

**EXPLORING THE EFFECTS OF SLACK  
RESOURCES AND INTERNATIONALISATION ON  
INNOVATION PERFORMANCE**

**A STUDY OF SOFTWARE DEVELOPMENT MNCs**

**By**

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## ABSTRACT

Intensive international business research has already been done on knowledge, networking and strategic orientation, with regard to what shapes innovation performance. Looking at the existing achievements, however, it appears that little attention has been devoted to how tangible resources and internationalisation could change firms' innovation performance. To address these research gaps, this thesis intends to incorporate the slack resource theory and multinationality construct into the international business (IB) research of innovation. Through introducing the former, the study seeks to illustrate how slack, yet tangible, resources could change firms' innovation behaviours, decision-making and performance. Through introducing the latter, the study seeks to present how internationalisation could contribute to firms' innovation performance in three conceivable ways. By combining these two theoretical constructs, the study forms a conceptual model and four separate research hypotheses.

The hypotheses were tested using the financial data collected from 67 internationalised software development firms. The results showed slack resources and internationalisation to be two highly influential factors that shape firms' innovation performance. In particular, a linear and positive relationship was found between slack resource, high- and low-discretion, and innovation performance. Furthermore, firms' degree of internationalisation (DOI) was found to bear a positive relationship to innovation performance. Lastly, firms' DOI was found to interact positively with high-discretion slack resources in shaping innovation performance. Potential implications of this study could enrich the IB research of innovation, extend the slack resource research of innovation and enrich the multinationality studies of innovation.

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**Key words:** Slack resources, Internationalisation, Innovation, Innovation performance

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## LIST OF ABBREVIATIONS

Abbreviation	Meaning
IB	International Business
MNC	Multinational corporation
DOI	Degree of internationalisation
RBV	Resource-based view
VRIN	Valuable, rare, inimitable and non-substitutable

# CHAPTER 1: INTRODUCTION

## 1.1 Background and overview

Over the past decade, innovation and innovation performance has drawn considerable scholarly interests (Tidd, 2001; Gatignon et al., 2002; Pittaway et al. 2004; He and Wong, 2004; Morgan and Berthon, 2008). To understand what shapes innovation performance, several arguments were devised in the IB research concerning innovation. From the resource-based view (RBV) perspective, there is the argument that innovation performance is shaped by firms' endowment of knowledge. If the endowment is rich, then firms are expected to be proficient in refining their products, renewing their competitive advantages and then generating innovation performance (Knight, 2001; Danneels, 2002; Knight and Cavusgil, 2004; Atuahene-Gima, 2005). From the dynamic capabilities perspective, there is the argument that innovation performance is shaped by learning. If the learning is continuous and effective, then firms are argued to be able to reconfigure its capabilities and competitiveness constantly, leading them to great innovation performance (Luo, 2000; Griffith and Harvey, 2001; Weerawardena et al., 2007). From the networking perspective, there is the argument that innovation performance is affected by internationalisation and the associated business interactions. When the interaction is intense, firms are presumed to be able to learn effectively, enabling them to improve their competitiveness and extend their innovation performance (Coviello and Munro, 1997; Schmid and Schurig, 2003; Venaik, Midgley and Devinney, 2005). From the innovative orientation perspective, there is the argument that innovation performance can be altered by firms' abilities to sense latent customer demands. Through that, firms are considered able to enter a niche market, where they could achieve unique innovations, sustained competitive advantages and then great innovation performance (Madsen and Servais, 1997; Shrader, Oviatt and McDougall, 2000; Karra, Phillips and Tracey, 2008).

Looking carefully at the arguments presented above, it seems that prior IB studies have overall, attributed changes of innovation performance to two main variables. Firstly, all four streams of IB research have recognised knowledge as an antecedent to innovation performance. In doing so, they have all adopted the basic argument of the RBV theory, that is, a valuable, rare, inimitable and non-substitutable (VRIN) combination of resources, tangible and intangible, can lead firms to greater competitive advantages and performance (Teece and



Pisano, 1994; Autio, Sapienza and Almeida, 2000; Wu, 2010). Secondly, in addition to knowledge, the networking research has also presented internationalisation as a path to greater innovation performance. By doing so, the research has displayed internationalisation as a source of knowledge with which firms could achieve profitable innovation and then sizable innovation performance (Welch and Welch, 1996; Coviello and Munro, 1997; Riap, Riap and Knight, 2005).

## **1.2 Research gaps**

As insightful as the prior studies are, it appears that few of them have addressed how tangible resources could serve to change firms' innovation performance in the IB context. In a research domain that draws heavily on the basic RBV argument, it is surprising how little has been done to resolve this question. Although sometimes research questions are unexplored due to their inherent lack of value, this study argues that it is not the case with the one in question. The basis of this argument comes from the managerial literatures on innovation and slack resources. According to these literatures, not only could tangible resources shape innovation performance, they have been found to do so in a number of multinational corporations (MNC) (Judge, Fryxell and Dooley, 1997; O'Brien, 2003; Geiger and Makri, 2006). For instance, in the study by Nohria and Gulati (1996), the slack resources (i.e. uncommitted tangible resources) of 22 MNC subsidiaries were found to shape innovation performance. Furthermore, in the study by Geiger and Cashen (2002), the slack resources of 250 world class MNCs were reported to precede innovation performance. In light of these evidences, the study thereby theorises that the question of whether and how tangible or slack resources could shape innovation performance is a viable research topic. Moreover, because IB studies have paid limited attention to this topic, to the best knowledge of this study, it is in essence a research gap (to the IB research of innovation).

Aside from slack resources, based on the managerial research of innovation performance, the study has identified a further flaw in the IB research of innovation. That is, in exploring what shapes innovation performance, the IB research has not fully addressed the effects of firms' internationalisation activities. As far as the study is aware, the only time the effects were explored (i.e. in the networking streams of IB research), firms' degree of internationalisation (DOI) is seen to offer interactions and knowledge (see McDougall and Oviatt 2000; Ibeh, 2003). By analysing this interaction argument with managerial literature, the study found the IB research on how firms' DOI affects innovation performance to be limited. To researchers

such as Kafouros et al (2008), this is because there are three ways for firms' DOI to shape innovation performance. By proposing the interaction argument, the IB research has only covered one of them (Frenz and Gillies, 2007; Li and Tang, 2010). Specifically, firms' DOI may alter innovation performance by presenting cost-effective and/or novel innovation inputs, as well as through interaction (see also Inauen and Wicki, 2011; Kotabe, Srinivasan and Aulakh, 2002). In addition, firms' DOI may change innovation performance by presenting additional foreign customers (Santos, Doz and Williamson, 2004; Casson, 2000). Based on these observations, the study thereby surmises that an additional research gap exists in the IB analysis of innovation performance.

From the perspective of the two identified research gaps, it is clear that, in the IB research of innovation, investigation is still required in order to answer two important questions: firstly, "How does tangible/slack resources shape innovation performance in the IB context?" and secondly, "How do the full effects of firms' DOI on innovation performance unfold?". To address these questions, the study plans to introduce two theoretical constructs from the managerial research of innovation. Firstly, there is the slack resource theory. With its help, the study intends to explain how and why organisational slack could precede innovation performance. Secondly, there is the construct of multinationality. Through this, the study aims to point out all three ways that firms' DOI can shape firms' innovation performance.

### **1.3 Research objective and questions**

By combining the two research gaps, the study forms a research objective:

*"To discern how slack resources could precede innovation performance under the influence of internationalisation."*

To achieve it, this study plans to (1) examine how slack resources of different varieties precede firms' innovation performance; and then (2) explore how firms' DOI interacts with slack resources in shaping innovation performance. According to this plan, the independent variable of the model is then firms' reserves of slack resources. To differentiate between different forms of slack resources, this study adopts the 'managerial discretion' criterion for classification. As a result, in this study, 'high-discretion' and 'low-discretion' slack resources are investigated separately as two isolated innovation performances. Furthermore, by applying the multinationality construct, firms' DOI is then a moderator in this study.

Looking at the research objective and the plan of resolution, the research objective of this study is breakable into two research questions. They are:

1. How does the degree of high- and low-discretion slack resource respectively precede innovation performance amongst IB entities?
2. How does firms' DOI interact with high- and low-discretion slack resource in shaping firms' innovation performance?

#### **1.4 Research contributions**

Overall, this study intends to contribute to three streams of research.

Firstly, it enriches the IB research of innovation by addressing two of its research gaps. It does this by introducing the slack resource theory and explaining how tangible resources could shape firms' innovation performance. This advances the IB research by presenting a new antecedent for firms' innovation performance in the IB context. The study also introduces the multinationality construct. Through this, the study points out all three ways for firms' DOI to regulate innovation performance. This broadens the IB researchers' insights into why different DOI is sometimes associated with different degrees of innovation performance.

Secondly, this study extends the research of slack resources by introducing DOI as an unexplored variable. Though most existing studies of slack resources explored innovation performance in the IB context, rarely have they considered DOI as a variable of great importance. Therefore, by pointing out how multinationality shapes innovation performance, this study potentially displays DOI as an unrealised 'research noise' in the slack resource research. This explains why the slack resource theory was sometimes not empirically supported in previous studies on slack resources (as reported by Daniel et al, 2004 and Huang and Cheng, 2010). In future studies, this allows more stringent testing of the slack resource theory to be performed.

Last but not least, this study contributes further to the research of firm's DOI through clarifying a debate surrounding the effects of multinationality. While many scholars have accepted that a high DOI increases innovation performance, others have held the opposite perception. According to Lu and Beamish (2001), this has triggered an ongoing debate about whether a high DOI improves or impairs innovation performance, causing major ambiguities to arise (Kafouros, 2005; Kafouros et al., 2008). By presenting slack resources as an

antecedent to innovation performance, this study has again presented an unexplored noise in the multinationality research. If such a noise is controlled appropriately in subsequent studies, a more explicit relationship may be observed between multinationality and innovation performance. In the current body of multinationality research, this viewpoint is echoed by Gomes and Ramaswamy (1999) and Kumar (2009). This suggests that recognising slack resources as an important antecedent to innovation performance could be a way of enriching the multinationality research.

### **1.5 Research methodology**

This study employs the content analysis method to collect financial information from corporate annual reports. Through this, the goal is to build an “objective, systematic and quantitative description of the manifest content of communication” (Berelson, p. 18). This means collecting information from the expressed contents of documents in the most objective and systematic fashion (Krippendorff, 1980; Guthrie et al., 2004). Although the method has been criticised for being applicable to unreliable data sources, its objectivity in data collection is yet unparalleled by any other alternative methods (Holsti, 1968; Suzuki, 1980; Neuendorf, 2002).

In the research of slack resources and multinationality, the use of content analysis with secondary data is not unprecedented. In fact, many of the most successful studies in slack research adopted this method for empirical investigation (Singh 1986; Bromiley, 1991; Nohria and Gulati, 1996; Tan and Peng, 2003; George, 2005). In multinationality research, the examples are even more abundant, due to the extensive use of periodic literature as data source (Lu and Beamish, 2001; Jeong, 2003; Tseng et al., 2007; Matysiak and Bausch, 2012).

This study adopts corporate annual reports as provided by the NASDAQ stock exchange market database as its primary data source. Using these reports, data surrounding the 2008-2011 operations of 67 internationally diversified software development entities was collected. To prepare the data for examination, the study applied them to the dependent variable, two independent variables, one moderator variable and five control variables. Once this was done, the variables were in turn investigated in four consecutive regression analyses to verify hypotheses and address the research questions.

## 1.6 Hypotheses and Results

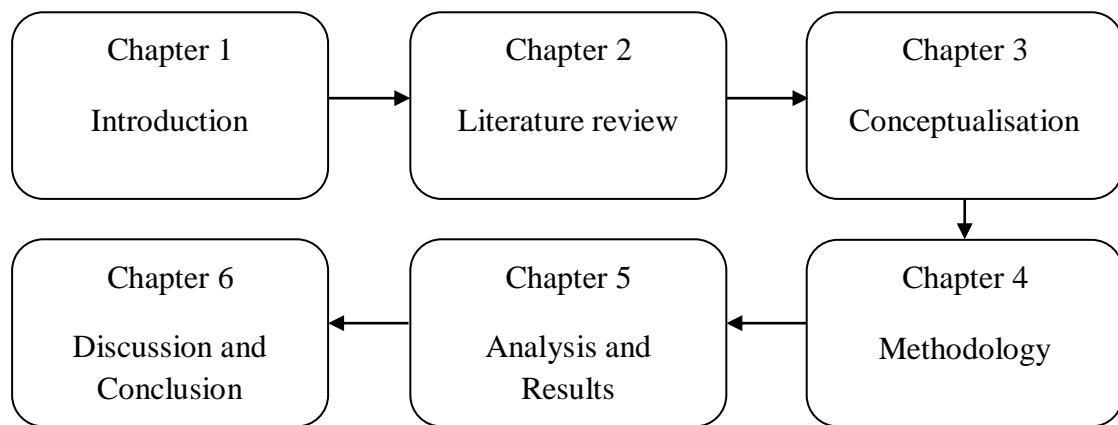
Basing on slack resources theory and multinationality construct, the study conceived four isolated hypotheses. These include Hypothesis 1 (a & b) that tests the relationship between high-discretion slack resources and innovation performance; Hypothesis 2 that tests the relationship between low-discretion slack resources and innovation performance; Hypothesis 3 that tests the interaction between high-discretion slack and firm's DOI in shaping innovation performance; and Hypothesis 4 that tests the interaction between low-discretion slack and firm's DOI in shaping innovation performance.

Through empirical investigation, the results supported Hypothesis 1a, 2 and 3. Conversely, they failed to support Hypothesis 1b and Hypothesis 4.

## 1.7 Thesis Outline

This study is divided into six chapters, the outlines of which are displayed in Figure 1.1 below.

**Figure 1.1 Thesis Outline**



Chapter 1 (Introduction) provides the background to the study and presents the research gaps and questions. Moreover, the research methodology and intended contribution of the study are proposed.

Chapter 2 (Literature Review) reviews relevant IB and managerial literatures to build the conceptual foundation of the study. The main task is to introduce the two research gaps in the IB research of innovation and illustrate the conceptual constructs need to address them.

