกับการพัฒนาผลิตภัณฑ์ในธุรกิจนี้	□ □ □ □ □

ส่วนที่ 5 :	ความสามารถในการใช้ข้อมูลจากแหล่งภายนอก
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โปรดให้ระดับความคิดเห็นด้วยเครื่องหมาย ✓ ในคำถามต่อไปนี้ เกี่ยวกับความสามารถในการใช้ข้อมูลจากแหล่งภายนอกของบริษัท โดย

1 = ไม่เห็นด้วยอย่างยิ่ง, 2 = ไม่เห็นด้วย, 3 = ไม่แน่ใจ, 4 = เห็นด้วย, 5 = เห็นด้วยอย่างยิ่ง
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	คำถาม	ระดับ				
		1	2	3	4	5
การใช้ข้อมูลภายนอก						
1	การค้นหาข้อมูลความรู้ที่เกี่ยวข้องกับอุตสาหกรรมนี้ เป็นสิ่งที่บริษัทดำเนินการทุกวัน/	□	□	□	□	□
2	บริษัทสร้างแรงจูงใจให้พนักงานค้นหาข้อมูลภายนอกที่เกี่ยวข้องกับอุตสาหกรรมนี้	□	□	□	□	□
3	บริษัทคาดหวังให้พนักงานค้นหาข้อมูลภายนอกอุตสาหกรรมนี้ด้วย	□	□	□	□	□
การสื่อสารภายใน						
1	ความคิดและคอนเซ็ปต์ต่างๆ ภายในบริษัท จะมีการสื่อสารในทุกแผนก	□	□	□	□	□
2	ข้อมูลจะถูกสื่อสารอย่างรวดเร็วภายในบริษัท เช่น ถ้าหน่วยธุรกิจได้รับข้อมูลที่สำคัญ มันจะถูกสื่อสารไปที่หน่วยธุรกิจอื่นหรือแผนกอื่นๆ ทันที	□	□	□	□	□
3	การบริหารจัดการของบริษัทเน้นให้ทุกแผนกงานมีส่วนร่วมในการแก้ไขปัญหาร่วมกัน	□	□	□	□	□
4	การบริหารจัดการของบริษัทควบคุมให้ทุกแผนกมีการประชุมร่วมกันเป็นระยะเพื่อแลกเปลี่ยนแนวทางการพัฒนา แชร้ปัญหาที่เกิดขึ้นรวมทั้งการแก้ไข	□	□	□	□	□
การบริหารจัดการความรู้ทั้งภายนอกและภายใน						
1	ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัท สามารถจัดระบบและใช้ข้อมูลที่เกี่ยวข้องรวบรวมมา	□	□	□	□	□

คำถาม	ระดับ				
	1	2	3	4	5
2 ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัท ค้นคว้าต่อความรู้ใหม่จากภายนอก และสามารถนำความรู้นี้ไปประยุกต์ใช้ได้ภายในบริษัท	<input type="checkbox"/>				
3 ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัท สามารถผสานความรู้ใหม่จากภายนอกกับความรู้ที่มีอยู่ในบริษัทได้อย่างประสบความสำเร็จ	<input type="checkbox"/>				
4 ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัท สามารถนำความรู้ใหม่จากภายนอกไปใช้ในการปฏิบัติงาน	<input type="checkbox"/>				
ภาพรวมการใช้ความรู้จากภายนอก					
1 การบริหารจัดการของบริษัทสนับสนุนต่อการพัฒนาผลิตภัณฑ์ตัวต้นแบบ	<input type="checkbox"/>				
2 บริษัทมีการพิจารณาทบทวนเทคโนโลยีใหม่อยู่อย่างสม่ำเสมอและประยุกต์ใช้กับความรู้ใหม่	<input type="checkbox"/>				
3 บริษัททำงานได้อย่างมีประสิทธิภาพและผลงานมากขึ้นเมื่อมีการรับเอาเทคโนโลยีใหม่ๆ มาใช้	<input type="checkbox"/>				

ส่วนที่ 6 :	ความสามารถทางด้านนวัตกรรม
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โปรดให้ระดับความคิดเห็นด้วยเครื่องหมาย ✓ ในคำถามต่อไปนี้ เกี่ยวกับความสามารถทางด้านนวัตกรรม และปัจจัยสิ่งแวดล้อม โดย

1 = ไม่เห็นด้วยอย่างยิ่ง, 2 = ไม่เห็นด้วย, 3 = ไม่แน่ใจ, 4 = เห็นด้วย, 5 = เห็นด้วยอย่างยิ่ง

คำถาม	ระดับ				
	1	2	3	4	5
A : กลยุทธ์					
กลยุทธ์มุ่งสู่ลูกค้า					
1 เป้าหมายทางธุรกิจของบริษัทขับเคลื่อนมาจากความพึงพอใจของลูกค้า	<input type="checkbox"/>				
2 บริษัทตรวจติดตามอย่างต่อเนื่องในเป้าหมายข้อตกลงที่บริษัทได้กำหนดขึ้นมาในการมุ่งสู่การตอบสนองความต้องการของลูกค้า	<input type="checkbox"/>				
3 กลยุทธ์ของบริษัทในการสร้างข้อได้เปรียบในการแข่งขัน ตั้งอยู่บนพื้นฐานความเข้าใจในความต้องการของลูกค้า	<input type="checkbox"/>				
4 บริษัทวัดความพึงพอใจของลูกค้าอย่างเป็นระบบและบ่อยครั้ง	<input type="checkbox"/>				

คำถาม	ระดับ				
	1	2	3	4	5
5 บริษัทมีมาตรฐานในการให้บริการลูกค้า	<input type="checkbox"/>				
กลยุทธ์ต่อคู่แข่ง					
6 ฝ่ายขายของบริษัท มีการแชร์ข้อมูลกลยุทธ์คู่แข่งให้บริษัททราบอย่างสม่ำเสมอ	<input type="checkbox"/>				
7 บริษัทตอบสนองอย่างรวดเร็วต่อการแข่งขันที่คุกคาม	<input type="checkbox"/>				
8 ฝ่ายบริหารระดับสูงมีการปรึกษาหารือกันอยู่เสมอ ในประเด็นข้อได้เปรียบและกลยุทธ์ของคู่แข่ง	<input type="checkbox"/>				
9 เราพุ่งเป้าไปที่กลุ่มลูกค้าที่เรามีโอกาสสร้างความได้เปรียบในการแข่งขันได้มากกว่าคู่แข่ง	<input type="checkbox"/>				
กลยุทธ์ทางด้านเทคโนโลยี					
10 ผลิตภัณฑ์ใหม่ของเราจะมีเทคโนโลยีที่ล้ำหน้าเสมอ	<input type="checkbox"/>				
11 บริษัทมีความรู้ทางด้านเทคโนโลยีที่ดีกว่าคู่แข่ง	<input type="checkbox"/>				
12 โปรแกรมหัวข้อการวิจัยและพัฒนาของบริษัทเราเหนือกว่าคู่แข่ง/	<input type="checkbox"/>				
13 เราเป็นบริษัทแรกเสมอในการใช้เทคโนโลยีใหม่ๆ มาใช้พัฒนาผลิตภัณฑ์ใหม่	<input type="checkbox"/>				
สำหรับข้อ 14-20 : หน่วยธุรกิจเชิงกลยุทธ์ของบริษัท...					
14 มีการใช้เทคโนโลยีขั้นสูงในการพัฒนาผลิตภัณฑ์ใหม่	<input type="checkbox"/>				
15 มีความสามารถเชิงรุกมาก ในการพัฒนาเทคโนโลยีใหม่	<input type="checkbox"/>				
16 มีความสามารถในเชิงรุกมากในการแก้ปัญหาทางเทคนิคใหม่ๆที่จะตอบสนองต่อความต้องการของผู้ใช้	<input type="checkbox"/>				
17 มีความตั้งใจและความสามารถที่จะสร้างความรุดหน้าทางเทคโนโลยีให้ตลาด	<input type="checkbox"/>				
18 มีเครือข่ายความสัมพันธ์ที่แน่นแฟ้นกับซัพพลายเออร์ด้านอุปกรณ์เทคโนโลยี	<input type="checkbox"/>				
19 มีกลยุทธ์ด้านสิทธิบัตรเทคโนโลยี	<input type="checkbox"/>				
20 มีวิธีการผลิตที่ดีกว่าคู่แข่ง	<input type="checkbox"/>				
B : การบริหารจัดการทรัพยากรในบริษัท					
1 บริษัทบริหารจัดการทรัพยากรมนุษย์ได้อย่างมีประสิทธิภาพ	<input type="checkbox"/>				
2 บริษัทบริหารจัดการข้อมูลได้อย่างมีประสิทธิภาพ	<input type="checkbox"/>				
3 บริษัทบริหารจัดการกับการเปลี่ยนแปลงทางเทคโนโลยีที่หลากหลายได้อย่างมีประสิทธิภาพ	<input type="checkbox"/>				
4 บริษัทบริหารจัดการเกี่ยวกับความต้องการของลูกค้าเพื่อให้ลูกค้าพึงพอใจ	<input type="checkbox"/>				