Chapter 3 (Conceptualisation) reveals the study's conceptual developments. Using the slack resource theory and multinationality construct, a conceptual model is developed and four separate hypotheses are built.

Chapter 4 (Methodology) introduces the research design of the study. It describes the process of sample gathering and data collecting. It also presents the measurements adopted for operationalizing the involved variable and details the plan to conduct the regression analyses.

Chapter 5 (Analysis and Results) reviews and analyses the results of the regression analyses. It describes the variables and sample of the study and then uses the results of the regression analyses to examine the hypotheses.

Chapter 6 (Discussion and Conclusion) discusses the findings of this study. It explains why hypotheses are supported/ rejected and highlights the underlying implications. Then, it outlines the theoretical, methodological and managerial implications of this study. Lastly, it presents the limitations of this study along with recommendations for future research.

### **1.8 Chapter Summary**

This chapter introduces the background and rationale for this study. It introduced the two research gaps the study identified in reviewing the IB research of innovation. Additionally, it also presented the research objective and question, intended contributions, methodology and results of the study. Moreover, it provided the outline for this thesis. In Chapter 2, the IB research on innovation performance will be reviewed and the conceptual instruments needed to address its two research gaps will be detailed.

## CHAPTER 2: LITERATURE REVIEW

This chapter reviews the major literature pertaining to the research problem. Two research gaps in the IB research on innovation performance are presented and a way to address them is introduced. To do this, the chapter performs three main tasks. Firstly, it reviews the four main definitions of the innovation performance concept. Secondly, it explains how IB researchers have approached the innovation performance concept. Thirdly, it reveals the two research gaps to which IB researchers have not yet paid extensive attention. In summing up, it proposes a resolution and details the involved theoretical constructs, i.e. the slack resources and multinationality construct.

### 2.1 Defining innovation performance

Innovation performance can be defined broadly as the impact of innovation on a firm's overall performance (Schumpeter, 1942; Grossman and Helpman, 1991; Hagedoorn and Cloudt, 2003; Caloghirou, Kastelli and Tsakanikas, 2004; Laursen and Salter, 2006).

According to prior studies, this suggests the essence of innovation performance is the relationship between innovation activity and firms' financial performance. In response to this, prior researchers have primarily defined the concept of innovation performance in three ways. Firstly and most popularly, innovation performance was defined as the financial incentives of innovation activities. Secondly, innovation performance was understood as patenting activities resulting in firms' innovation. Thirdly, innovation performance was interpreted as the intensity of firms' innovation activities.

In line with the first definition, many researchers had defined innovation performance as the tangible economic returns generated by firms' innovation. Examples of these include authors such as Liu and Buck (2007), Alegre and Chiva (2008) and Kafouros and Wang (2009), all of whom saw the concept as the turnover of innovation (see also Nohria and Gulati, 1997; Fischer et al., 2001; Romijn and Albaladejo, 2002). As reported by Kafouros and Wang (2009), the economic return perception has been the most popular way of defining innovation performance for many years.

In addition to this perception, there were also authors who chose to perceive innovation performance as an output of innovation that carries financial incentives. Amongst those, authors such as Henderson and Cockburn (1996), Ahuja and Katila (2001) and Aghion et al.

(2005) saw innovation performance as patenting activities/behaviours (Dutta and Weiss, 1997; Schoenecker and Swanson, 2002; Miller, 2004). According to Ahuja (2000), this reflects how frequent innovation can produce patents and, consequently, how often it can promote firms' competitiveness and performance (see also Griliches, 1984; Griliches 1990; Baumol, 2002; Peeters and de la Potterie, 2006; Herold, Jayaraman and Narayanaswamy, 2006; Zeng, Xie and Tam, 2010).

Some researchers considered innovation performance essentially to be firms' innovative/R&D intensity (Baysinger and Hoskisson, 1989; Hall and Bagchi-Sen, 2002; Geiger and Cashen, 2002; Laursen and Salter, 2006). To these authors, R&D intensity specifies how likely it is that firms' innovation activities would subsidise firms' organisational capabilities, competitive advantages and performance (Hansen and Hill, 1991; Hitt et al, 1997; Geiger and Cashen, 2002; Almus and Czarnitzki, 2003).

For clarity of discussion, this study interprets innovation performance in the same way as Liu and Buck (2007), Alegre and Chiva (2008) and Kafouros and Wang (2009). Simply put, this means perceiving innovation performance as the tangible economic incentives generated by firms' innovation activities. The reason for doing so is threefold. Firstly, judging from the review of prior studies, the study found the economic return definition of innovation performance to be the most popularly accepted amongst researchers. To follow this trend, it therefore adopted the economic return definition. Secondly, by reviewing definitions, the study considered that innovation performance, no matter what form it takes, has to convert itself into economic returns to add to firms' performance. Therefore, to more directly address innovation performance, the study therefore followed the economic return definition. Thirdly, the intended arguments of this study have little to do with patenting and innovation intensity but are connected closely to the economic incentives of innovation. As a result, the economic incentive definition, in comparison with the other definitions, is strongly preferred in the study.

## **2.2 The research of innovation in IB studies**

To understand how innovation performance is shaped and generated, IB scholars have adopted several different theoretical perspectives. In particular, these include the resource-based view (RBV), the dynamic capability perspectives, the networking perspectives and the innovativeness perspectives. Simply put, based on the RBV viewpoint, it was argued that innovation produced innovation performance by providing firms with robust competitive



advantages (Autio et al, 2000; Knight and Cavusgil, 2004; Poon and MacPherson, 2005; Garengo and Bernardi, 2007; Eriksson, Nummela and Saarenketo, 2013). From the dynamic capability standpoint, innovation was contended to yield innovation performance by improving firms' abilities to learn from the external environment (Filatotchev and Piesse, 2009; Killen and Hunt, 2009; Alegre, Sengupta and Lapiedra, 2011; Corner and Wu, 2011; Woldesenbet, Ram and Jones, 2011). By applying the networking perspectives, it was theorised that innovation fostered innovation performance by exposing firms to great firm-to-firm interactions and learning opportunities (McDougall and Oviatt, 1997; Zahra, Ireland and Hitt, 2000; Mort and Weerawardena, 2006; O'Cass and Weerawardena, 2009; Coviello, McDougall and Oviatt, 2011). Moreover, through innovativeness philosophies, innovation is contended to induce innovation performance by helping firms to penetrate unexplored market segments (Oviatt and McDougall, 1994; Zahra, Ireland and Hitt, 2000; Zahra, 2004; Coviello, 2006; Zetting and Benson-Rea, 2008).

### **2.2.1 Innovation Performance from the Resource-Based View**

The RBV as a theory explains how different endowments of organisational resources, tangible and intangible, could lead firms to achieve different sets of competitive advantages (Barney, 1991; Peteraf, 1993; Grant, 1996; Barney, 2001; Ray, Barney and Muhanna, 2004). In short, it proposes that, with distinct sets of resources, firms could develop highly distinct capabilities by combining/exploiting them in different ways. The theory argues that robust capabilities will be created through productive combinations, providing new routines, competences and competitive advantages to firms (Eisenhardt and Martin, 2000; Lockett, Thompson and Morgenstern, 2009; Kraaijenbrink, Spender and Groen, 2010). Furthermore, the theory suggests that a collection of valuable, rare, inimitable and non-substitutable (VIRN) capabilities will result from an optimal combination (Teece and Pisano, 1994; Autio et al., 2000; Wu, 2010). In effect, sustained competitive advantages would have been generated, giving firms the chance to achieve enduring success in competition.

When explaining how innovation performance is shaped, scholars adopting the RBV viewpoints suggested that the process is largely driven by firms' knowledge of their key products. The authors argued that if the knowledge is extensive then firms are fully capable of refining, modifying and upgrading their products during innovation (Pitelis, 2004; Rodriguez and Rodriguez, 2005; Garengo and Bernardi, 2007). Furthermore, it also implies that firms are able to integrate their product expertise and create new products during

innovation (Collis, 1991; Knight and Cavusgil, 2004; Alegre, Sengupta and Lapiedra, 2013). As a result, when firms engage in innovation activities, scholars posited that they would effectively achieve two outputs. On the one hand, there would be a set of uniquely valuable products, enabling firms to better service their customers (Tallman, 1991; Autio et al, 2000; Pla-Barber and Alegre, 2007). On the other hand, there is considered to be a portfolio of valuable, rare and inimitable tacit knowledge that enhances firms' abilities to alter their products (Hitt, Ireland and Hoskisson, 1999; Autio et al, 2000; Knight, 2001). With the former outputs, authors suggested that firms would then achieve a specific amount of innovation performance. With the latter outputs, authors argued that firms would experience growth in their organisational capabilities, leading them to acquire better competences and embedded routines. In turn, innovation would lead firms to extra competitive advantages, driving them to consolidate their market position and obtain superior innovation performance (Poon and MacPherson, 2005; Garengo and Giovanni Bernardi, 2007; Eriksson, Nummela and Saarenketo, 2013).

To extend the argument above, studies from IB research had applied it to the investigation of many research topics. Based on the idea that knowledge breeds innovation performance, Knight and Cavusgil (2004) argued that an innovation culture is highly capable of leading firms to great performance. In the same vein, Pitelis (2004) posited that continuous innovation and knowledge integration is instrumental to firms' pursuit of long-term success. Also applying this perception, Poon and MacPherson (2005) contended that knowledge acquisition is a sound strategy through which IB entities may gather competences and acquire ample profits. Building on the same notion, Rodriguez and Rodriguez (2005) and Pla-Barber and Alegre (2007) advanced a positive relationship between firms' innovation and exporting performance.

From the RBV standpoint, prior studies in the IB research have explained innovation performance as being shaped by firms' endowment of product knowledge. In explanation, it was argued that knowledge can lead firms to innovate productively and acquire great outputs from innovation. This means that firms, by the end of their innovation activities, will have innovations of significant embedded value and furthermore, robust competitive advantages. With the help of these outputs, it is asserted that firms will then achieve innovation performance of a specific degree.

### **2.2.2 Innovation performance from the dynamic capability perspective**

The theory of dynamic capability is, in essence, an upgraded version of the RBV theory. Adding to the RBV theory, the dynamic capability theory argues that the true engine of competitive advantages conception is the routines that firms create to reconfigure their resources (Helfat, 1997; Eisenhardt and Martin, 2000; Makadok, 2001). Without them, it suggests, firms would then possess a static pool of resources and capabilities, but no conceivable ways of enriching them (Iansiti and Clark, 1994; Winter, 2003; Marsh and Stock, 2006). Also, without them, firms would have no way of improving their competitive advantages, with readily adoptable resources and capabilities present in their external environment (Eisenhardt and Martin, 2000; Winter, 2003; Blyler and Coff, 2003).

With regard to innovation performance, scholars adopting the dynamic capability perspectives share many of the same disciplines as those adopting the RBV principles. These include how knowledge is the key for firms to achieve competitive advantage renewal and how innovation could integrate firms' existing knowledge and create new knowledge. In addition, these disciplines also include how improved knowledge, products and competitive advantages could drive firms towards better innovation performance.

Beside the insights above concerning innovation performance, the dynamic capability perspective is able to contribute an additional rationale. Basically, this refers to how innovation could boost a firm's ability to identify and assimilate knowledge from its external market and in turn yield innovation performance (Luo, 2000; Corner and Wu, 2011; Lew, Sinkovics and Kuivalainen, 2013). According to Eriksson, Nummela and Saarenketo (2013), the way this works is related closely to the process wherein innovation improves firms' endowment of knowledge (see also Lu et al., 2010). When this happens, it was argued that, beside extra capabilities and competitive advantages, firms could receive the ability to see and appreciate the value of external knowledge (Lawson and Samson, 2001; Weerawardena et al., 2007; Woldesenbet, Ram and Jones, 2012). It was also argued that, with the improved endowment of knowledge, firms could also gain extra proficiency in absorbing knowledge related to their main products (Madhoc and Osegowitch, 2000; Griffith and Harvey, 2001; Ellonen, Wikstrom and Jantunen, 2009). Because of these newly obtained abilities, authors contended that, when valuable product knowledge emerges, firms that actively innovated would then be the first to acquire it (Ellonen, Wikstrom and Jantunen, 2009; Prange and Verdier, 2011; Eriksson, Nummela and Saarenketo, 2013). Through further innovation

activities, the newly achieved knowledge could then enhance firms' skills in refining their products and improve their capabilities, competences and routines. In consequence, firms could then devise more valuable innovative products and gain stronger competitive advantages. Ultimately, firms' innovation performance would be boosted.

Drawing on the perceptions of the dynamic capability theory, researchers have addressed many additional research problems in the IB studies. For instance, by doing so, Ellonen, Wikstrom and Jantunen (2009) revealed that firms with stronger ability in acquiring valuable knowledge tend to have higher innovation performance. Also, they found that innovation tends to improve firms' ability to acquire knowledge. Furthermore, by applying the perceptions, Weerawardena et al (2007) argued that firms with intensive innovation and learning abilities often achieve great performance. In the same vein, Prange and Verdier (2011) found that firms with a balanced dynamic capability in learning and innovation tend to perform very well in the IB context. Moreover, Hall and Bagchi-Sen (2002) state that firms that are better at learning from their customers and suppliers are found to achieve better innovation performance. Lastly, Hung et al. (2010) argue that great dynamic capabilities, together with effective process alignment, foster productive innovation and bring about marked performance improvement.

By employing the perspectives of dynamic capability, IB scholars have again linked firms' knowledge-based resources to their innovation performance. They did so by revealing firms' knowledge as a facilitator of their learning capacities. They also pointed out how a good learning capacity can enable firms to acquire valuable external knowledge with great efficiency. It was further argued that a larger portfolio of knowledge and a higher innovation performance would have been achieved after the absorption was completed.