คำถาม	ระดับ									
	1	2	3	4	5					
C : ความฉลาดขององค์กร										
<ul style="list-style-type: none"> ● การค้นหาข้อมูล : ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่ ทีมงานมีความสามารถอย่างต่อเนื่องในการ... 										
1	เก็บรวบรวมข้อมูลที่มาจากลูกค้า					<input type="checkbox"/>				
2	เก็บรวบรวมข้อมูลเกี่ยวกับกิจกรรมของคู่แข่ง					<input type="checkbox"/>				
3	เก็บรวบรวมข้อมูลสถานการณ์ที่เกี่ยวข้อง นอกเหนือจากข้อมูลลูกค้าและคู่แข่ง					<input type="checkbox"/>				
4	เก็บรวบรวมข้อมูลจากผู้เชี่ยวชาญภายนอก (เช่น ที่ปรึกษา)					<input type="checkbox"/>				
5	พิจารณาบททวนประโยชน์ของข้อมูลที่ได้รับรวบรวมได้จากการศึกษาในก่อนหน้านั้น					<input type="checkbox"/>				
<ul style="list-style-type: none"> ● การสื่อสารข้อมูล : ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่ ทีมงานมี..... 										
6	ความสามารถในการเชื่อมข้อมูลจากทุกฝ่ายที่เกี่ยวข้องในโครงการ					<input type="checkbox"/>				
7	เครือข่ายไม่เป็นทางการ ที่สามารถให้ข้อมูลตามที่สมาชิกทีมต้องการ					<input type="checkbox"/>				
8	การให้ความรู้ซึ่งกันและกันในระหว่างการทำโครงการ					<input type="checkbox"/>				
9	ได้รับการฝึกอบรมในงานใหม่ๆ ที่เกี่ยวข้องกับโครงการ					<input type="checkbox"/>				
<ul style="list-style-type: none"> ● การใช้ข้อมูล : ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่ ทีมงานมีความสามารถในการ..... 										
10	สรุปข้อมูลและลดความซับซ้อนของข้อมูล					<input type="checkbox"/>				
11	จัดการข้อมูลในทางที่ทำให้เกิดประโยชน์ที่สำคัญ					<input type="checkbox"/>				
12	ประมวลผลข้อมูลในทางที่ทำให้เกิดประโยชน์ที่สำคัญ					<input type="checkbox"/>				
13	ใช้ข้อมูลที่มีอยู่อย่างเต็มที่เพื่อตัดสินใจเกี่ยวกับโครงการ					<input type="checkbox"/>				
14	ใช้ข้อมูลที่มีอยู่เพื่อแก้ปัญหาเฉพาะที่เกิดขึ้นในระหว่างโครงการ					<input type="checkbox"/>				
15	จัดหาข้อมูลที่จะดำเนินการโครงการได้อย่างมีประสิทธิภาพ					<input type="checkbox"/>				
D : ความคิดสร้างสรรค์										
<ul style="list-style-type: none"> ● สมาชิกทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัท... 										
1	สามารถเสนอแนะวิธีการใหม่ๆ เพื่อบรรลุผลตามเป้าหมายหรือวัตถุประสงค์					<input type="checkbox"/>				
2	สามารถเสนอแนะวิธีการใหม่ๆ ที่จะเพิ่มคุณภาพ					<input type="checkbox"/>				
3	สามารถเสนอแนะวิธีการใหม่ๆ ในการปฏิบัติงาน					<input type="checkbox"/>				
4	มีความคิดใหม่ๆ และเป็นนวัตกรรมอยู่บ่อยๆ					<input type="checkbox"/>				
5	มีวิธีการแก้ปัญหาแบบใหม่ๆ อยู่บ่อยๆ					<input type="checkbox"/>				
6	มีความคิดใหม่ๆ ที่สามารถปฏิบัติได้เพื่อเพิ่มสมรรถนะการปฏิบัติงาน					<input type="checkbox"/>				

คำถาม	ระดับ				
	1	2	3	4	5
7 มีการแก้ไขปัญหาที่สร้างสรรค์	<input type="checkbox"/>				
8 มีการค้นหาเทคโนโลยีใหม่ๆ กระบวนการ รวมทั้งเทคนิคหรือความคิดใหม่ๆ เกี่ยวกับผลิตภัณฑ์	<input type="checkbox"/>				
9 ส่งเสริมการเป็นผู้นำทางความคิดให้พนักงานคนอื่น ๆ	<input type="checkbox"/>				
10 แสดงความคิดสร้างสรรค์ในงานเมื่อได้รับโอกาส	<input type="checkbox"/>				
11 สามารถพัฒนาแผนและการดำเนินการได้ตามความคิดใหม่ๆ นั้น	<input type="checkbox"/>				
12 เป็นแหล่งที่ดีของความคิดสร้างสรรค์	<input type="checkbox"/>				
13 ไม่กลัวต่อความเสี่ยงในข้อผิดพลาด	<input type="checkbox"/>				
E : โครงสร้างและระบบ					
1 ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่ บริษัทจะใช้ทีมงานจากหลายๆ แผนกที่มีประสิทธิภาพ	<input type="checkbox"/>				
2 ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัทมีความยืดหยุ่นสูง	<input type="checkbox"/>				
3 การปฏิบัติงานของทีมพัฒนาผลิตภัณฑ์ใหม่ ถูกขับเคลื่อนมาจากความต้องการของลูกค้า	<input type="checkbox"/>				
4 สมาชิกทีมๆ ทุกคนมีความรับผิดชอบร่วมกัน	<input type="checkbox"/>				
5 สมาชิกทีมๆ ได้รับมอบอำนาจในการตัดสินใจ	<input type="checkbox"/>				
6 สมาชิกทีมๆ สามารถใช้เทคโนโลยีไอซีทีได้อย่างมีประสิทธิภาพในการติดต่อประสานงาน แม้อยู่ต่างพื้นที่	<input type="checkbox"/>				
7 รางวัลตอบแทนแก่สมาชิกทีมๆ มีความเสมอภาคและเท่าเทียมกัน	<input type="checkbox"/>				
F : วัฒนธรรมและบรรยากาศองค์กร					
1 มีกระบวนการให้พนักงานแสดงความคิดเห็นต่างๆ ในบริษัทอย่างเป็นทางการ	<input type="checkbox"/>				
2 พนักงานทุกคนมีส่วนร่วมในการนำเสนอความคิด	<input type="checkbox"/>				
3 ไม่มีการถูกทำโทษ เมื่อมีความล้มเหลวและข้อผิดพลาดในการพัฒนาผลิตภัณฑ์ใหม่เกิดขึ้น	<input type="checkbox"/>				
4 ฝ่ายจัดการอาวุโสรับผิดชอบต่อความเสี่ยงที่อาจเกิดขึ้นในการสร้างนวัตกรรมผลิตภัณฑ์	<input type="checkbox"/>				
5 บริษัทส่งเสริมให้พนักงานมีความเป็นผู้ประกอบการภายใน หรือมีพนักงานที่เป็นผู้นำด้านผลิตภัณฑ์	<input type="checkbox"/>				

คำถาม	ระดับ				
	1	2	3	4	5
6 บริษัทส่งเสริมในเรื่องความมีอิสระ เวลา และรางวัลตอบแทน ในการสร้างสรรค์นวัตกรรม	<input type="checkbox"/>				
7 บริษัทส่งเสริมและให้รางวัล สำหรับการแชร์หรือแบ่งปันความรู้	<input type="checkbox"/>				
8 งบประมาณจะมีการถูกจัดสรรให้ ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่	<input type="checkbox"/>				
9 ทรัพยากรถูกจัดสรรให้เพียงพอ ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่เพื่อบรรลุเป้าหมายที่ตั้งไว้	<input type="checkbox"/>				
10 การปฏิบัติการทั้งหมดขับเคลื่อนมาจากความต้องการของลูกค้า	<input type="checkbox"/>				
G : การบริหารจัดการเทคโนโลยี					
1 บริษัทพยายามอย่างสม่ำเสมอที่จะใช้เทคโนโลยีใหม่ๆ ที่ก้าวหน้าในอุตสาหกรรมนี้	<input type="checkbox"/>				
2 บริษัทมีการคาดการณ์ในศักยภาพของวิธีปฏิบัติการใหม่ๆ รวมทั้งเทคโนโลยีใหม่ๆ	<input type="checkbox"/>				
3 บริษัทได้กำหนดโปรแกรมระยะยาวเพื่อเพิ่มความสามารถทางเทคโนโลยีที่เกินจากที่มีอยู่ในปัจจุบัน	<input type="checkbox"/>				
4 บริษัทคิดอย่างต่อเนื่องเกี่ยวกับเทคโนโลยีในอนาคต ที่อาจจำเป็นต้องใช้ในอุตสาหกรรมนี้	<input type="checkbox"/>				

Appendix 3 : Questionnaire (Survey)

Questionnaire

The Study of External Search, Absorptive Capacity, and Innovation Capability in New Product Development: Case of Thai Dessert SMEs

Instruction

1. Questionnaire is composed of six main sections

Section A: General Information

Section B: External Knowledge Access

Section C: New Product Development

Section D: Knowledge Base

Section E: Absorptive Capacity

Section F: Innovation Capability

2. Required respondent must be as staff or member in the firm's new product development team. Data given will be anonymous and it will be used for only the research.
3. Product referred in the questionnaire means 'Thai dessert product'

Section A :	General Information
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1.1 Firm Size (No. of employees)

- Less than 50
- 51-200

1.2 Firm Age

- Less than 5 years 5-10 years 11-15 years 16-20 years
- Over 20 years

1.3 Formal R&D in organizational chart

- Yes No

1.4 Job Title

- Owner General Manager Departmental manager
- Employee/staff

1.5 Job Department

- Owner Production Quality assurance
- Marketing R&D

1.6 Role of Respondents in NPD team

- Project manager Member

1.7 Experience of being an NPD team in a firm

- Less than 5 years 5-10 years 10-15 years Over 15 years

Section B :	External Knowledge Access
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2.2 Oriented-Knowledge Domain

1 = Never 2 = Seldom 3 = Sometimes 4 = Often 5 = Always

Knowledge	Frequency				
	1	2	3	4	5
Marketing-based knowledge					
MK1: New packaging design	<input type="checkbox"/>				
MK2: Improved raw materials to improve product quality	<input type="checkbox"/>				
MK3: Customers' positive suggestions for product development	<input type="checkbox"/>				
MK4: Customers' negative comments for product improvement	<input type="checkbox"/>				

Knowledge	Frequency				
	1	2	3	4	5
MK5: Current customers' consumption behaviour related to product	<input type="checkbox"/>				
Manufacturing-based knowledge with quality management system					
QS1: Application of GMP standard based on Thai FDA fitting with the company	<input type="checkbox"/>				
QS2: Application of Codex GMP standard fitting with the company	<input type="checkbox"/>				
QS3: Application of HACCP standard fitting with the company	<input type="checkbox"/>				
QS4: New technology, including machines and equipment, to facilitate food quality and safety standards	<input type="checkbox"/>				
QS5: New technology of packaging for extending the shelf life of products and maintaining product quality	<input type="checkbox"/>				

2.3 External Knowledge Access

1 = Not relevant at all 2 = Low relevant 3 = Medium relevant 4 = Most relevant

External Knowledge Source	Level of Use			
	1	2	3	4
Market				
SB1: Suppliers of equipment, materials, components, or software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB2: Clients or customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB3: Competitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB4: Consultants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB5: Commercial laboratories/R&D enterprises	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Institutional				
SB6: Universities or other higher education institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB7: Government research organisations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB8: Other public sectors, e.g. business links, government offices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB9: Private research institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specialised				
SB10: Technical standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB11: Health and safety standards and regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

External Knowledge Source	Level of Use			
	1	2	3	4
SB12: Environmental standards and regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other				
SB13: Professional conferences, meetings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB14: Trade associations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB15: Technical/trade press	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB16: Computer databases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SB17: Fairs, exhibitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section C:	New Product Development
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3.1 Type of Product

- Please indicate the successful project of new product development during the year 2011-2015, with using external knowledge to support

- 1 New-to-the-World
- 2 New Product Line
- 3 Line extension
- 4 Improvements in
- 5 Repositioning
- 6 Cost Reduction

3.2 New Product Performance

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree
--

New Product Performance	Level				
	1	2	3	4	5
NPP2: New products of our company can meet the needs of its customers	<input type="checkbox"/>				
NPP3: The ratio of the successful NPD projects in our company is higher than that of major competitors	<input type="checkbox"/>				
NPP4: New products of our company attain the goal of expected sales	<input type="checkbox"/>				

New Product Performance	Level				
	1	2	3	4	5
NPP5: New products of our company attain the goal of expected profitability	<input type="checkbox"/>				
NPP6: Overall performance of new products of our company is successful	<input type="checkbox"/>				

Section D:	Knowledge Base
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1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree

Knowledge Breadth	Level				
	1	2	3	4	5
KB1: We possess market information from a wide-ranging customer portfolio	<input type="checkbox"/>				
KB2: We possess market information from a diversified customer portfolio	<input type="checkbox"/>				
KB3: We have accumulated knowledge of multiple market segments	<input type="checkbox"/>				
KB4: Our R&D expertise consists of technical knowledge from a variety of backgrounds	<input type="checkbox"/>				
Knowledge Depth					
KD1: We have a thorough understanding and experience of current customers	<input type="checkbox"/>				
KD2: We have accumulated in-depth knowledge of the key market segment that we focus on	<input type="checkbox"/>				
KD3: Our R&D experts have thorough technical knowledge and skills within our specialised domain	<input type="checkbox"/>				