### **2.2.3 Innovation performance from the networking perspective**

The networking perspective explains how activities like alliancing and inter-firm collaboration could help firms achieve a favourable objective. In the IB research, the perspective is typically used to illustrate knowledge transference between subsidiaries (Phene and Almeida, 2003; Schmid and Schurig, 2003; Ambos, Ambos and Schlegelmilch, 2006), acquiring knowledge through business interactions (Tsai, 2001; Zhang, Macpherson and Jones, 2006; Abimbola, 2009) and rapid internationalisation (Welch and Welch, 1996; Coviello and Munro, 1997; Riap, Riap and Knight, 2005). Its main argument is that, through productive networking activities, firms may achieve resources such as valuable knowledge,

resources and capabilities from business interactions. With these, firms could also obtain a higher level of competitive advantage and, sometimes, rapid international expansion.

From the networking perspective, IB research scholars have presented that networking with IB entities is a way for firms to arrive at higher innovation performance. For MNCs in particular, the same argument applies, except that the interactions are sometimes between the enterprises and their subsidiaries (Schmid and Schurig, 2003; Phene and Almeida, 2003; Venaik, Midgley and Devinney, 2005). In essence, the logic behind the proposition is that intensive and productive interactions between IB entities can strongly enrich a firm's understanding about its main products (Venaik, Midgley and Devinney, 2005; Ambos, Ambos and Schlegelmilch, 2006; Zhang, Macpherson and Jones, 2006). In effect, by applying a new understanding of innovation, firms would then be able to create innovation of great value and, as a result, achieve considerable innovation performance (Coviello and Munro, 1997; Tsai, 2001; Basile, 2011). Additionally, with more product knowledge, firms would also develop more competitive advantages, further uplifting their innovation performance. This logic makes productive business interactions a factor that directly improves firms' innovation capabilities. At the same time, it makes entering IB networks a way of promoting firms' innovation performance. In the IB innovation research, the proposition is typically considered to imply that greater internationalisation can help firms seize more interactions and gain greater innovation performance (Pittaway et al. 2004; Kocak and Abimbola, 2009; Zeng, Xie and Tam, 2010; Higon and Driffield, 2010).

However, in order for these events to happen, it was argued that firms must have some knowledge-based assets/innovations that no other IB entities concurrently possess (Lynskey, 2004; Zahra, Ireland and Hitt, 2000; Mort and Weerawardena, 2006; O'Cass and Weerawardena, 2009). If these assets are valuable enough, it is then expected that other IB entities will take an interest in capturing them (Hanna and Walsh, 2008; Coviello, McDougall and Oviatt, 2011; Gallego, Rubalcaba and Hipp, 2012). As a result, this would then lead the other entities to make an offer for firms to collaborate with them and join their business network. Once the offer is accepted, frequent business interactions would occur and the opportunities for firms to learn from the interactions would thereby be created.

Applying the networking rationale, IB researchers have made many findings around how business interactions can lead to proficiency in innovation and greater innovation performance. Effective networking and knowledge sharing with subsidiaries was argued by

Ambos, Ambos and Schlegelmilch (2006) to be a significant source of innovation capability for MNCs. If everything is undertaken effectively, the authors theorised that exceptional innovations and great performance could be achieved.

In Schmid and Schurig (2003), subsidiaries were described as the main agent of knowledge absorption and creation. Therefore, effectively interacting with them was said to have become a significant approach by which MNCs create innovation and produce innovation performance. In Hanna and Walsh (2008), 'interfirm' cooperation and networking was argued to be a way for firms to perform numerous tasks more effectively. Innovation is amongst them, leading the authors to suggest that networking leads to effective innovation and greater innovation-related performance.

Furthermore, in Tsai (2001), effective network designs were argued to be the key for MNCs to promote innovation in their knowledge-intensive subsidiaries. Through the design, it is considered that better innovations will be conceived in these subsidiaries and greater innovation performance will be achieved. Moreover, in Venaik, Midgley and Devinney (2005) both intra- and interfirm networking activities were argued to be the source of MNCs' innovation and innovation performance.

Overall, by adopting the networking perspective, previous IB scholars have illustrated how networking activities can enlarge firms' innovation performance. In particular, they argued that networking can give firms the chance to have productive interactions with either other firms or their own subsidiaries. Through the interactions, more product knowledge will be acquired, leading firms to develop additional competitive advantages and innovations of a higher value. It was furthermore argued that, as a result of using these achievements, firms will achieve higher innovation performance.

#### **2.2.4 Innovation Performance from the innovativeness perspective**

The innovativeness perspective is a fundamental part of the construct named the entrepreneurial orientation. In the construct, the perspective is employed mainly to explain why an innovative strategic orientation could help firms to pursue growth and productive value creation (Lumpkin and Dess, 1996; Lyon, Lumpkin and Dess, 2000; Mort and Weerawardena, 2006). With this orientation, the construct argued that firms would be able to generate uniquely valuable technologies (McDougall and Oviatt, 2000) and use them to capture business opportunities that their competitors could not (Zahra and George, 2002;

Zahra, Korri and Yu, 2005). In the IB research, the perspective is most typically applied in analysing small firms' (such as international new ventures) internationalisation (Dimitratos, Lioukas and Carter, 2004; Mort and Weerawardena, 2006; Keupp and Gassmann, 2009).

Employing the innovativeness perception, authors of the IB study have presented another way that firms' product knowledge can extend their innovation performance. That is, by holding a set of idiosyncratic knowledge-based assets, firms could sometimes recognise a stream of latent customer demands invisible to their major competitors (Oviatt and McDougall, 1994; Zahra, Ireland and Hitt, 2000; Zhou, Barnes and Lu, 2010). If the stream is large and the demands are addressable via innovation, it was argued that by recognising the demands, firms are given the opportunity to occupy a highly specific niche market (Shrader, Oviatt and McDougall, 2000; Oviatt and McDougall, 2005; Knight and Cavusgil, 1996). As soon as they have seized this opportunity, researchers argued, firms would essentially have made two advantageous achievements. On the one hand, they would have created innovations of great customer value and profitability (Karra, Phillips and Tracey, 2008; Fernhaber, McDougall and Oviatt, 2007). On the other hand, they would have found a way to generate innovation performance without facing any competitive pressures (Madsen and Servais, 1997; Autio, 2005; Andersson and Wictor, 2003). According to Zahra (2004), as long as these firms continue to innovate and serve the market segment, these outputs would ultimately turn into sustained competitive advantages. By effectively exploiting the advantages, it was argued, firms would achieve greater innovation performance (Riap, Riap and Knight, 2005; Knight and Cavusgil, 2005; Kuivalainen, Sundqvist and Servais, 2007).

Following the innovativeness perspective, authors have made many comments on innovation performance. For example, in Zhou, Barnes and Lu (2010), it was argued that innovating for market niche would only yield innovation performance when reinforced by constant innovation. In Fernhaber, McDougall and Oviatt (2007), it was contended that targeting niche markets is most effective in yielding innovation performance for firms within industries with specific attributes. In Prashantham and Young (2009), to avoid losing the financial merits gained from targeting niche markets, firms are encouraged to be proactive in learning and capability forming. In Kuivalainen, Sundqvist and Servais (2007), it was suggested that firms that are more entrepreneurial tend to gain better innovation performance by targeting a market niche.

The innovativeness perception has led IB scholars to conclude that servicing an unexplored market niche is a way to generate innovation performance. In essence, the theoretical basis of the perception is that knowledge and innovation enables firms to recognise niche market opportunities that are undetectable to their major competitors. By addressing the opportunities through further innovation, firms would eventually achieve rare and inimitable competitive advantages and, in turn, greater innovation performance.

### **2.2.5 Research gaps**

After reviewing the IB research of innovation, it appears that, in ascertaining what affects innovation performance, prior studies have made a number of achievements. From the RBV perspective, innovation performance was presented as the product of knowledge integration and new product development. From the dynamic capability perspective, innovation performance was shown to be influenced by firms' abilities to recognise and acquire new knowledge from the external environment. From the networking perspective, innovation performance was said to be governed by firms' involvement in IB networks and its interactions with other IB entities/its own subsidiaries. From the innovativeness standpoint, innovation performance was argued to be shaped by firms' (product knowledge-related) ability to sense, enter and fully occupy a market niche.

Through analysing the achievements, the study arrives at two observations. Firstly, in terms of what shapes innovation performance, prior studies of the IB research seem to agree that firms' accumulation of knowledge generally plays a crucial role. In the RBV and dynamic capability stream of IB research, indicators of the observation can be found in their shared belief that knowledge precedes innovation and capability creation. In the networking stream of IB, indicators can be identified in the argument that firms need valuable and distinct knowledge to be invited to join IB networks. In the innovative research stream, the indicator is that firms require a certain degree of product understanding before they are able to recognise and capture untouched market niches. To the study, this observation implies, on the one hand, that all four streams of IB research on innovation have accepted that knowledge-based resources precede innovation performance. On the other hand, it indicates that all four streams of IB research concur with the RBV argument that valuable resources lead to robust capabilities and competitive advantages.

The second observation is related exclusively to the networking stream of IB research. While reviewing it, the study realises that firms' DOI has been described as a factor that regulates



their innovation performance. Through gaining wider internationalisation, it is argued that firms could have the opportunity to join more business networks and in turn engage in more frequent business interactions. In this regard, this study considers that IB innovation research recognises firms' DOI as an amplifier of their innovation performance.

Through these observations, the study has detected two potential research gaps in the IB innovation research. Firstly, while all four research domains have made an RBV-related argument, the study found the emphasis of their investigation to focus solely on firms' knowledge-based resources. As the RBV theory covers both tangible and intangible resources (Barney, 2001), the study realised that little is known in the IB studies about how tangible resources affect innovation performance (see also Autio et al., 2000; Ray, Barney and Muhanna, 2004; Wu, 2010). Although such a question, as far as the study knows, has yet to be raised in the IB research as a valid concern, it has, however, occurred in the managerial research of innovation. Moreover, great progress, particularly in the research into slack resources, has already been made in resolving the question (Nohria and Gulati, 1995; George, 2005; Daniel et al, 2004; Lin, Cheng and Liu, 2009). Seeing that many of the studies were performed on IB entities (see Nohria and Gulati, 1996), the study ascertained that paying minimal attention to how tangible resources affect innovation is a research gap (see also Geiger and Cashen, 2002, as an example). In addition, the study realises that, to further the IB analysis of innovation performance, the achievements made in the slack resource research has to be integrated in the IB research.

Secondly, in reviewing the networking stream of IB research, the study found its rationale on how firms' DOI shapes innovation performance to reflect only a part of reality. According to researchers such as Kafouros et al. (2008), this is true, as there are in total three ways for internationalisation to change firms' innovation performance (see also Jeong, 2003; Filipescu, Rialp and Rialp, 2009). By proposing the interaction argument, the networking research has only addressed one of them. The study indicates that international diversification can also alter innovation performance, not only through interactions, but also by offering firms additional customers (Hitt, Hoskisson and Kim, 1997; Wang and Kafouros, 2009) and organisational resources (Hitt and Ireland, 1994; Kafouros and Buckley, 2008). For this reason, the study concludes that a further research gap is identified and there is room for improvement in the networking stream of IB research.

### **2.2.6 Plan to resolution**

In regard to addressing the research gaps, the study recommends the IB research to absorb two constructs developed in the managerial research of innovation. In particular, these refer to the slack resource theory and multinationality construct. By embracing the former, the study believes that the IB research of innovation could learn how tangible/slack resources could serve to precede firm's innovation performance (Damanpour, 1991; Voss, Sirdeshmukh and Voss, 2008; Huang and Chen, 2010). Simply put, the slack resource propositions can help address the first research gap. By embracing the latter, the study posits that the IB research of innovation could then cover all three ways in which internationalisation could alter firm's innovation performance (Gomes and Ramaswamy, 1999; Kotabe, Srinivasan and Aulakh, 2002; von Zedtwitz and Gassmann, 2002; Capar and Kotabe, 2003). In a nutshell, the multinationality construct could help resolving the second research gap.

## **2.3 The theory of slack resources**

This section details the disciplines of the slack resource theory. In doing so, it covers firstly the definition of slack resources. Then it introduces the effects of high-discretion slack on innovation performance. After that, it introduces the effects of low-discretion slack on innovation performance.

### **2.3.1 Defining slack resource**

Over the years, many definitions of slack resources have been put forward. At an early stage, Cyert and March (1963) identified slack as “the disparity between the resources available to organisations and the payments required to maintain the coalition (p.36)”. In addition, Dimick and Murray (1978) emphasised that slack resources have to be resources uncommitted to any specific use. Also, they must be open for redeployment at the manager's discretion. Bourgeois (1981) suggests that slack resource is a “cushion... which allows an organisation to adapt” to internal and external pressures surrounding its operations (p.30). A more widely accepted definition came from Nohria and Gulati (1996; 1997). They proposed that slack resource “refers to the pool of resources in an organisation that is in excess of the minimum necessary to produce a given level of organisational outputs (p. 1246)”. A further definition updated recently by George (2005) interprets slack resources as “utilisable resources that can be diverted or redeployed for the achievement of organisational goals (p.661)”. Moreover, he suggests that slack resources are an inducement to experimentation,

risk-taking and exploration of uncertain strategic options (George, 2005; see also Geiger and Makri, 2006).

A summary of these definitions reveals that slack resources have several common attributes. Firstly, slack resources are redundant organisational inputs that remain unexploited after firms have fully implemented their intended business strategies (Damanpour, 1991; Tan and Peng, 2003; Daniel et al, 2004). Secondly, slack resources are multifunctional organisational resources that are applicable for achieving a series of organisational intentions (Subramanian and Nilakanta, 1996; Judge, Fryxell and Dooley, 1997; Herold, Jayaraman and Naratanaswamy, 2006). Thirdly, slack resources as uncommitted resources are perfect raw materials for financing firms' contingency strategies against any conceivable threats and hazards in the future (Gatignon, et al, 2002; Tan, 2003; Voss, Sirdeshmukh and Voss, 2008). Lastly, slack resources as a firm's contingency strategy can cushion a firm from threats generated by a manager's pursuit of risk-intensive operations (Nohria and Gulati, 1995; Geiger and Cahsen, 2002; Yang, Wang and Cheng, 2009).