Section E:	Absorptive Capacity
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1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree
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	Level				
	1	2	3	4	5
Acquisition					
AC1: The search for relevant information concerning our industry is an every-day business in our company	<input type="checkbox"/>				
AC2: Our management motivates the employees to use information sources within our industry	<input type="checkbox"/>				
AC3: Our management expects the employees to deal with information beyond our industry	<input type="checkbox"/>				
Assimilation					
AS1: In our company, ideas and concepts are communicated on a cross-departmental basis	<input type="checkbox"/>				
AS2: In our company, there is quick information flow, e.g. if a business unit obtains important information, it communicates this information promptly to all other business units or departments	<input type="checkbox"/>				
AS3: Our management emphasises cross-departmental support to solve problems	<input type="checkbox"/>				
AS4: Our management demands periodical cross-departmental meetings to share new developments, problems, and achievements	<input type="checkbox"/>				
Transformation					
TS1: Our employees have the ability to structure and use collected knowledge	<input type="checkbox"/>				
TS2: Our employees are used to absorbing externally new knowledge as well as to prepare it for further purposes and make it available	<input type="checkbox"/>				
TS3: Our employees successfully link internally existing knowledge with external insights	<input type="checkbox"/>				
TS4: Our employees are able to apply new external knowledge in their practical work	<input type="checkbox"/>				
Exploitation					
EX1: Our management supports the development of prototypes	<input type="checkbox"/>				
EX2: Our company regularly reconsiders technologies and adapts them according to new knowledge	<input type="checkbox"/>				

	Level				
	1	2	3	4	5
EX3: Our company has the ability to work more effectively by adopting new technologies	<input type="checkbox"/>				

Section F: Innovation Capability

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree
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	Level				
	1	2	3	4	5
<i>Strategic orientation</i>					
<i>Customer orientation</i>					
SO2: We constantly monitor our level of commitment and orientation to serve customer needs	<input type="checkbox"/>				
SO3: Our strategy for competitive advantage is based on our understanding of customers' needs	<input type="checkbox"/>				
SO5: We routinely or regularly measure our customer service	<input type="checkbox"/>				
<i>Competitor orientation</i>					
SO6: Our salespeople regularly share information within our business concerning competitors' strategies	<input type="checkbox"/>				
SO7: We rapidly respond to competitors' actions that threaten us	<input type="checkbox"/>				
SO8: Top management regularly discusses competitors' strengths and strategies	<input type="checkbox"/>				
SO9: We target customers where we have an opportunity for competitive advantage	<input type="checkbox"/>				
<i>Technology orientation</i>					
SO10: Our new products are always at the state-of-the-art of the technology	<input type="checkbox"/>				
SO11: We have better technological knowledge than our competitors	<input type="checkbox"/>				
SO12: Our R&D programmes are more ambitious than those of our competitors	<input type="checkbox"/>				
SO14: Our strategic business unit (SBU) uses sophisticated technologies for its NPD	<input type="checkbox"/>				

	Level				
	1	2	3	4	5
SO17: Our SBU has the will and the capacity to build and market a technological breakthrough	<input type="checkbox"/>				
SO19: Our SBU has an aggressive technological patent strategy	<input type="checkbox"/>				
SO20: Our SBU has better industrial methods than the competitor	<input type="checkbox"/>				
<i>Resource management</i>					
RM1: We manage our human resources efficiently	<input type="checkbox"/>				
RM2: We manage our information systems efficiently	<input type="checkbox"/>				
RM3: We manage various technology-related changes efficiently	<input type="checkbox"/>				
RM4: We manage to satisfy most of our clients' requirements	<input type="checkbox"/>				
<i>Organisational intelligence</i>					
<i>Information acquisition ability</i>					
OI1: We have the ability to continuously collect information from customers	<input type="checkbox"/>				
OI2: We have the ability to continuously collect information about competitors' activities	<input type="checkbox"/>				
OI3: We have the ability to continuously collect information about relevant public other than customers and competitors	<input type="checkbox"/>				
OI4: We have the ability to continuously collect information from external experts, such as consultants	<input type="checkbox"/>				
OI5: We have the ability to continuously re-examine the value of information collected in previous studies	<input type="checkbox"/>				
<i>Information dissemination ability</i>					
OI6: We have formal information links established among all parties involved in a project	<input type="checkbox"/>				
OI7: We have informal networks that ensure all employees have the information they need	<input type="checkbox"/>				
OI8: Employees of the NPD team are able to educate each other during a project	<input type="checkbox"/>				
OI9: Employees of the NPD team are trained in new tasks relating to a project	<input type="checkbox"/>				
<i>Information implementation ability</i>					
OI14: We are able to use information to solve specific problems encountered in a project	<input type="checkbox"/>				

	Level				
	1	2	3	4	5
OI15: We are able to provide information to effectively implement a project	<input type="checkbox"/>				
<i>Creativity</i>					
CR1: Our employees are able to suggest new ways to achieve goals or objectives	<input type="checkbox"/>				
CR2: Our employees are able to suggest new ways to increase quality	<input type="checkbox"/>				
CR3: Our employees are able to suggest new ways of performing work tasks	<input type="checkbox"/>				
CR4: Our employees often have new and innovative ideas	<input type="checkbox"/>				
CR5: Our employees often have a fresh approach to problems	<input type="checkbox"/>				
CR6: Our employees are able to come up with new and practical ideas to improve performance	<input type="checkbox"/>				
CR7: Our employees are able to come up with creative solutions to problems	<input type="checkbox"/>				
CR8: Our employees are able to search out new technologies, processes, techniques, and/or product ideas	<input type="checkbox"/>				
CR9: Our employees are able to promote and champion ideas to others	<input type="checkbox"/>				
CR10: Our employees are able to exhibit creativity on the job when given the opportunity	<input type="checkbox"/>				
CR11: Our employees are able to develop adequate plans and schedules for the implementation of new ideas	<input type="checkbox"/>				
CR12: Our employees are good sources of creative ideas	<input type="checkbox"/>				
CR13: Our employees are not afraid to take risks	<input type="checkbox"/>				
<i>Structure and system</i>					
SS1: Projects are developed using effective cross-functional teams	<input type="checkbox"/>				
SS2: Project teams are organic, flexible, and agile	<input type="checkbox"/>				
SS3: All team operations are driven by customer needs	<input type="checkbox"/>				
SS4: All team members are mutually accountable	<input type="checkbox"/>				
SS5: Team members are empowered to make decisions	<input type="checkbox"/>				
SS6: Virtual team members are equipped with effective ICT tools	<input type="checkbox"/>				
SS7: Team members' rewards are equitable	<input type="checkbox"/>				
<i>Culture and climate</i>					
CC1: There is a formal idea generation process in place	<input type="checkbox"/>				
CC2: All employees participate in generating ideas	<input type="checkbox"/>				

	Level				
	1	2	3	4	5
CC3: Failures and mistakes are tolerated and not punished	<input type="checkbox"/>				
CC4: Senior management is committed to risk-taking in product innovation	<input type="checkbox"/>				
CC5: The organisation permits the emergence of intrapreneurs or product champions	<input type="checkbox"/>				
CC6: The organisation provides support in terms of autonomy, time, and rewards	<input type="checkbox"/>				
CC7: Knowledge sharing is encouraged and rewarded	<input type="checkbox"/>				
CC8: Money is made available for internal projects	<input type="checkbox"/>				
CC9: Adequate resources are available and committed to achieving project goals	<input type="checkbox"/>				
CC10: All operations are driven by customer needs	<input type="checkbox"/>				
<i>Management of technology</i>					
MO1: Our company always attempts to stay on the leading edge of new technology in our industry	<input type="checkbox"/>				
MO2: We make an effort to anticipate the full potential of new practices and technologies	<input type="checkbox"/>				
MO3: We pursue long-range programmes in order to acquire technological capabilities in advance of our needs	<input type="checkbox"/>				
MO4: We are constantly thinking of the next generation of technology	<input type="checkbox"/>				

แบบสอบถาม (ชุด Survey)

เรื่อง การค้นหาความรู้ภายนอก ความสามารถในการเรียนรู้ และความสามารถด้านนวัตกรรมขององค์กรในการพัฒนาผลิตภัณฑ์ใหม่ : กรณีวิสาหกิจขนาดกลางและขนาดย่อมอุตสาหกรรมชนบทไทย

คำแนะนำในการกรอกแบบสอบถาม

1. แบบสอบถามในงานวิจัยนี้ ประกอบด้วย 6 ส่วน คือ

ส่วนที่ 1 : ข้อมูลเกี่ยวกับบริษัทและผู้กรอกแบบสอบถาม

ส่วนที่ 2 : การเข้าสู่แหล่งความรู้ภายนอกของบริษัท

ส่วนที่ 3 : สมรรถนะของโครงการการพัฒนาผลิตภัณฑ์ใหม่

ส่วนที่ 4 : โครงสร้างฐานความรู้ในบริษัท

ส่วนที่ 5 : ความสามารถในการใช้ข้อมูลจากแหล่งภายนอก

ส่วนที่ 6 : ความสามารถทางด้านนวัตกรรม

2. ผู้ให้ข้อมูลแบบสอบถาม ควรเป็นสมาชิกทีมงานโครงการการพัฒนาผลิตภัณฑ์ใหม่ของบริษัท

3. คำว่า “ผลิตภัณฑ์” ในแบบสอบถามนี้ หมายถึง “ผลิตภัณฑ์ชนบทไทย”

ส่วนที่ 1 :	ข้อมูลเกี่ยวกับบริษัทและผู้ให้ข้อมูล
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โปรดให้ข้อมูลด้วยเครื่องหมาย ✓ ในคำถามต่อไปนี้

- 1.1 จำนวนพนักงาน/ลูกจ้างในบริษัท)เฉพาะลูกจ้างประจำเท่านั้น)
 ไม่เกิน 50 คน 51-200 คน
- 1.2 จำนวนปีของการก่อตั้งบริษัท
 น้อยกว่า 5 ปี 5-10 ปี 11-15 ปี 16-20 ปี
 มากกว่า 20 ปี
- 1.3 บริษัทมีแผนวิจัยและพัฒนา (R&D) ตามผังโครงสร้างองค์กรหรือไม่
 มี ไม่มี
- 1.4 ตำแหน่งงานของท่านในบริษัท
 เจ้าของ ผู้จัดการทั่วไป ผู้จัดการแผนก
 พนักงาน
- 1.5 แผนงานของท่านในบริษัท (เลือกข้อเดียว)
 เจ้าของ แผนกผลิต แผนกประกันคุณภาพ
 แผนกการตลาด แผนกการวิจัยและพัฒนา
- 1.6 บทบาทของท่านในทีมงานพัฒนาผลิตภัณฑ์ใหม่ของบริษัทนี้
 ผู้จัดการโครงการ สมาชิกทีมงาน
- 1.7 ประสบการณ์การทำงานของท่านในการเป็นทีมงานพัฒนาผลิตภัณฑ์ใหม่ของบริษัทนี้
 น้อยกว่า 5 ปี 5-10 ปี 10-15 ปี มากกว่า 15 ปี

ส่วนที่ 2 :	การเข้าสู่แหล่งความรู้ภายนอกของบริษัท
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2.4 ความรู้และเทคโนโลยีภายนอกที่บริษัทค้นหา

โปรดระบุความถี่ด้วยเครื่องหมาย ✓ ในการค้นหาความรู้และเทคโนโลยีภายนอกที่บริษัทได้ดำเนินการ (ทำทุกข้อ) โดย

1 = ไม่เคยค้นหาเลย 2 = ค้นหานานๆ ครั้ง 3 = ค้นหาบางครั้ง บางคราว 4 = ค้นหาบ่อยๆ 5 = ค้นหาสม่ำเสมอ

ประเภทข้อมูล/ความรู้ภายนอก	ระดับความถี่				
	1	2	3	4	5
ความรู้ที่มุ่งสู่การตลาด					
รูปแบบบรรจุภัณฑ์ใหม่ๆ ที่จะนำมาใช้กับผลิตภัณฑ์	<input type="checkbox"/>				
คุณสมบัติของวัตถุดิบการผลิตที่มีการพัฒนาในด้านต่างๆ ในการช่วยเพิ่มคุณภาพให้ผลิตภัณฑ์	<input type="checkbox"/>				
ข้อเสนอแนะเชิงบวกของลูกค้าในการพัฒนาผลิตภัณฑ์	<input type="checkbox"/>				
ข้อวิจารณ์เชิงลบของลูกค้าในการปรับปรุงผลิตภัณฑ์	<input type="checkbox"/>				
พฤติกรรมผู้บริโภคของลูกค้าในปัจจุบันที่เกี่ยวข้องกับผลิตภัณฑ์	<input type="checkbox"/>				
ความรู้ที่มุ่งสู่มาตรฐานคุณภาพและความปลอดภัยของอาหาร					
แนวทางการประยุกต์ใช้ภายในบริษัท ตามข้อปฏิบัติของมาตรฐาน GMP อย.	<input type="checkbox"/>				
แนวทางการประยุกต์ใช้ภายในบริษัท ตามข้อปฏิบัติของมาตรฐาน GMP สากล (Codex GMP)	<input type="checkbox"/>				
แนวทางการประยุกต์ใช้ภายในบริษัท ตามข้อปฏิบัติของมาตรฐาน HACCP	<input type="checkbox"/>				
เทคโนโลยี/เครื่องจักรหรืออุปกรณ์การผลิตใหม่ๆ ที่สนับสนุนต่อมาตรฐานคุณภาพและความปลอดภัยของอาหาร	<input type="checkbox"/>				
เทคโนโลยีบรรจุภัณฑ์ใหม่ๆ ที่ช่วยยืดอายุและรักษาคุณภาพของผลิตภัณฑ์	<input type="checkbox"/>				

2.2 การเข้าสู่แหล่งข้อมูลภายนอก

- โปรดระบุระดับการเข้าสู่ข้อมูลของบริษัทจากแหล่งความรู้ภายนอกต่อไปนี้ ด้วยเครื่องหมาย ✓ (ทำทุกข้อ) โดย

1 = ไม่ได้เกี่ยวข้องเลย 2 = เกี่ยวข้องน้อย 3 = เกี่ยวข้องปานกลาง 4 = เกี่ยวข้องมาก

แหล่งข้อมูลจากภายนอก	ระดับความเกี่ยวข้อง			
	1	2	3	4
การตลาด				
1 ผู้จำหน่าย/ซัพพลายเออร์ อุปกรณ์ วัตถุดิบ ส่วนประกอบหรือซอฟต์แวร์	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 ลูกค้า	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 คู่แข่งขันทางธุรกิจ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 บริษัทที่ปรึกษา	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