Besides the definitions, a further approach used by previous scholars to study slack resources is through classification. According to Nohria and Gulati (1996), the intention behind classification is to distinguish slack resources in accordance with their different impacts on different organisational activities. In this proposition, Geiger and Cashen (2002) found that different types of slack are capable of inciting different levels of reaction from managers towards the same issue. To add to this, George (2005) also observed that diverse forms of slack can cause diverse impacts on managers' behaviours when facing a specific situation. Basing on these findings, this study theorises that different types of slack can operate differently when preceding firms' innovation and innovation performance. As a result, it follows prior studies and classifies slack resources based on a widely accepted criterion.

Upon reflection, it was decided that the study would adopt the managerial discretion criterion to classify slack resources. The basis of this decision is largely related to the principles of the criterion in differentiating slack based on their decision-making implications (Sharfman et al, 1988; George, 2005). Since the study intends to frame its proposition with slack resources construct and all of its arguments pertaining to decision-making, this criterion is arguably the ideal choice.

Following the suggestions of Sharfman et al (1988), adopting the managerial discretion criterion means the study has classified slack into high- and low-discretion slack. In interpretation, George (2005) identified high-discretion slack as slack resources that are easily deployable at the manager's discretion. Examples of these include firms' cash, receivables and securities. Following this, George (2005) also illustrated low-discretion slack as resources that are less flexible for deployment at the manager's discretion. Examples of these involve firms' equity, accumulated debts and basically everything else that makes up firms' borrowing power.

### **2.3.2 High-discretion slack and innovation**

In relation to innovation performance, firms' high-discretion slack (e.g. cash and securities), according to the slack resource research, can serve to deliver three impacts. When firms' reserves of high-discretion slack is low, there is an impact, as referred to in prior studies, named the 'slack search' effect (Chen and Miller, 2007; Adner and Levinthal, 2004; Huang and Chen, 2010). More specifically, this refers to an effect where firms are motivated to search for effective uses for all of their tangible slack resources. In innovative enterprises, the 'use' in question would thus be innovation. According to Nohria and Gulati (1996), the reason for this effect has a lot to do with how firms and managers instinctively perceive slack resources. That is, in addition to a risk buffer, it was suggested that managers are highly prone to seeing organisational slack as a sign of inefficiency and wastage (Judge, Fryxell and Dooley, 1997; Subramaniam and Youndt, 2005). They would therefore be driven to apply the high-discretion slack in operations that best serve their company's interest. As advised by Daniel et al (2004), in innovative enterprises, the operations in question would often refer to innovation (Nohria and Gulati, 1996; Herold, Jayaraman and Naratanaswamy, 2006).

The slack search effect can essentially exert two influences on firms' innovation and innovation performance. On the one hand, as more resources are applied to innovation, firms' innovation activities are made more intensive and the potential payoffs are more substantial (Tan, 2003; George, 2005). On the other, because a low-level high-discretion slack offers limited threat buffering, firms' disciplines in making innovation-related decisions are thereby made highly strict (Subramaniam and Youndt, 2005; Huang and Chen, 2010). In consequence, according to Tan and Peng (2003), firms' innovation activities would then be made more effective and firms' innovation performance made more substantial. Collectively, the two influences suggest that, if the slack search effect happens, the outcome would most likely

involve highly refined innovations and greater innovation performance (Tan and Peng, 2003; Geiger and Makri, 2006). Graphically, the outcome presents a positive relationship between innovation and innovation performance.

The second impact of high-discretion slack on innovation occurs when a firm's reserves of high-discretion slack reaches, relative to the firm's size, the medium level. Because of this, it was suggested that firms' high-discretion slack would be able to maximise firms' effectiveness and performance in innovation (Nohria and Gulati, 1997). In comparison, the impact in question is almost identical to the slack search effect. On the one hand, they both encourage firms to apply the additional high-discretion slack to innovation. On the other, they both provide firms with a less than robust buffering mechanism, as well as a reminder to be cautious in innovation (Geiger and Cashen, 2002; Nohria and Gulati, 1996). The only difference is that a medium level of high-discretion slack allows firms to take on more innovation projects and/or of greater payoff potential. As a result, with a cautious attitude towards innovation, firms are expected in prior studies to be effective in conducting their extensive innovative activities (Martinz and Artz, 2006; George, 2005; Tan and Peng, 2003). Furthermore, following the activities, it was also predicted that firms will experience substantial innovation performance.

In prior studies, the innovation performance achieved with a medium level of high-discretion slack is believed to be the maximum of all innovative enterprises for two reasons. Firstly, this is because prior studies are convinced that a medium level of high-discretion slack stands for the ideal amount of resources for firms to productively pursue innovation. Secondly, this is because prior research believes an abundant level of high-discretion slack can corrupt firms' standards when making effective innovation-related decisions.

To justify both reasons, the slack resource research introduces the impact of abundant high-discretion slack (i.e. the third impact of high-discretion slack) on firms' innovation. In addressing the first reason, researchers such as Geiger and Cashen (2002) suggested that, when firms' high-discretion slack goes above the medium level, ineffectiveness is fostered. Primarily this is because an excess reserve of high-discretion slack grants firms a buffering mechanism that is overly powerful. Under its protection, previous authors believe that managers will often become increasingly less concerned with innovation failures, as the costs associated with them are easily affordable. Nohria and Gulati (1996) suggested that managers would then, therefore, adopt innovation projects with high risks and uncertain rewards, which

do not often result in productive innovation. In addressing the second reason, prior studies argued, facing an excess level of high-discretion slack, firms are greatly susceptible to a bias in decision-making. In the study by Kahneman and Lovallo (1994), this is called the planning fallacy. This refers to an inclination by managers to make decisions about a certain operation with a sense of overconfidence and unjustified optimism (Kahneman and Lovallo, 1994). In connection with innovation performance, researchers have argued that this bias could prevent firms from being cautious in innovation-related decision-making (Herold, Jayaraman and Naratanaswamy, 2006; George, 2005). Hence, effective innovations are thwarted and opportunities to achieve substantial innovation performance are eroded.

In relation to innovation performance, researchers of slack resources generally believe the third impact or the impact of abundant high-discretion slack on innovation to be negative (Tan and Peng, 2003; Geiger and Cashen, 2002). With planning fallacy and an overprotective buffering mechanism at play, it is argued that firms would go through a phase of ineffectiveness in terms of innovating. If the ineffectiveness is not corrected in time, the predicted outcome is that their innovation performance will decrease considerably. That is also why a medium level (specific to different firms) of high-discretion slack was seen to maximise firms' innovation performance. Graphically, if mapping how innovation performance changes when firms' high-discretion slack grows from medium to abundant, a negative graph will be produced.

In summary, with regard to the impacts of high-discretion slack on innovation and innovation performance, the slack resource theory makes three propositions. Firstly, when firms' stocks of high-discretion slack are low, it suggests that effective/cautious innovation will result and greater innovation performance will be achieved. Secondly, when firms' stocks of high-discretion slack is at the medium level, it suggests that effective innovation involving more innovation projects will be produced and sizable innovation performance will be attained. Thirdly, when firms' stocks of high-discretion slack goes above the medium level, it suggests that ineffective innovation will occur and low-innovation performance will be induced. Together, the three impacts above reveal that the relationship between high-discretion slack and innovation performance is shaped like an inverted U.

By reviewing the high-discretion portion of the slack resource theory, the study indicates that part of the study's first research gap can already be addressed. With regard to the antecedent of innovation performance, rationales of high-discretion slack research illustrated how high-

discretion slack could induce effective/ ineffective innovation. Relating to the determinant of firms' innovation effectiveness, the research has shown how stringent and loss decision-making disciplines can breed productive/unproductive innovation. Pertaining to how the antecedent could shape firms' innovation effectiveness, the research explains how various levels of high-discretion slack alter firms' decision-making disciplines. Regarding the relationship between innovation performance and antecedents, the research showed an inverted U-shaped curve between innovation performance and high-discretion slack.

### **2.3.3 Low-discretion slack and innovation**

In relation to innovation, firms' low-discretion slack (e.g. equity and accumulated debts), according to the slack resource research, can reliably exert two impacts. When firms' reserves of low-discretion slack resources are high, meaning firms' debts are low and equity is high, the impact is that risk-taking and innovation is encouraged. While a low level of debt does not appear to be the ideal context for innovation, prior studies still believe innovation can be resulted due to two reasons (Geiger and Cashen, 2002; Tan and Peng, 2003). On the one hand, this is because low-discretion slack, just like its high-discretion counterpart, is fully capable of offering a buffering mechanism. As a result, when firms have it at a high degree, they are thus (to some extent) shielded from the negative ramifications of risky operations such as innovation. When these circumstances arise, researchers such as Wiseman and Bromiley (1996) have argued that there is a high chance that innovative enterprises will undertake innovation (see also Voss, Sirdeshmukh and Voss, 2008). The second reason why low-discretion slack could induce innovation is related to how good borrowing power could prompt firms to be selective, rather than close to adopting innovation. Therefore, when projects with low risk and predictable returns emerge, it was argued that firms would prefer to innovate (and make profits) rather than stagnate (and make no profits). To explain why this is the case, Moses (1992) puts forth an argument concerning slack resources and risk-taking (see also Singh, 1986; Martinz and Artz, 2006). That is, when firms hold a high level of low-discretion slack, they tend to regard risk-taking in the same way as those holding a low level of high-discretion slack. In effect, when innovation projects with acceptable risk come along, a firm's reaction is thus to cautiously undertake and develop them, just like the slack search perception presents.

By reviewing the first impact of low-discretion slack on innovation, the study realises that it has the potential to offer reasonable innovation performance to firms. As above, this is

because, on the one hand, low-discretion slack could present a buffering mechanism upon which firms could feel confident to innovate. On the other hand, this is because low-discretion slack could prompt firms to selectively and cautiously undertake innovation projects with reasonable returns. A reasonable result is therefore achieved.

The second impact of low-discretion slack on innovation, according to prior studies, comes when a firm's holding of low-discretion slack is at a low level. According to the definition, a low level of low-discretion slack could either mean a firm's equity is limited or it could suggest that a firm's liabilities are extensive. In either case, the implication is identical. That is, firms are facing potentially serious threats of bankruptcy. Based on this implication, Staw, Sandelands and Dutton (1981) proposed the second impact of low-discretion slack on innovation in their 'threat-rigidity' argument. In it, they argued that, when firms' survival is in jeopardy, they tend to re-evaluate their strategic objectives and prioritise survival in their strategic agenda. With risk-taking activities like innovation, this means a full suspension of all ongoing projects and spending cuts. In consequence, whenever firms' reserves of low-discretion slack falls under a specific point, their innovation activities and innovation performance would then gradually disappear.

In summary, concerning the relationship between low-discretion slack and innovation performance, the slack resource theory offers two propositions. When firms' reserves of low-discretion slack are high, then cautious innovation will be induced and reasonable innovation performance will be attained. When firms' reserves of low-discretion slack are low, then a full suspension of all innovation activities will be engendered and a decline of innovation performance will be incited. If putting these two impacts into graphs, a linear and positive relationship would be achieved between low-discretion slack and innovation performance.

Upon analysis, the study realises that certain aspects of the study's first research gap are addressable by the low-discretion slack part of the slack resource theory. Firstly, concerning the antecedent of innovation performance, rationales of the low-discretion slack research explains how low-discretion slack can provoke innovation. With regard to the factors that shape firms' innovation effectiveness, the research suggests how low-discretion slack could encourage firms to innovate with extra care and caution.



## 2.4 The multinationality construct

Overall, the multinationality construct presents three ways in which internationalisation could affect firms' innovation activities and then innovation performance: firstly, by providing additional foreign customers; secondly, by offering cost-effective and/or novel resources; thirdly, by supplying valuable foreign technology/knowledge.

As suggested by the multinationality construct, the first way for internationalisation to affect firms' innovation performance is through providing extra markets and additional customers. The basis of this proposition comes from a basic IB discipline that foreign market penetration brings firms a pool of new potential customers. As more customers mean higher sales potential for firms' innovation, it is thus clear that market penetration or internationalisation could improve firms' innovation performance.

In prior studies, the second way for multinationality to influence innovation performance is to work through providing valuable knowledge and cost-effective resources. In essence, the basis of this proposition comes again from the fundamental disciplines of the IB studies. More specifically, it suggests that one of the primary outputs of foreign market penetration is the opportunity for firms to acquire cost-effective inputs for their operational needs. According to Wang and Kafouros (2009), for innovative enterprises, these refer primarily to valuable technologies and cheap/diverse R&D resources.

When the outputs are mainly resources instead of technologies, it was suggested that firms may achieve higher innovation performance in two plausible ways. If the resources are just cost-effective, then by acquiring those (by spending either high- or low-discretion slack) firms could largely lower their innovation costs (Kotabe et al, 2002; Goerzen and Beamish, 2003). According to Cheng and Bolon (1993), this advantage is especially apparent with locally embedded resources. For instance, in comparison with firms' domestic markets, foreign markets may supply cheap, yet highly skilled, personnel with whom the firm could trust its R&D operations. Similarly, foreign markets may also provide state-of-the-art research facilities or capitals at a very low price, enabling firms to again considerably cut their R&D spending (Cheng and Bolon, 1993). Authors Kotabe, Srinivasan and Aulakh (2002) suggested that when resources like these emerge, firms would therefore be granted a considerable competitive advantage in innovation development. Furthermore, they would presumably also be given the opportunity to exploit their innovation at a competitive price level, thus boosting their ultimate level of innovation performance. However, if the resources

acquired are both cost-effective and novel, according to Kafouros, et al. (2008), the effect that multinationality could pose on firms' innovation is much more powerful. When this happens, there are arguments (Santos, Doz and Williamson, 2004) suggesting that internationalisation would have given firms an idiosyncratic portfolio of resources (see also Casson, 2000). Once this unique portfolio is obtained, it is expected that firms would have achieved the resource foundation to develop innovations of radical newness and profitability. If this is true, Kotabe (1990) argued that, as firms get more geographically diversified, they would also become more capable of developing radical innovations of exception value (see also Knight and Cavugill, 2004). After these innovations begin to make profits, firms' innovation performance would be greatly promoted.