แหล่งข้อมูลจากภายนอก	ระดับความเกี่ยวข้อง			
	1	2	3	4
5 ห้องปฏิบัติการทดสอบทางพาณิชย์ด้านการวิจัยและพัฒนา	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
สถาบันการศึกษา				
6 มหาวิทยาลัย/สถาบันอุดมศึกษา	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 หน่วยงานวิจัยของภาครัฐ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 หน่วยงานภาครัฐอื่นๆ เช่น เครือข่ายทางธุรกิจ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 สถาบันวิจัยภาคเอกชน	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
แหล่งข้อมูลด้านมาตรฐาน				
10 มาตรฐานทางเทคนิค	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11 มาตรฐานและข้อบังคับด้านสุขภาพและความปลอดภัย	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 มาตรฐานและข้อบังคับด้านสิ่งแวดล้อม	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
แหล่งความรู้อื่นๆ				
13 งานประชุมวิชาชีพ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14 สมาคมการค้าต่างๆ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15 ข้อมูลวิชาการจากการตีพิมพ์ผ่านสื่อสิ่งพิมพ์	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16 ฐานข้อมูลคอมพิวเตอร์จากเว็บไซต์ต่างๆ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17 งานแสดงสินค้าและนิทรรศการ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ส่วนที่ 3 :	การพัฒนาผลิตภัณฑ์ใหม่
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3.1 ชนิดของโครงการ

- **โปรดชี้บ่งลักษณะโครงการที่บริษัทได้ดำเนินการแล้วประสบความสำเร็จ โดยเป็นโครงการที่ได้ดำเนินการในช่วง 5 ปีที่ผ่านมา (พ.ศ. 2554 - 2558) และมีการใช้ข้อมูลจากแหล่งภายนอกมาสนับสนุน**
- 1 **ผลิตภัณฑ์ที่ใหม่ต่อทั้งบริษัทและตลาด :** เช่น ผลิตภัณฑ์ขนมแช่แข็ง
- 2 **ผลิตภัณฑ์ในสายการผลิตใหม่ :** เป็นผลิตภัณฑ์ใหม่ที่บริษัทผลิตเป็นครั้งแรก แต่อาจจะมีการผลิตอยู่แล้วโดยบริษัทอื่น
- 3 **ผลิตภัณฑ์เสริมในสายผลิตภัณฑ์เดิม :** เป็นผลิตภัณฑ์ใหม่ที่ต่อยอดมาจากสายการผลิตของบริษัทที่มีอยู่ เช่น การเปลี่ยนรสชาติใหม่, ใช้ไส้ขนมแบบใหม่, เปลี่ยนรูปร่างขนม หรือเปลี่ยนขนาดของบรรจุภัณฑ์
- 4 **ผลิตภัณฑ์เดิมที่ได้รับการปรับปรุง :** เช่น การเปลี่ยนชนิดของบรรจุภัณฑ์เพื่อเพิ่มคุณภาพให้ผลิตภัณฑ์/ยืด

อายุขณม, การลดปริมาณแคลอรีในขณม

- 5 การวางตำแหน่งผลิตภัณฑ์ใหม่ในตลาด : เป็นการกำหนดตำแหน่งผลิตภัณฑ์ขึ้นมาใหม่
- 6 ผลิตภัณฑ์ตัดราคา : เป็นผลิตภัณฑ์รูปแบบเดิม แต่บริษัทมีต้นทุนการผลิตที่ลดลงสำหรับผลิตภัณฑ์นี้

3.2 : สมรรถนะของผลิตภัณฑ์ใหม่

- โปรดให้ระดับความสำเร็จของโครงการฯ ดังกล่าว ด้วยเครื่องหมาย ✓ โดย

1 = ไม่เห็นด้วยอย่างยิ่ง, 2 = ไม่เห็นด้วย, 3 = ไม่แน่ใจ, 4 = เห็นด้วย, 5 = เห็นด้วยอย่างยิ่ง

ความสำเร็จของผลิตภัณฑ์ใหม่	ระดับ				
	1	2	3	4	5
1 ผลิตภัณฑ์ใหม่ของบริษัทสามารถตอบสนองต่อความต้องการของลูกค้า	<input type="checkbox"/>				
2 สัดส่วนของโครงการพัฒนาผลิตภัณฑ์ใหม่ของบริษัทที่ประสบความสำเร็จมีมากกว่าคู่แข่งชั้นหลัก	<input type="checkbox"/>				
3 ผลิตภัณฑ์ใหม่ของบริษัทบรรลุยอดขายตามเป้าหมายที่คาดหวัง	<input type="checkbox"/>				
4 ผลิตภัณฑ์ใหม่ของบริษัทบรรลุผลกำไรตามเป้าหมายที่คาดหวัง	<input type="checkbox"/>				
5 สมรรถนะของผลิตภัณฑ์ใหม่ในภาพรวมถือว่าประสบความสำเร็จ	<input type="checkbox"/>				

ส่วนที่ 4 : โครงสร้างฐานความรู้ในบริษัท

โปรดให้ระดับความคิดเห็นด้วยเครื่องหมาย ✓ ในคำถามต่อไปนี้ เกี่ยวกับโครงสร้างฐานความรู้ในบริษัท โดย

1 = ไม่เห็นด้วยอย่างยิ่ง, 2 = ไม่เห็นด้วย, 3 = ไม่แน่ใจ, 4 = เห็นด้วย, 5 = เห็นด้วยอย่างยิ่ง

A : ความกว้างของฐานความรู้	ระดับ				
	1	2	3	4	5
1 บริษัทมีข้อมูลกลุ่มลูกค้าหลายๆ กลุ่มในอุตสาหกรรมนี้	<input type="checkbox"/>				
2 บริษัทมีข้อมูลลูกค้าในกลุ่มที่บริษัทได้แตกแขนงธุรกิจออกไปจากอุตสาหกรรมนี้	<input type="checkbox"/>				
3 บริษัทมีความรู้สะสมในเรื่องภาคส่วนการตลาดย่อย โดยสามารถจำแนกกลุ่มลูกค้าเป็นภาคส่วนการตลาดย่อยตามความชอบผลิตภัณฑ์	<input type="checkbox"/>				
4 ทีมวิจัยและพัฒนาผลิตภัณฑ์ของบริษัทประกอบไปด้วยสมาชิกที่มีความรู้ทางเทคนิคในสาขาที่หลากหลาย	<input type="checkbox"/>				

		ระดับ				
B : ความลึกของฐานความรู้						
1	บริษัทมีประสบการณ์และความเข้าใจในลูกค้าปัจจุบันของบริษัท	<input type="checkbox"/>				
2	บริษัทมีความรู้สะสมเชิงลึกในภาคส่วนการตลาดหลักที่บริษัทเน้นเจาะกลุ่ม	<input type="checkbox"/>				
3	ทีมวิจัยและพัฒนาผลิตภัณฑ์ของบริษัทมีความรู้ทางเทคนิคและทักษะเฉพาะทางที่เกี่ยวข้องกับการพัฒนาผลิตภัณฑ์ในธุรกิจนี้	<input type="checkbox"/>				

ส่วนที่ 5 :	ความสามารถในการใช้ข้อมูลจากแหล่งภายนอก
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โปรดให้ระดับความคิดเห็นด้วยเครื่องหมาย ✓ ในคำถามต่อไปนี้ เกี่ยวกับความสามารถในการใช้ข้อมูลจากแหล่งภายนอกของบริษัท โดย

1 = ไม่เห็นด้วยอย่างยิ่ง, 2 = ไม่เห็นด้วย, 3 = ไม่แน่ใจ, 4 = เห็นด้วย, 5 = เห็นด้วยอย่างยิ่ง
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คำถาม	ระดับ				
	1	2	3	4	5
การใช้ข้อมูลภายนอก					
1 การค้นหาข้อมูล/ความรู้ที่เกี่ยวข้องกับอุตสาหกรรมนี้ เป็นสิ่งที่บริษัทดำเนินการทุกวัน	<input type="checkbox"/>				
2 บริษัทสร้างแรงจูงใจให้พนักงานค้นหาข้อมูลภายนอกที่เกี่ยวข้องกับอุตสาหกรรมนี้	<input type="checkbox"/>				
3 บริษัทคาดหวังให้พนักงานค้นหาข้อมูลภายนอกอุตสาหกรรมนี้ด้วย	<input type="checkbox"/>				
การสื่อสารภายใน					
1 ความคิดและคอนเซ็ปต์ต่างๆ ภายในบริษัท จะมีการสื่อสารในทุกแผนก	<input type="checkbox"/>				
2 ข้อมูลจะถูกสื่อสารอย่างรวดเร็วภายในบริษัท เช่น ถ้าหน่วยธุรกิจได้รับข้อมูลที่สำคัญ มันจะถูกสื่อสารไปที่หน่วยธุรกิจอื่นหรือแผนกอื่นๆ ทันที	<input type="checkbox"/>				
3 การบริหารจัดการของบริษัทเน้นให้ทุกแผนกงานมีส่วนร่วมในการแก้ไขปัญหาพร้อมกัน	<input type="checkbox"/>				
4 การบริหารจัดการของบริษัทควบคุมให้ทุกแผนกมีการประชุมร่วมกันเป็นระยะเพื่อแลกเปลี่ยนแนวทางการพัฒนา แทรกปัญหาที่เกิดขึ้นรวมทั้งการแก้ไข	<input type="checkbox"/>				
การบริหารจัดการความรู้ทั้งภายนอกและภายใน					
1 ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัท สามารถจัดระบบและใช้ข้อมูลที่เก็บรวบรวมมา	<input type="checkbox"/>				
2 ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัทคุ้นเคยต่อความรู้ใหม่จากภายนอก และสามารถนำความรู้นี้ไปประยุกต์ใช้ได้ภายในบริษัท	<input type="checkbox"/>				

คำถาม	ระดับ				
	1	2	3	4	5
3 ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัทสามารถผสานความรู้ใหม่จากภายนอกกับความรู้ที่มีอยู่ในบริษัทได้อย่างประสบความสำเร็จ	<input type="checkbox"/>				
4 ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัทสามารถนำความรู้ใหม่จากภายนอกไปใช้ในการปฏิบัติงาน	<input type="checkbox"/>				
ภาพรวมการใช้ความรู้จากภายนอก					
1 การบริหารจัดการของบริษัทสนับสนุนต่อการพัฒนาผลิตภัณฑ์ตัวต้นแบบ	<input type="checkbox"/>				
2 บริษัทมีการพิจารณาทบทวนเทคโนโลยีใหม่อยู่อย่างสม่ำเสมอและประยุกต์ใช้กับความรู้ใหม่	<input type="checkbox"/>				
3 บริษัททำงานได้อย่างมีประสิทธิภาพและผลงานมากขึ้น เมื่อมีการรับเอาเทคโนโลยีใหม่ๆ มาใช้	<input type="checkbox"/>				

ส่วนที่ 6 : ความสามารถทางด้านนวัตกรรม

โปรดให้ระดับความคิดเห็นด้วยเครื่องหมาย ✓ ในคำถามต่อไปนี้ เกี่ยวกับความสามารถทางด้านนวัตกรรม และปัจจัยสิ่งแวดล้อม โดย

1 = ไม่เห็นด้วยอย่างยิ่ง, 2 = ไม่เห็นด้วย, 3 = ไม่แน่ใจ, 4 = เห็นด้วย, 5 = เห็นด้วยอย่างยิ่ง

คำถาม	ระดับ				
	1	2	3	4	5
A : กลยุทธ์					
กลยุทธ์มุ่งสู่ลูกค้า					
1 บริษัทตรวจติดตามอย่างต่อเนื่องในเป้าหมายข้อตกลงที่บริษัทได้กำหนดขึ้นมาในการมุ่งสู่การตอบสนองความต้องการของลูกค้า	<input type="checkbox"/>				
2 กลยุทธ์ของบริษัทในการสร้างข้อได้เปรียบในการแข่งขันตั้งอยู่บนพื้นฐานความเข้าใจในความต้องการของลูกค้า	<input type="checkbox"/>				
3 บริษัทมีมาตรฐานในการให้บริการลูกค้า	<input type="checkbox"/>				
กลยุทธ์ต่อคู่แข่ง					
4 ฝ่ายขายของบริษัทมีการแชร์ข้อมูลกลยุทธ์คู่แข่งให้บริษัททราบอย่างสม่ำเสมอ	<input type="checkbox"/>				
5 บริษัทตอบสนองอย่างรวดเร็วต่อการแข่งขันที่คุกคาม	<input type="checkbox"/>				

คำถาม	ระดับ				
	1	2	3	4	5
6 ฝ่ายบริหารระดับสูงมีการปรึกษาหารือกันอยู่เสมอในประเด็นข้อได้เปรียบและกลยุทธ์ของคู่แข่ง	<input type="checkbox"/>				
7 เราพุ่งเป้าไปที่กลุ่มลูกค้าที่เรามีโอกาสสร้างความได้เปรียบในการแข่งขันได้มากกว่าคู่แข่ง	<input type="checkbox"/>				
กลยุทธ์ทางด้านเทคโนโลยี					
8 ผลิตภัณฑ์ใหม่ของเราจะมีเทคโนโลยีที่ล้ำหน้าเสมอ	<input type="checkbox"/>				
9 บริษัทมีความรู้ทางด้านเทคโนโลยีที่ดีกว่าคู่แข่ง	<input type="checkbox"/>				
10 โปรแกรม/หัวข้อการวิจัยและพัฒนาของบริษัทเราเหนือกว่าคู่แข่ง	<input type="checkbox"/>				
สำหรับข้อ 11-14 : หน่วยธุรกิจเชิงกลยุทธ์ของบริษัท...					
11 มีการใช้เทคโนโลยีขั้นสูงในการพัฒนาผลิตภัณฑ์ใหม่	<input type="checkbox"/>				
12 มีความตั้งใจและความสามารถที่จะสร้างความรุดหน้าทางเทคโนโลยีให้ตลาด	<input type="checkbox"/>				
13 มีกลยุทธ์ด้านสิทธิบัตรเทคโนโลยี	<input type="checkbox"/>				
14 มีวิธีการผลิตที่ดีกว่าคู่แข่ง	<input type="checkbox"/>				
B : การบริหารจัดการทรัพยากรในบริษัท					
1 บริษัทบริหารจัดการทรัพยากรมนุษย์ได้อย่างมีประสิทธิภาพ	<input type="checkbox"/>				
2 บริษัทบริหารจัดการข้อมูลได้อย่างมีประสิทธิภาพ	<input type="checkbox"/>				
3 บริษัทบริหารจัดการกับการเปลี่ยนแปลงทางเทคโนโลยีที่หลากหลายได้อย่างมีประสิทธิภาพ	<input type="checkbox"/>				
4 บริษัทบริหารจัดการเกี่ยวกับความต้องการของลูกค้าเพื่อให้ลูกค้าพึงพอใจ	<input type="checkbox"/>				
C : ความฉลาดขององค์กร					
● การค้นหาข้อมูล : ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่ ทีมงานมีความสามารถอย่างต่อเนื่องในการ...					
1 เก็บรวบรวมข้อมูลที่มาจกลูกค้า	<input type="checkbox"/>				
2 เก็บรวบรวมข้อมูลเกี่ยวกับกิจกรรมของคู่แข่ง	<input type="checkbox"/>				
3 เก็บรวบรวมข้อมูลสาธารณะที่เกี่ยวข้อง นอกเหนือจากข้อมูลลูกค้าและคู่แข่ง	<input type="checkbox"/>				
4 เก็บรวบรวมข้อมูลจากผู้เชี่ยวชาญภายนอก (เช่น ที่ปรึกษา)	<input type="checkbox"/>				
5 พิจารณาบททวนประโยชน์ของข้อมูลที่ได้รวบรวมได้จากการศึกษาในก่อนหน้านั้น	<input type="checkbox"/>				
● การสื่อสารข้อมูล : ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่ ทีมงานมี.....					
6 ความสามารถในการเชื่อมข้อมูลจากทุกฝ่ายที่เกี่ยวข้องในโครงการ	<input type="checkbox"/>				