When the output of internationalisation is mainly knowledge, it was advised multinationality could boost innovation performance by enhancing firms' innovation capabilities. To explain how, researchers like Knight and Cavugill (2004) tendered the argument that being multinational allows firms to work with highly achieving foreign research institutes (see also Lu and Beamish, 2001; Capar and Kotabe, 2003). As productive collaboration is established, it was argued that firms should thereby be able to gain valuable and locally devised insights into their main business offerings. More importantly, with the help of the institutes, Gomes and Ramaswamy (1999) asserted that firms would be able achieve this expertise in a highly condensed time frame. Through productive knowledge integration, these firms are further expected to reach an improved collection of innovation capabilities (Gomes and Ramaswamy, 1999; Qian et al., 2008). Once these capabilities are applied, Zedtwitz and Gassmann (2002) suggest that firms will instantly gain the competence to create valuable innovation in a cost-effective fashion. At the end, if everything is handled as expected, then firms would attain superior innovation performance, making multinationality a contributing factor to firms' innovation performance. However, as contended by Hitt et al. (1997), the effects explained above may be more instantaneous if multinationality could expose firms to readily available new technologies. When these technologies are valuable enough, it was deduced that firms may be able to conceive a new innovation without a process of rigorous research and refinement. As fewer activities mean smaller investments, firms with new technologies could then achieve significant revenues and performance from their innovation. Once again, the knowledge outputs of multinationality have led firms to greater innovation performance.

In summary, in illustrating the effects of multinationality on innovation performance, the research of multinationality advanced two important propositions. Firstly, it explained how the resources and customer output of multinationality could facilitate firms' development and exploitation of their innovations. Secondly, it clarified how the knowledge outputs may lower firms' R&D spending and enhance their capabilities in innovation.

## **2.5 Chapter summary**

This chapter presented an overview of the IB research concerning innovation performance. In doing so, it uncovered two research gaps that the IB researchers have not yet paid much attention to. In proposing a resolution, the chapter recommended the IB research of innovation to absorb the slack resource theory and multinationality construct as potential remedies. By absorbing them, it is believed that the IB research of innovation will become more aware of how slack resource could precede and how firms' DOI could alter innovation performance. Beyond recommending them, the study also illustrated the two constructs in preparation for hypotheses forming and model constructing, i.e. the main tasks of Chapter 3.

## CHAPTER 3: CONCEPTUALISATION

Chapter 3 presents the hypotheses and the conceptual model of the study. In line with the literature reviewed in Chapter 2, the chapter integrates the slack resource theory and multinationality construct to address the research gaps stated in the introduction. The chapter is organised as follows. Firstly, it explains and hypothesises how slack resource, and low- and high-discretion slack, contributes to IB entities' innovation performance. Secondly, it proposes the moderation effects of multinationality, the construct of firms' DOI, on the relationship between slack resources and innovation performance. Lastly, a conceptual model incorporating all hypotheses is illustrated.

### 3.1 Slack resource theory and innovation performance

This section describes slack resources as viable antecedents to innovation performance and argues for an extension to the IB context. In it, the effects of high- and low-discretion slack resources on innovation performance are explained and the applicability of the slack resource theory is justified.

#### 3.1.1 Relationship between high-discretion slack and innovation performance

The literature suggests an inverted U-shaped relationship exists between high-discretion slack resources and firms' innovation performance (Judge, Fryxell and Dooley, 1997; Surbramaniam and Youndt, 2005; Geiger and Makri, 2006). In this section, the study describes the relationship and extends it to international business entities.

##### 3.1.1.1 Relationship between low levels of high-discretion slack and innovation performance

Towards shaping innovation performance, the effects of high-discretion slack resources, as described by slack resource researchers, typically come in three forms. Collectively, they depict an inverted U-shaped relationship between high-discretion slack and innovation performance (Nohria and Gulati, 1996; Geiger and Cashen, 2002; Herold, Jayaraman and Narayanaswamy, 2006).

The first effect, as induced by a low level of high-discretion slack, refers to the linear and positive influence of high-discretion slack over innovation performance (Nohria and Gulati, 1996; Nohria and Gulati, 1997; Tan and Peng, 2003). While a holding like this does not offer

an ideal condition for innovation, to authors such as George (2005), there are still two ways for it to induce innovation performance (see also, Tan, 2003; Geiger and Makri, 2006).

To begin with, there is the way specified in the renowned slack search argument. According to Singh (1986), this refers to a scenario where low reserves of tangible (in this case, high-discretion) slack is perceived by firms as uncommitted organisational capital (see also Nohria and Gulati, 1996; Greve, 2003; Greve, 2007). For this reason, upon seeing the reserve, firms would automatically sense inefficiency and feel obligated to exploit it with the most profitable operations. In the event these firms are innovation-oriented, there is therefore a strong chance that the high-discretion slack would be invested in innovation (March, 1991; Subramanian and Nilakanta, 1996; Greve, 2007). As soon as the new investment begins to generate innovation, contributions are made to firms' innovation performance. Furthermore, a positive relationship is displayed between a low level of high-discretion slack and innovation performance.

Based on the reasoning above, the study theorises that, when holding a low level of high-discretion slack, innovative IB entities will proactively engage on innovation. The reason for this is primarily that, in comparison with domestic enterprises, IB entities as suggested by the interaction argument tend to possess more knowledge and ideas for innovation (Tsai, 2001; Schmid and Schurig, 2003; Ambos, Ambos and Schlegelmilch, 2006). However, due to resource limitations, it is reasonable to assume that not all of the knowledge is invested into commercially valuable innovation projects. This has the potential to suppress firms' innovation capabilities and undermine their innovation performance. Therefore, when a stock of readily deployable resources is detected, the study presumes it is likely that entities will recognise the opportunity to fund more innovation projects and apply their slack as such. As a result, contributions will again be made to firms' innovation performance. A positive relationship between a low level of high-discretion slack and innovation performance will again be presented.

An additional way for a low level of high-discretion slack to affect firms' innovation performance is through functioning as a buffering mechanism against threats (Subramanian and Nilakanta, 1996; Voss, Sirdeshmukh and Voss, 2008; Huang and Chen, 2010).

According to authors such as Daniel et al (2004), slack resources, due to their highly re-deployable nature, have by definition the capacity to shield firms from unexpected threats (see also Cheng and Kesner, 1997). For this reason, whenever firms hold a low reserve of

high-discretion slack, what they actually possess is a limited cushion against unforeseen hazards and threats (Geiger and Cashen, 2002; Martinez and Artz, 2006). While this could encourage firms to innovate, as mentioned above, the slack resource researchers argued that it could only do so to a certain extent. In explanation, Geiger and Cashen (2002) stated that, when a firm becomes aware of how limited its risk buffer is, what it intuitively feels is a sense of vulnerability, instead of safety (George, 2005; Herold, Jayaraman and Narayanaswamy, 2006). According to Nohria and Gulati (1996), the reason behind this is that, to firms, limited protection is indifferent to high susceptibility to dangers of a considerable scale. As long as this stays true, they will continue to feel threatened and behave cautiously and reluctantly when adopting and handling innovation projects (Lin, Cheng and Liu, 2009; Tan and Peng, 2003). In consequence, pressures are transferred to managers, forcing them to be highly disciplined when making all innovation-related decisions (Bromiley, 1991; Damanpour, 1987; Greve, 2003). Therefore, managers are compelled to adopt only innovation projects with low risks and a guaranteed rate of return (Nohria and Gulati, 1996; George, 2005; Lin, Cheng and Liu, 2009). Additionally, they are also pushed to be very exacting in the development and commercialisation of innovation, allowing no ineffectiveness to arise in the process (Judge, Fryxell and Dooley, 1997; Tan and Peng, 2003; George, 2005). In the end, innovations of reasonable value are devised and a marked degree of innovation performance is attained.

Looking at the second way a low level of high-discretion slack affects innovation performance, the study conceives that the same influences can also be induced in IB entities. The reasoning behind this comes from an analogy commonly used in the IB literature for distinguishing domestic and international enterprises. In particular, this refers to the risk level comparison, suggesting IB entities tend to undergo a greater level of risks on a daily basis, relative to their domestic counterparts (Akoorie and Scott-Kennel, 2005; Fisher et al., 2006; Deresky, 2007). For this reason, when the only buffering mechanism IB entities have is limited, it is arguable that they will also be motivated to handle risk-taking activities like innovation with great care. From this standpoint, the study theorises, if a low level of high-discretion slack can induce cautious innovation behaviours in domestic firms, it can also do so in IB entities. If this presumption turns out to be accurate, then a low level of high-discretion slack can also foster innovation of significant embedded value and subsequently sizable innovation performance.

At this point, it is necessary to clarify that the relationship between a low level of high-discretion slack and innovation performance is not only positive, but also linear. According to the slack resource research, this is because when a firm's stock of high-discretion slack is low, the innovation projects it adopts are thus limited in number and value (Tan and Peng, 2003; Yang, Wang and Cheng, 2009; Lin, Cheng and Liu, 2009). For this reason, the payoffs received by firms are less than superior. However, as the shortage recedes, researchers predict, the innovation projects that firms undertake could grow in both number and profitability (Geiger and Cashen, 2002; Herold, Jayaraman and Narayanaswamy, 2006). As a result, firms' achievements in innovation performance would also expand. Graphically, this makes the relationship between innovation performance and a low stock of high-discretion slack positive and linear.

### **3.1.1.2 Relationship between medium levels of high-discretion slack and innovation performance**

The second effect of high-discretion slack on innovation performance happens when firms have mounted a medium level of high-discretion slack (Geiger and Cashen, 2002; Herold, Jayaraman and Narayanaswamy, 2006; Huang and Cheng, 2010). Although the level 'medium' is relative to a firm's individual size, it generally stands for a level of high-discretion slack from which firms can attain a solid buffering mechanism (Nohria and Gulati, 1997; Tan, 2003; Lin, Cheng and Liu, 2009). When referring to innovation, this means firms are prone to act proactively in innovation (for pursuing higher innovation performance; Dampour, 1991; Judge, Fryxell and Dooley, 1997). Moreover, this also means firms are fully aware that any failure in innovation could easily exhaust their high-discretion slack resources and their defence against threats (Voss, Sirdeshmukh and Voss, 2008; Yang, Wang and Cheng, 2009). In response to both mentalities, firms would, as Nohria and Gulati (1996) suggested, feel the pressure to behave both proactively and cautiously in innovation (Geiger and Cashen, 2002; George, 2005). In practice, this implies that they choose to adopt numerous innovation projects whilst paying great attention to the selection, development and commercialisation of the projects. Consequently, slack resource researchers have suggested that numerous valuable innovations and a substantial level of innovation performance would be conceived (Martinez and Artz, 2006; George, 2005).

In many prior studies, the innovation performance associated with a medium level of high-discretion slack stands for the maximum level any firms are able to achieve (Nohria and

Gulatai, 1996; O'Brien, 2003; Lin, Cheng and Liu, 2009). The reason behind the belief is that, for many authors, a simultaneously ambitious and fearful orientation is the ideal attitude for developing innovation (Lin, Cheng and Liu, 2009; Tan and Peng, 2003). If a firm's reserve of high-discretion slack falls down from the medium level, it was argued that its ambition to innovate would also drop, thus dragging down its innovation performance; if a firm's reserve of high-discretion slack expands beyond the medium level, it was contended that its cautious orientation would drop, again dragging down its innovation performance. For this reason, a medium reserve of high-discretion slack is generally considered to provide maximum innovation performance to firms in the slack resource research (Tan, 2003; O'Brien, 2003; Lee and Grewal, 2004; Huang and Chen, 2010). Graphically speaking, this places the medium reserve on the top point of the inverted U-shaped relationship between high-discretion slack resources and innovation performance.

The study contends that the effects of a medium stock of high-discretion slack on innovation performance have a great chance of occurring among IB entities. The arguments here are twofold.

Firstly, an argument has been put forward around the effects of a low reserve of high-discretion slack; that is, because IB entities experience much higher risks than domestic firms, when domestic firms feel insecure about their buffering mechanisms, so would IB entities. Therefore, when firms' slack resource reserves are only at a medium level, then IB entities would feel threatened by the unpredictable consequences of innovation failure. In turn, they are motivated to exercise caution when developing innovation.

Secondly, there is the argument for low-discretion slack. To recap, in the second argument, the study reasoned that, because IB entities can acquire more interactions than domestic firms, they can also acquire more great ideas for innovation. Due to resource concerns, not all of them are launched. However, when a set of high-discretion slack is presented, in this case, a medium level, they would therefore proactively undertake additional innovation operations to pursue higher returns. Therefore, a higher innovation performance is achieved.

In summary, in terms of the overall effects of high-discretion slack, the effects of a medium reserve on innovation performance signify an important turning point. For a low reserve of high-discretion slack and its effects, the medium reserve offers an extension. For a high reserve and its effects, the medium reserve offers a falling point.



*Hypothesis 1a: The relationship between a medium-to-low level of high-discretion slack resources and innovation performance is positive and linear.*

### **3.1.1.3 Relationship between high levels of high-discretion slack and innovation performance**

The third effect of high-discretion slack on innovation performance deals with when firms' reserves of high-discretion slack reach an abundant level. At this stage, although an optimal capacity is achieved in innovation, the effects of this capacity on innovation performance is negative (Tan and Peng, 2003; Lee and Grewal, 2004; George, 2005). Numerous authors have posited in explanation that, while excess high-discretion slack, as a buffer mechanism, does make innovation less threatening, it also trivialises innovation failure (Daniel et al, 2004; Lin, Cheng and Liu, 2009; Herold, Jayaraman and Narayanaswamy, 2006). In other words, as a rich stock of high-discretion slack provides the perfect defence for all innovation failures, managers are led to regard innovation failures far less seriously. Researchers suggest a chain reaction will be initiated as a result, causing firms to perform carelessly in the selection, execution and commercialisation of innovation projects (Daniel et al, 2004; George, 2005). In consequence, innovation projects of low embedded values are likely to be adopted and innovations of slim profitability are likely to be developed (Nohria and Gulati, 1996; Nohria and Gulati, 1997; Daniel et al, 2004; George, 2005). Subsequently, poor returns are acquired from innovation after large investments were made into it, causing a decline in firms' innovation performance. Graphically speaking, the effects of excess high-discretion slack form the falling part of the inverted U-shaped relationship between high-discretion slack and innovation performance.

Judging by the arguments above, the study is inclined to consider that the influences of excess high-discretion slack on innovation performance are shared by domestic and IB entities. The reason for this is connected to the networking research of innovation performance (refer to Chapter 2). That is, while intense business interactions may bring IB entities many constructive ideas for innovation, the study believes that the chance these interactions will bring inferior ideas is equally great. Therefore, when excess high-discretion slack has led domestic and IB firms to exhaust their primary innovation projects, there is a higher risk of IB entities launching bad projects. Even though the IB entities may not become over-confident due to the excess reserve, the study argues that it may at least lead these firms to make mistakes. Keeping in mind that the products of IB entities, unlike those of domestic

firms, are often launched internationally, one failure in innovation could potentially mean millions in lost earnings. If this occurs, the study suggests that the innovation performance of IB entities will be considerably reduced.

In summary, the overall effects of high-discretion slack resources on innovation performance are threefold. When a firm's holding of high-discretion slack is low, the effect triggers productive innovation and enhances innovation performance. When the holding is medium, the effect invites a greater number of productive innovations and engenders superior innovation performance. When the holding is overabundant, the effect stifles productive innovation and erodes firms' efforts to achieve superior innovation performance.

***Hypothesis 1b: The relationship between high-discretion slack resources and innovation performance is curvilinear amongst IB entities (Inverted-U shaped).***

### **3.1.2 Low-discretion slack and innovation performance**

Prior studies suggested that the effects of low-discretion slack resources on innovation performance are linear and, overall, positive (Daniel et al, 2004; George, 2005). This means, when firms maintain high or full reserves of low-discretion slack resources, their innovation performance is likely to increase. When they maintain a low reserve of low-discretion slack resources, their innovation performance is likely to decline.

To explain the former, the slack resource research begins with defining low-discretion slack. Through it, they argued that, as a high level of low-discretion slack means limited debts, when firms gain possession of it, there is often no reason for them to be active in risk-taking (Sharfman et al., 1988). Although low-discretion slack can act as a buffering mechanism, firms often choose not to operate innovatively in order to protect themselves. In fact, according to Lin, Cheng and Liu (2009), even when holding abundant low-discretion slack, firms may still adopt strategies that value risk aversion and promote survival (see also Latham and Braun, 2008).

In retrospect, this mentality is very similar to that fostered by a low reserve of high-discretion slack. The only difference is that a high level of borrowing power renders firms more susceptible to potential threats (Tan and Peng 2003; George, 2005). This means firms will be hesitant to take on any type of risk-taking activity, let alone innovation. Additionally, the consequences of 'spending' borrowing power (i.e. debts), further reduces a firm's interest in picking up innovation (Staw, Sandelands and Dutton, 1981; Martinez and Artz, 2006).

However, according to slack resource researchers, there is still a chance that firms with abundant low-discretion slack will undertake innovation. In particular, this refers to a situation where firms have discovered innovation projects with low risk and almost guaranteed returns (Tan and Peng, 2003; Daniel et al, 2004; George, 2005). If this happens, researchers proposed that firms with a high level of low-discretion slack would react differently from those holding a low level of high-discretion slack. That is, they would proactively take on the project and prepare to innovate (Bourgeois and Singh, 1983; Lin, Cheng and Liu, 2009). At the same time, and again just like holders of scarce high-discretion slack, firms with extensive low-discretion slack will choose to develop their innovation with great caution. The motive behind this is to reduce the risk factor of developing innovations to the minimum level and to secure the firms' entitlement to receive the expected innovation performance. Ultimately, if everything is handled ideally, then a valuable innovation will be created and a reasonable amount of innovation performance will be yielded.

In addressing the effect of scarce low-discretion slack on innovation performance, the slack resource researchers advanced a scenario of minimum innovation performance (George, 2005; Martinez and Artz, 2006). They argued that because low-discretion slack implies debt and poor equity, when a firm's stock of slack resources is scarce, it is then virtually on the edge of bankruptcy (Wiseman and Bromiley, 1996; Martinez and Artz, 2006). Assuming these firms still want to survive, their managers will therefore logically suspend all risk-taking operations, such as innovation, in order to cut spending (George, 2005). In the slack resource research, this rationale is referred as the 'threat-rigidity' argument, which was firstly introduced by Staw, Sandelands and Dutton (1981). Eventually, with no innovation activity, firms thereby achieve no innovation performance.

Amongst IB entities, the study expects low-discretion slack to exert the same effects, as described above, on innovation performance for two potential reasons. Firstly, this is because the scenario where a high stock of low-discretion slack encourages risk-taking operations, such as innovation, has already been found in IB literatures. Although the evidence so far covers only the activity of internationalisation, the way in which low-discretion slack may encourage risk-taking in firms has already been validated (Lin, Cheng and Liu, 2009; Tseng et al, 2007; Daniel et al., 2004). If this rationale is true in any way, then the supposition that abundant low-discretion slack could motivate innovation in innovative enterprises should also be true. Secondly, as slim low-discretion slack indicates heavy liability and poor equity, the

study theorises that suspending all innovation should be a generic natural response by firms. For this reason, the study perceives no reason why such a scenario would not occur amongst IB entities.

In summary, the effect of low-discretion slack on innovation performance is linear and positive.

***Hypothesis 2: The relationship between low-discretion slack resources and innovation performance is positive and linear amongst IB entities.***

### **3.2 The moderation effect of firms' DOI on innovation performance**

As explained in Chapter 3, firms' slack resources and DOI can both determine firms' innovation performance. However, for firms' DOI and its three outputs (i.e. customers, knowledge and cost-effective resources) to make an impact, firms must have enough slack resources to engage in innovation. Based on the study by Jeong (2003), no matter how much innovation a firm's DOI brings, there would be any innovation performance for it to alter if the firm has insufficient slack resources (see also Hitt, Hoskisson and Kim, 1997; Kafouros et al, 2008; Wang and Kafouros, 2009). Following this viewpoint, it is then arguable that there is a complementary relationship between slack and internationalisation, in terms of generating innovation performance. Furthermore, it is also arguable that the way multinationality could affect innovation performance is through moderating the relationship between slack and innovation performance.

According to multinationality research, the study argues that there are three ways for the moderation effects to unfold (Wang and Kafouros, 2009; Capar and Kotabe, 2003). To be more specific, it theorises that the first effect occurs as firms' internationalisation provides additional customers (Kurokawa et al., 2007; Kafouros et al., 2008). Through offering these customers, according to Lu and Beamish (2001), what firms' DOI actually does is provide more opportunities for firms to exploit their innovation creation (Kim, Hwang and Burgers, 1993; Delios and Beamish, 1999; Capar and Kotabe, 2003). While these opportunities remain unchanged for a specific DOI, the study posits that the innovation performance they are able to generate can vary considerably. The reason for this speculation is threefold. If the innovation in question is carefully refined (in result to a high reserve of low-discretion slack) then the study expects the opportunities to generate great returns (refer to section 3.1.2). If the innovation in question is refined and of great value (due to a medium-to-low reserve of high-

discretion slack), then the study anticipates the opportunity would generate superior returns (refer to sections 3.1.1.1 and 3.1.1.2). If the innovation is poorly refined (because of an excess reserve of high-discretion slack), the study argues that the opportunities will only generate limited returns (refer to section 3.1.1.3). Based on the above reasoning, the study thereby concludes that, in generating innovation performance, multinationality could interact positively with slack resources.

The second way for firms' DOI to moderate the relationship between slack resources and innovation performance is through providing novel and/or cost-effective R&D resources (Santos, Doz and Williamson, 2004; Filatotchev and Piesse, 2009).

In this regard, if the resources provided are just cost-effective, the study argues the moderation effect of internationalisation is primarily lowering firms' innovation expenses (von Zedtwitz and Gassmann, 2002; Kotabe, Srinivasan and Aulakh, 2002). This is because, when firms gain access to a pool of cheap, yet high quality, innovation resources, their ability to afford these types of resources potentially increases. In practice, this implies that firms would be able to buy more of these resources with more high- (cash) and low- (borrowing power) discretion slack at hand than ever before. For this reason, that which previously cost a lot now costs less, considerably reducing firms' innovation spending. With regard to firms' innovation performance, the study postulates that the effect of providing cost-effective resources is positive.

However, in terms of the extent to which cost-effective resources can alter innovation performance, the study believes that the effects vary for firms with differing reserves of slack resources. The reason for this is related to the slack resource theory. That is, while cost-effective resources can certainly cut firms' innovation spending, how firms decide to use the resources for innovation is still dictated by their slack resource reserve (Lin, Cheng and Liu, 2009; Huang and Chen, 2010). For example, if the reserve is composed mainly of abundant low-discretion slack, the study argues that cost-effective resources will enable firms to invest more in innovation. As abundant low-discretion slack is typically tied to disciplined decision-making (George, 2005), the study theorises that cost-effective resources can significantly raise firms' innovation performance (see also section 3.1.2; Damanpour, 1991; Geiger and Makri, 2006). If the reserve is made of a medium-to-low level of high-discretion slack, the study again expects more resources to be put into innovation. Since a medium-to-low level of high-discretion slack is associated also with disciplined innovation (Nohria and Gulati, 1996),

the study argues that cost-effective resources can significantly extend firms' innovation returns (see also sections 3.1.1.1 and 3.1.1.2; Judge, Fryxell and Dooley, 1997; Tan, 2003). If the reserve is made of excess high-discretion slack, the study, by drawing on slack resources research, speculates that resources may be applied to fund inferior innovation (see section 3.1.1.3). As a result, the study, based on the argument that inferior innovation yields inferior products (Geiger and Cashen, 2002), argues that the effect of cost-effective resources on innovation performance is positive but limited (see also section 3.1.1.2; O'Brien, 2003; Daniel et al, 2004). In other words, instead of significantly augmenting firms' innovation performance, the resources generated by firms' DOI may only help to reduce the losses caused by the inferior innovations.

If the resources provided are novel, the effect exerted by firms' DOI on the relationship between slack and innovation performance is therefore elevated innovation capabilities. The logic underlying this comes from the dynamic capability studies (Alegre and Chiva, 2008; Teece and Pisano, 1994). More specifically, when firms gain wider internationalisation, they are exposed to many different types of resources. Kotabe (1990) suggested that as firms begin to build a portfolio of diverse resources, they become capable of creating more valuable innovations (Knight and Cavugill, 2004; Kafouros et al, 2008). For firms holding a particular reserve of slack resources, this means they would be able to execute innovation projects much more effectively. As a result, with the same project, if firms have higher internationality, the outcome is then innovation of greater value and innovation performance of a higher level.

Despite all of these factors, when firms are not making rational innovation decisions due to their excess high-discretion slack, the effects of novel resources may be limited. This is because, irrespective of how capable a firm may be when it comes to innovation, selecting and developing their innovation projects with insufficient care is not a constructive use of those capabilities. If this behaviour is maintained, the study believes that the firm will use their innovation capability to develop innovation projects of inferior quality and profitability. While first-rate capabilities may help to remove some unprofitable elements from inferior projects (Kafouros et al, 2008), the study expects this to be effective only to a limited extent (see also Hitt, Ireland and Hoskisson, 1999; Jeong, 2003; Filipescu, Rialp and Rialp, 2009).

Consequently, the study argues that, when a firm's stock of high-discretion slack is high, the effects of novel resources may only minimally improve its innovation performance.

Accordingly, for firms holding a medium-to-low level of high-discretion slack, the effects of novel foreign resources would be marked, due to tight disciplines in decision-making. Finally yet importantly, the effects would be significant for firms holding substantial low-discretion slack, due once more to stringent standards in decision-making.

The third way for firms' DOI to enhance the relationship between slack resources and innovation performance is by providing valuable business interactions and then knowledge. As IB innovation research has proposed, this is achieved through firms' DOI creating the opportunity for firms to collaborate with foreign research institutes. Knight and Cavugill (2004) suggested that, depending on the number of collaborations that firms have, they could gain significant knowledge about their business offerings within differing time frames (Lu and Beamish, 2001; Capar and Kotabe, 2003). If the number is high, firms will gain a large amount of knowledge quite quickly (Berry, 2006; Kotabe, 2002). As Gomes and Ramaswamy (1999) asserted, firms will be able to acquire additional innovation capabilities through knowledge integration when this happens (see also Delios and Beamish, 1999; Qian et al., 2008). As already argued above, greater innovation capabilities imply a higher proficiency in implementing innovation projects. In turn, they present a good opportunity for firms to rapidly generate highly valuable innovations and obtain superior innovation performance. Again, as the capabilities can only minimally improve the value of innovation projects, when firms make bad choices their effects would then be limited. Therefore, when firms sustain excess high-discretion slack, the effects exerted by the capabilities on innovation performance would be positive but highly confined. However, when firms possess medium-to-low level of high-discretion slack, the effects on innovation performance would be marked. Lastly, when firms hold abundant high-discretion slack, the effects would be reasonable.

Through discussion, the study found that for internationalisation to affect firms' innovation performance, it must firstly interact with firms' slack resources. When the output of multinationality is mainly new markets, internationalisation could amplify the profitability of firms' innovation that is originally shaped by slack resources. When the output is mainly resources, internationalisation could improve the value and profitability of firms' innovation that is primarily created by slack resources. When the output is mainly knowledge, internationalisation could again uplift the value and profitability of firms' innovation that is eventually created by slack resources.

Because of these theorisations, the study has uncovered one conclusion. That is, if slack resources generate innovation performance, then firms' multinationality must be what moderates the process. Also, because all outputs of multinationality are, as discussed above, great contributors to firms' innovation performance, then the moderation effects should also be positive overall. Since the study has classified slack resources as high- and low-discretion, the moderation effects should then be twofold.