คำถาม	ระดับ				
	1	2	3	4	5
7	เครือข่ายไม่เป็นทางการ ที่สามารถให้ข้อมูลตามที่สมาชิกทีมต้องการ				
8	การให้ความรู้ซึ่งกันและกันในระหว่างการทำโครงการ				
9	ได้รับการฝึกอบรมในงานใหม่ๆ ที่เกี่ยวข้องกับโครงการ				
<ul style="list-style-type: none"> ● การใช้ข้อมูล : ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่ ทีมงานมีความสามารถในการ..... 					
10	ใช้ข้อมูลที่มีอยู่เพื่อแก้ปัญหาเฉพาะที่เกิดขึ้นในระหว่างโครงการ				
11	จัดหาข้อมูลที่จะดำเนินการโครงการได้อย่างมีประสิทธิภาพ				
D : ความคิดสร้างสรรค์					
<ul style="list-style-type: none"> ● สมาชิกทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัท... 					
1	สามารถเสนอแนะวิธีการใหม่ๆ เพื่อบรรลุผลตามเป้าหมายหรือวัตถุประสงค์				
2	สามารถเสนอแนะวิธีการใหม่ๆ ที่จะเพิ่มคุณภาพ				
3	สามารถเสนอแนะวิธีการใหม่ๆ ในการปฏิบัติงาน				
4	มีความคิดใหม่ๆ และเป็นนวัตกรรมอยู่บ่อยๆ				
5	มีวิธีการแก้ปัญหาแบบใหม่ๆ อยู่บ่อยๆ				
6	มีความคิดใหม่ๆ ที่สามารถปฏิบัติได้เพื่อเพิ่มสมรรถนะการปฏิบัติงาน				
7	มีการแก้ไขปัญหาที่สร้างสรรค์				
8	มีการค้นหาเทคโนโลยีใหม่ๆ กระบวนการ รวมทั้งเทคนิคหรือความคิดใหม่ๆ เกี่ยวกับผลิตภัณฑ์				
9	ส่งเสริมการเป็นผู้นำทางความคิดให้พนักงานคนอื่น ๆ				
10	แสดงความคิดสร้างสรรค์ในงานเมื่อได้รับโอกาส				
11	สามารถพัฒนาแผนและการดำเนินการได้ตามความคิดใหม่ๆ นั้น				
12	เป็นแหล่งที่ดีของความคิดสร้างสรรค์				
13	ไม่กลัวต่อความเสี่ยงในข้อผิดพลาด				
E : โครงสร้างและระบบ					
1	ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่ บริษัทจะใช้ทีมงานจากหลายๆ แผนกที่มีประสิทธิภาพ				
2	ทีมพัฒนาผลิตภัณฑ์ใหม่ของบริษัทมีความยืดหยุ่นสูง				
3	การปฏิบัติงานของทีมพัฒนาผลิตภัณฑ์ใหม่ถูกขับเคลื่อนมาจากความต้องการของลูกค้า				

คำถาม	ระดับ				
	1	2	3	4	5
4 สมาชิกทีมฯ ทุกคนมีความรับผิดชอบร่วมกัน	<input type="checkbox"/>				
5 สมาชิกทีมฯ ได้รับมอบอำนาจในการตัดสินใจ	<input type="checkbox"/>				
6 สมาชิกทีมฯ สามารถใช้เทคโนโลยีไอซีทีได้อย่างมีประสิทธิภาพในการติดต่อประสานงานแม้อยู่ต่างพื้นที่	<input type="checkbox"/>				
7 รางวัลตอบแทนแก่สมาชิกทีมฯ มีความเสมอภาคและเท่าเทียมกัน	<input type="checkbox"/>				
F : วัฒนธรรมและบรรยากาศองค์กร					
1 มีกระบวนการให้พนักงานแสดงความคิดเห็นต่างๆ ในบริษัทอย่างเป็นทางการ	<input type="checkbox"/>				
2 พนักงานทุกคนมีส่วนร่วมในการนำเสนอความคิด	<input type="checkbox"/>				
3 ไม่มีการถูกทำโทษ เมื่อมีความล้มเหลวและข้อผิดพลาดในการพัฒนาผลิตภัณฑ์ใหม่เกิดขึ้น	<input type="checkbox"/>				
4 ฝ่ายจัดการอาวุโสรับผิดชอบต่อความเสี่ยงที่อาจเกิดขึ้นในการสร้างนวัตกรรมผลิตภัณฑ์	<input type="checkbox"/>				
5 บริษัทส่งเสริมให้พนักงานมีความเป็นผู้ประกอบการภายใน หรือมีพนักงานที่เป็นผู้นำด้านผลิตภัณฑ์	<input type="checkbox"/>				
6 บริษัทส่งเสริมในเรื่องความมีอิสระ เวลา และรางวัลตอบแทน ในการสร้างสรรค์นวัตกรรม	<input type="checkbox"/>				
7 บริษัทส่งเสริมและให้รางวัลสำหรับการแชร์หรือแบ่งปันความรู้	<input type="checkbox"/>				
8 งบประมาณจะมีการถูกจัดสรรให้ ในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่	<input type="checkbox"/>				
9 ทรัพยากรถูกจัดสรรให้เพียงพอในการทำโครงการพัฒนาผลิตภัณฑ์ใหม่เพื่อบรรลุเป้าหมายที่ตั้งไว้	<input type="checkbox"/>				
10 การปฏิบัติการทั้งหมดขับเคลื่อนมาจากความต้องการของลูกค้า	<input type="checkbox"/>				
G : การบริหารจัดการเทคโนโลยี					
1 บริษัทพยายามอย่างสม่ำเสมอที่จะใช้เทคโนโลยีใหม่ๆ ที่ก้าวหน้าในอุตสาหกรรมนี้	<input type="checkbox"/>				
2 บริษัทมีการคาดการณ์ในศักยภาพของวิธีปฏิบัติการใหม่ๆ รวมทั้งเทคโนโลยีใหม่ๆ	<input type="checkbox"/>				
3 บริษัทได้กำหนดโปรแกรมระยะยาวเพื่อให้มีความสามารถทางเทคโนโลยีที่เกินจากที่มีอยู่ในปัจจุบัน	<input type="checkbox"/>				
4 บริษัทคิดอย่างต่อเนื่องเกี่ยวกับเทคโนโลยีในอนาคต ที่อาจจำเป็นต้องใช้ในอุตสาหกรรมนี้	<input type="checkbox"/>				

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