*Hypothesis 3: Multinationality/internationalisation activities will exert a positive moderating effect on the relationship between high-discretion slack resources and innovation performance.*

*Hypothesis 4: Multinationality/internationalisation activities will exert a positive moderating effect on the relationship between low-discretion slack resources and innovation performance.*

### **3.3 The conceptual model**

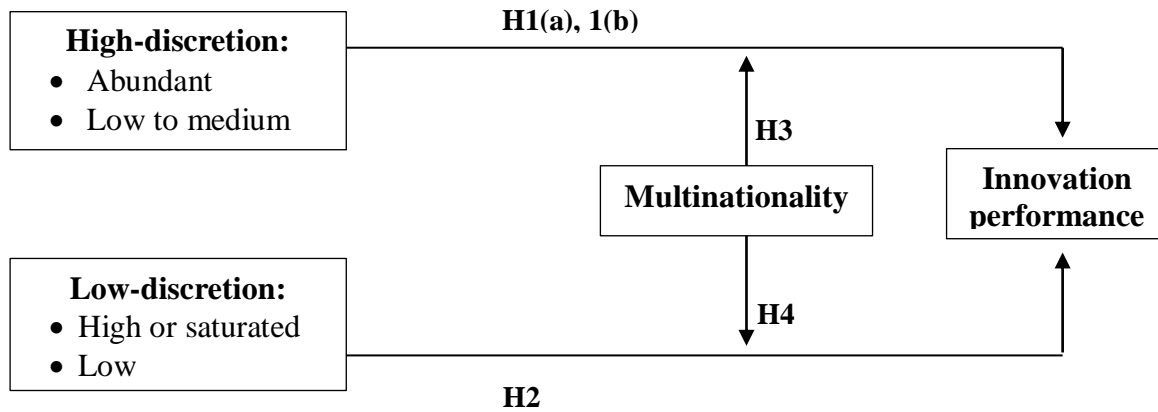
As a summary of the previous two sections, this section introduces the main model of this study. In this model, slack resource is employed as the main antecedent of innovation performance. Conceptually speaking, this placement is consistent with both the slack resource theory and multinationality construct. In the former, both low- and high-discretion slack resources are argued to shape managers' disciplines in making innovation-related decisions. In the latter, the placement does not violate rationales of the multinationality construct. In fact, it echoes the perception of the multinationality construct, that resources facilitate innovation. As a result, both high- and low-discretion slack resources are placed as antecedents in the conceptual model. As for the need to study slack resource as two antecedents instead of one, section 3.1 has already shown how high- and low-discretion slack affects innovation performance differently. To recognise these differences, slack resource is thereby studied as two instead of one antecedent to innovation performance.

Another salient component of the model is firms' DOI or multinationality. In the model, multinationality is adopted as a moderator for two reasons. Firstly, as section 3.2 has demonstrated, multinationality could influence innovation performance in several conceivable ways. Therefore, it is primarily a contributor to innovation performance. Secondly, as section 3.2 has also illustrated, multinationality could only affect innovation performance when slack resource permits innovation activities. Essentially, this means that



for multinationality to alter innovation performance, it must interact with slack resources, and the innovation process is fostered by slack resources. Therefore, if slack resources shape innovation performance, multinationality moderates the process.

**Figure 3.1 The conceptual model**



Following the above-mentioned relationship between innovation performance, slack resources and multinationality, the conceptual model is graphically recreated in Figure 3.1.

The way this model works is consistent with the hypotheses formed in previous sections. It involves two relationships between slack resources and innovation performance operating under the moderation effects of multinationality. When the slack resources are high-discretion in nature, the model tenders Hypothesis 1 and predicts a curvilinear relationship between slack and innovation performance. When the slack resources are low-discretion in nature, the model advances Hypothesis 2 and suggests a positive and linear connection between slack and innovation performance.

As the moderator, this model presumes multinationality would have the same positive effects on the two relationships between slack resources, high- and low-discretion, and innovation performance. The model submits a positive moderation effect in Hypothesis 3 around the relationship between high-discretion slack and innovation performance. Through this hypothesis, the study argues that all multinationality outputs tend to interact constructively with firms' high-discretion slack in altering firms' innovation performance. The model forwards another positive moderation effect in Hypothesis 4 around the relationship between low-discretion slack and innovation performance. In this hypothesis, the study postulates that all multinationality outputs interact productively with firms' high-discretion slack in determining firms' innovation performance.

To the best knowledge of this study, this model, and its approach to analysing innovation performance, has not been submitted in existing IB and managerial studies. Although both the slack resource theory and multinationality construct have been developed for years, cases where they are linked to the analysis of innovation performance have been rare. Therefore, if the model were supported by empirical evidence, it would imply that slack resources should be studied in IB innovation research as precursors to innovation performance. Moreover, it would also suggest that the full principles of the multinationality construct should be applied in IB research to examine the generation of innovation performance. Thirdly, it would indicate that integrating the slack resource theory and multinationality construct is an effective way of analysing firms' innovation performance.

### **3.4 Chapter summary**

This chapter proposes a conceptual model that examines the relationship between slack resources, internationalisation and innovation performance. The model integrates the slack resource theory and multinationality construct and extends them to the IB context. While performing these tasks, four hypotheses have been made. Firstly, to explore how high-discretion slack affects innovation performance in the IB context, the chapter formed Hypotheses 1a and 1b. Secondly, to analyse how low-discretion slack affects innovation performance in the IB context, the chapter formed Hypothesis 2. Thirdly, to study how internationalisation interacts with slack resource in shaping firms' innovation performance, the chapter formed Hypotheses 3 and 4. Based on the model developed in this chapter, Chapter 4 will present the methodology for testing the study's hypotheses.

## CHAPTER 4: METHODOLOGY

Chapter 4 presents the method adopted for testing the study's hypotheses. Its objective is to introduce the statistical means selected to examine the relationship between slack resources, multinationality and innovation performance. In doing so, the sample and the sampling process is firstly described. The measurements for all involved variables are also outlined and detailed elaborations for this study's research design are presented.

### 4.1 The sample

The sample for this study is comprised of MNCs operating in the software development industry. The sample is built using the NASDAQ stock exchange database: <http://www.nasdaq.com/screening/companies-by-industry.aspx>. The reason for choosing software development firms as subjects is primarily related to the nature of their business. That is, a highly changeable context of operation, a short span of product life cycle and a high demand for ground-breaking innovations (Kobrin, 1991; Zahra et al., 2000). For this reason, software development firms are forced to maintain constant innovation activities, making them the ideal subjects for innovation related studies like this one.

To be a part of the sample, a software development firm has to meet the following criteria. Firstly, it must operate in the software development business, not the software retailing business. Secondly, its international sales ratio (i.e. international revenues over total revenue) must be more than 10%. Thirdly, it must have operations in more than three international markets. Fourthly, it must have been founded prior to 2007.

The first criterion was adopted to ensure that the sampled firms are legitimate practitioners of innovation rather than mere retailers. While this distinction as a sampling criterion may seem redundant, it was surprisingly useful, as the NASDAQ database which does not distinguish between software dealers and innovators.

The 10% international sales ratio was employed to make sure that the sampled firms have significant operations overseas. If they do not, past studies believed that they have not internationalised to a point where multinationality can effectively influence their operation and performance (Goerzen and Beamish, 2003; Hennart, 2010). The basis for the 10% threshold comes from a widely accepted definition of MNCs, where a 10% international sale

is argued to convey salient international involvement (Gomes and Ramaswamy, 1999; Contractor, Kundu and Hsu, 2005).

However, as the international sales ratio reports only the ‘depth’ of firms’ international presence, in terms of reflecting firms’ DOI, it could easily give out false information (Ramaswamy, 1993; Sanders and Carpenter, 1998; Thomas and Eden, 2004). A classic example of this would be when a firm conducts 10% of its business in one lead foreign market. To avoid this, this study adopts another measurement of internationalisation, i.e. the number of markets in which a firm has established operations, to check the breadth of firm’s DOI (Kogut, 1985; Sullivan, 1994; Ramaswamy et al., 1996).

The last sampling criterion is created to examine the sampled firms within the same time frame, between 2008 and 2011. Adopting this time frame permits this study to capture changes in firm’s slack resource reserve and moreover how these changes shifted firms’ innovation performance.

Through applying the sampling criterion, the study initially gathered 70 software development MNCs as its sample. Information surrounding the sampled firms is then retrieved from numerous publically available financial documents. In most cases, these include the annual and sometimes quarterly reports filed by the sampled firms as a part of their ‘Security and Exchange Commission (SEC) Filings’. Unfortunately, due to data availability and data processing requirements (see section 4.2.2), three firms were later cut out of the sample, leaving the final sample size at 67.

## **4.2 Variables and Measurement**

### **4.2.1 Dependent variable**

In line with Chapter 2, innovation performance in this study is defined as the economic returns provided by the innovations sales. Using financial information, this study measures this variable via a ratio that divides firms’ R&D expenditure by their total revenue/sales (i.e.  $\text{R\&D expenditure} / \text{Revenue}$ ). This measurement was adopted for three reasons. Firstly, it uses information readily available in a firm’s annual and quarterly financial reports. Secondly, it is adopted because it mathematically conveys the amount of revenue generated by every dollar spent on innovation. Thirdly, this ratio has been widely employed to measure firms’ innovation performance in traditional managerial research (Hitt et al, 1997; Geiger and Cashen, 2002; Laursen and Salter, 2006).

Compared with other measurements, the ratio of 'R&D-over-revenue' uses information that is easily obtainable for the present study. Considering this study's limited sources of information, the adoption of the 'R&D-over-revenue' ratio is a logical choice. Besides, compared with surveys and interviews, the ratio in question offers good objectivity in the measurement of innovation performance.

As a measurement for innovation performance, the ratio of 'R&D-over-revenue' presents a sound mathematical logic. By dividing a firm's R&D spending by its revenue, the result is the amount of revenue generated by every dollar that a firm invests in innovation. While it is arguable that not all revenue is generated by innovation, past studies have contended that, in innovative entities, total revenue is a good indicator of innovation revenue. There is also the perception that firms in innovative industries do little more than create and commercialise innovations (Hitt, Hoskisson and Johnson, 1996; Hall and Bagchi-Sen, 2002). As such, if a fluctuation occurs in total revenue, it would indicate a similar variation is taking place in innovation revenue. Therefore, the ratio of 'R&D-over-revenue' is believed to a good indicator of innovation performance.

Lastly, the ratio of 'R&D-over-revenue' is adopted for quantifying innovation performance because it has been widely employed for the same purpose in previous studies. Examples of these are most identifiable in the management literature, with the latest being the work of Geiger and Cashen, 2002); (see also Hansen and Hill, 1991; Hitt et al, 1996; Hitt et al, 1997).

#### **4.2.2 Independent variables**

High- and low-discretion slack resources are the two independent variables in this study. To operationalise them, past research was consulted and two important lessons were learned. Firstly, in terms of measurement, there is a pool of financial proxies used to quantify firm's high- and low-discretion slack resources. Secondly, a specific time lag has to be administered in the calculation of slack resources, in order to properly test the relationship between slack and innovation.

Through the first lesson, this study became aware that numerous financial proxies are available to measure high- and low-discretion slack resources. The study chose to employ the current ratio (current assets/current liabilities) and debt-to-equity (debts/equity) ratio to respectively calculate high- and low-discretion slack resources. Primarily, these indicators were adopted due to their popularity, as reported by Daniel et al. (2004), within slack

resource research. Secondly, in comparison to the other measurements, the two ratios were adopted for their use of easily retrievable financial information.

Through the second lesson, this study learned that the impact of slack resources on innovation performance is often not instantaneous. On the contrary, past studies have argued that the impacts may take up to two years to fully manifest themselves (Geiger and Cashen, 2002; Daniel et al., 2004). Within this time frame, it was said, some of the impacts would emerge gradually as parts of the slack resources were applied to develop and commercialise various innovation projects. As such, if the year in question is T, then the innovation performance of year T is shaped by both the slack resource of year T and those of year T-1. According to previous studies, this requires studies of innovation performance to introduce a time lag into their calculation of slack resources. In this study, the time lag introduced is one year, in line with traditional studies (Nohria and Gulati, 1996), and the way it is introduced is consistent with the method adopted by Geiger and Cashen (2002). In practice, this means slack resources was calculated as a mean of slack resources in year T and year T-1 ((Slack resources T + Slack resource T-1)/2).

#### **4.2.3 Moderator**

To operationalise firms' multinationality/ DOI, this study follows the perception of Thomas and Eden (2004). In particular, this means it intends to measure firms' multinationality by combining both the depth and breadth of their international involvement.

According to Thomas and Eden (2004), an important element that defines the depth of firms' internationalisation is their international sales ratio (i.e. international sales/total sales).

Through the ratio, it was argued that researchers would be able to ascertain the level of business an MNC conducts overseas. More importantly, the ratio also compares the firms' international operations with their overall operations. In essence, this informs researchers of the importance an MNC's international operations are to their total operations. The more important they are, the more committed the MNC is to their activities overseas. Therefore, when the international sales ratio is high, MNCs would have significant international involvement. For this reason, the ratio was selected as the first measurement of firms' DOI.

To capture the breadth of MNC's DOI, this study adopts the number of countries in which firms have subsidiaries (i.e. foreign subsidiaries/total international offices). Following the work of Sanders and Carpenter (1998), this ratio is believed to be best suited for the task as it

effectively reflects the geographical dispersion of firms' internationalisation. As such, it effectively reports the full extent of firms' global reach, making it an ideal measure for the breadth of firms' DOI (Elango and Pattnaik, 2007).

To combine the two measures of multinationality, this study adopts the approach firstly introduced by Sullivan (1994). This involves combining the two measures and forming a composite measure of multinationality (see also Delio and Ramaswamy, 1999; Capar and Kotabe, 2003). Given that the two adopted measurements use different scales, the corresponding ratios are standardised and then added together (Sullivan, 1994; Gomes and Ramaswamy, 1999).

#### **4.2.4 Control variables**

This study adopts five control variables to account for their plausible research noises. These include a firm's age, size, marketing intensity, performance and country of origin.

Regarding firms' age, the motivation to control it is inspired by an argument from George (2005) suggesting younger firms often lack well-established innovation capabilities (see also Lin, Liu and Cheng, 2009). As a result, they are more inclined than their older counterparts to spend slack resources on seeking and acquiring a system of innovation development and commercialisation. Consequently, their investments in actual innovation projects are lower, meaning their chances of acquiring superior innovation performance are slim. Because older firms do not have these problems, if slack resources are equal, their investments in innovation would therefore not be diverted. Eventually, this would give them an unfair advantage in innovation and furthermore a better opportunity in achieving substantial innovation performance. To account for the effect of age, this study adopts it as a control variable that indicates the number of years a firm has operated since its inception.

The reason for controlling firms' size in this study is largely related to how size differences could cause firms to behave differently when faced with the same amount of slack resources. This is because, even with the same stock of slack resources, larger and smaller firms would often disagree on how abundant this stock actually is (Sorenson, 2000). More importantly, when the perception of the slack resource stock is different, according to the slack resource theory, firms may react very differently in terms of innovation (Geiger and Cashen, 2002). Different levels of innovation performance would therefore be achieved, making firms' size a critical variable for investigations of innovation performance such as this one. To account for

its effects, a firm's size is adopted as a control variable. In this study, a firm's size is measured by the logarithm of firms' total asset, sales and employees (George, 2005; Lin, Cheng and Liu, 2009).

The decision to control firms' performance is provoked by a notion that an inferior degree of corporate earnings would discourage innovation and hence reduce innovation performance. The logic here is very similar to a perception advanced by the innovation strategy construct about low environmental turbulence and high competitiveness (He and Wong, 2004; Zhou, Yim and Tse, 2005; Danneels and Sethi, 2011). It believes that, when facing poor corporate performance, managers become less willing to engage in innovation activities due to the risks associated with them. If this happens, this study fears that the relationship between slack and innovation performance may be eroded by an innovation strategy that suspends all innovation operations. To neutralise the possible effects on firms' performance, it is adopted as another control variable. To measure it, this study follows conventional practice and employs the return-on-equity (ROE) ratio.

A further control variable is firms' marketing intensity. The reason for controlling it is to account for the widely recognised role of marketing activities in shaping the returns from innovation. Most typically, this viewpoint was widely cited in the research regarding productive systems of innovation, where market intelligence is perceived as a driver of innovation performance (Jansen, Bosch and Volberda, 2005; Zhou, Yim and Tse, 2005; Leenders and Wierenga, 2008). The underlying proposition of the research is this: when it comes to developing great innovation performance, owning robust technical expertise is only a part of the equation. In addition, firms also need a good understanding of their existing and potential customers to know how to deploy their technical expertise and how to promote their eventual innovations. Without sufficient marketing efforts, researchers contended that firms would be unable to create new products that address their target customers' needs and aspirations (Kotabe, Srinivasan and Aulakh, 2002; Bruni and Verona, 2009; Calantone and Rubera, 2012). Because of this, they would be unable to receive superior innovation performance from their new products (Leenders and Wierenga, 2008). For the reason stated above, this study was prompted to consider marketing intensity as a control variable. The measurement selected for operationalising marketing intensity is the ratio of marketing intensity, i.e. marketing expenditures/firms' sales. In making this choice, this study followed the example of O'Brien (2003), Weerawardena (2003) and also Qian and Li (2003).



The last control variable is firms' country of origin. The purpose of controlling it is, to some extent, address firms' liability of 'foreignness' when entering specific foreign markets. According to the classic view of internationalisation, if the liability is high, then firms are less likely to undertake radical movements, such as launching innovations, in the short term. Instead, the firm may use the initial years of entry to learn the local market before making heavy resource commitments (Johanson and Vahlne, 1977; Johanson and Vahlne, 2009). In this case, the effect of slack resources on innovation may be undermined greatly, causing the findings of this investigation to be less than robust. Conversely, if the liability of foreignness is negligible, then the firms under discussion may be completely free from worrying about the uncertainties attached to their new markets (Johanson and Vahlne, 2009). In consequence, they may be motivated to pursue innovation immediately, leaving the relationship between slack and innovation performance flourishing. To recognise the impacts that different liabilities of foreignness could have on firms' innovative orientation, firms' country of origin is employed as the final control variable. The method of measuring it is through setting up dummy variables. If a firm's country of origin is the US, then the assigned value is 0. If it is another country, the value is 1.

### 4.3 Regression analyses

This study chooses to examine the relationship between slack resource and innovation performance using the four regression analyses. The mathematical equations involved in the analyses are outlined respectively as equation 1, 2 and 3 below. In these equations, *DV* represents innovation performance as the dependent variable. *IDV*<sub>1</sub> and *IDV*<sub>2</sub> are used to reflect high- and low-discretion slack resources respectively as the independent variables. *Mod* is employed to indicate the composite measure of firms' multinationality, the moderator of this study. Control variables are expressed as AGE (firm's age), SIZE (firm's size), PER (firm's performance) and COUNT (firm's country of origin).

$$\begin{aligned}
 DV = & \beta_0 + \beta_1 AGE + \beta_2 SIZE + \beta_3 COUNT + \beta_4 Mkt + \beta_5 PER + \beta_6 IDV_1 + \beta_7 IDV_2 \\
 & + \beta_8 Mod + e
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 DV = & \beta_0 + \beta_1 AGE + \beta_2 SIZE + \beta_3 COUNT + \beta_4 Mkt + \beta_5 PER + \beta_6 IDV_1 + \beta_7 IDV_2 \\
 & + \beta_8 Mod + \beta_9 IDV_1^2 + \beta_{10} IDV_2^2 + e
 \end{aligned} \tag{2}$$

$$\begin{aligned}
DV = & \beta_0 + \beta_1 AGE + \beta_2 SIZE + \beta_3 COUNT + \beta_4 Mkt + \beta_5 PER + \beta_6 IDV_1 + \beta_7 IDV_2 \\
& + \beta_8 Mod + \beta_9 IDV_1^2 + \beta_{10} IDV_2^2 + \beta_{11} IDV_1 Mod + \beta_{12} ID_2 Mod + e
\end{aligned} \tag{3}$$

Through equation 1, this study intends to test the linear connection between low-discretion slack resources and innovation performance. In doing this, Hypothesis 2 is investigated. A further function of equation 1 is testing the linear relationship between high-discretion slack resources and innovation performance (Hypothesis 1a). By doing so, the hope is to ascertain whether a low- and medium-level of high discretion slack is positively linked to innovation performance. Graphically speaking, this means to discern whether there is an upward-going portion of the inverted U-shaped curve postulated in Hypothesis 1b. In line with the suggestion of several researchers, this is a good starting point in order to verify the linear parts of a curvilinear relationship (see George, 2005; Capar and Kotabe, 2003; Lin, Cheng and Liu, 2009).

In equation 2, the emphasis of the investigation is on examining the curvilinear relationship between high-discretion slack resource and innovation performance. Ideally, this equation should help to verify that a high degree of high-discretion slack resources compresses innovation performance. In graphical forms, this step of the investigation should produce support for the downward-going portion of the inverted U-shaped curve stated in Hypothesis 1b. The method adopted, as described above, to test the inverted U-shaped hypothesis comes from Lu and Beamish (2001). In their study, they also used squared independent variables to investigate a hypothetical U-shaped relationship between intense FDI activities and firms' performance.

In equation 3, the focus of the investigation is on checking the moderation effects of firms' DOI. The way this study chooses to do it is through a method adopted widely in past academic studies (Sharma, Durand and Gur-Arie, 1981; Baron and Kenny, 1986; Frazier, Tix, and Baroon, 2004). This method is applied by multiplying high-discretion slack resources with the moderator and examining the result against innovation performance. The purpose of this move is to confirm how interactions between multinationality and slack resources could drive up innovation performance. The expectation here is to test Hypotheses 3 and 4.

#### **4.4 Chapter summary**

This chapter presents the research methods the study adopts to examine the hypotheses. In line with the conceptual model, the dependent variable of the study is innovation performance, as measured by the R&D-to-sales ratio (i.e. R&D expenditure/sale). The independent variables are high- and low-discretion slack resources, as measured respectively by the current ratio (current assets/current liabilities) and debt-to-equity ratio (debts/equity). The moderator variable is firms' DOI, as measured by the composite of the breadth and depth of firms' internationalisation. The breadth is qualified by the geographic dispersion ratio (foreign subsidiaries/total international office), whereas the depth is assessed by the standardised international sales ratio (foreign sales/total sales). The control variables include firms' age, size, marketing intensity, performance and country of origin. With regard to testing the hypotheses, the chapter also presents three equations for modelling the forthcoming regression analyses. Chapter 5 will present descriptive data for all variables, characteristics for the data collected and the findings of the regression analyses.

## CHAPTER 5: ANALYSIS AND RESULTS

In this chapter, data collected from the secondary source is analysed. Firstly, the data is explored to provide an understanding of the sample firms. Secondly, through multiple regressions, data is analysed to test the hypotheses presented in previous chapters. This is followed by the presentation of the results. The statistical programme SPSS 18.0 is used for the quantitative analysis.

### 5.1 Variables and sample

This section presents the sample and variables of the study. In doing so, it provides firstly descriptive statistics of the variables and secondly the characteristics of the sample.

#### 5.1.1 The variables

Table 5.1 presents the variables involved in the study. It exhibits the means, standard deviations, maximum level, minimum level and the bivariate correlations for all variables.

In section (a) of its content, it touches on the control variables. With regard to firm size, the table reports statistics pertaining to its three indicators, i.e. firms' assets, sales and employees. In line with Chapter 4, the values presented for these indicators are a logarithm of their actual value. In presenting firm age, the table points out that the oldest subject in the study is 46 years (founded in 1965) of age whilst the youngest is six (founded in 2005). In introducing firms' overall performance, the table indicates the maximum return-on-equity ratio (ROE) for firms in the study is 3.24, whereas the minimum is -9.94. In addressing firms' marketing intensity (marketing expenditure/sales), the table suggests, the firm spending the most and least on marketing invested respectively 81% and 1% of its total revenue in product promotion.

In section (b), the table introduces the dependent and independent variables. With regard to innovation performance (R&D/sales), the table reveals that the average level is 0.16, while the maximum and minimum level is 0.68 and 0.01 respectively. Regarding high-discretion slack, the table suggests that the firm holding the largest and smallest reserve has 9.55 and 0.06 times more current assets than liabilities (current assets/current liabilities). Regarding low-discretion slack resources (equity/debt), the table indicates the mean level to be 0.89. This is followed by the highest level of 10.01 and the lowest level of -6.58.

**Table 5.1 Descriptive statics and correlation**

Variables	Mean	S.D.	Max	Min	1	2	3	4	5	6	7	8	9	10	11
<b>(a) Control Variables</b>															
1. Assets	13.15	1.97	18.50	5.95	1.000										
2. Sales	12.82	1.72	18.06	9.67	0.888***	1.00									
3. Employee	7.41	1.46	11.59	4.28	0.880***	0.963***	1.000								
4. Age	22	9.17	46	6	0.369***	0.399***	0.431***	1.000							
5. Performance	-0.01	0.68	3.24	-9.94	0.036	0.043	0.060	0.114	1.000						
6. Marketing Intensity	0.28	0.14	0.81	0.01	-0.116	-0.126	-0.103	-0.220	-0.079***	1.000					
7. Country of origin	0.08	0.278	1	0	-0.086	-0.085	-0.057	0.119**	0.030	-0.067	1.000				
<b>(b)Dependent and Independent variable</b>															
8. Innovation performance	0.16	0.09	0.68	0.01	0.062	0.003	0.000	-0.038	-0.257***	0.279***	-0.170***	1.000			
9. High-discretion Slack	1.8	0.99	9.55	0.06	0.034	0.021	-0.023	-0.058	0.015	-0.065	0.130*	0.177**	1.000		
10. Low-discretion Slack	0.89	1.28	10.01	-6.58	0.053***	0.001***	-0.030***	-0.079***	0.065	-0.064	0.101**	0.204	0.644	1.000	
<b>(c) Moderator</b>															
11. Multinationality	0.88	0.49	1.71	0.23	0.244	0.229	0.260	0.331	-0.042	-0.074	0.206	0.085	0.036	0.003	1.000

Number of observations = 268 (67 cases multiplied by four years).  
 Results generated by a bivariate correlation analysis, 2-tailed test.  
 Sig. \*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Section (c) is all about firms' DOI. Through it, the table presents the average DOI in this study as 0.88, with the maximum degree being 1.71 and the minimum being 0.23. It must be clarified here that the multinationality variable in section (c) is not just the international sales ratio (foreign sales/total sales) or the geographic dispersion statistic (foreign subsidiaries/total international office) but a combination of the two (refer to Chapter 4). To do so, international sales and geographic dispersion ratio were both statistically standardised before combination.

### **5.1.2 Sample demographics**

Table 5.2 presents the key demographic information of the study's sample. In section (1) of its content, the table indicates that 80.60% of the total sample is made up of companies based in the United States (54 firms). As for the remaining 19.40%, the table shows that 14.93% comes from Israel (10 firms) and 4.48% comes from other countries (3 firms).

Section (2) of the table displays the annual sales of the sampled firms by the end of 2011. In particular, it indicates that 22.39% of the sample has annual sales between \$100,000 and \$200,000 (15 firms). This may imply a slight convergence of firms in sales amongst the study's sample.

Section (3) of the table conveys the total assets the sampled firms achieved by the end of 2011. Surprisingly, the data suggests that 43.28% of the sample had capital ranging from \$800,000 to \$1,600,000 (29 firms), a total of 11 more firms than those listed in second place.

Section (4) of the table reports the age of the sampled firms at the end of 2011. Amongst the wide range, the table reflects firstly that the firms under 10 years old make up 5.97% of the sample (4 firms). Within these firms, the most recent of all, according to the data, was the one formed in late 2005 (6 years old). Secondly, in this section, the table also shows 25.37% are firms aged between 15 and 20 years (17 firms).

The final section of Table 5.2 addresses the number of countries in which the sampled firms had offices at the end of 2011. What has to be noted here is that the data in discussion is not the statistics of geographic dispersion (refer to section 4.2.3). Rather, it is only the denominator of the ratio.

**Table 5.2 Firm demographics**

Range	Frequency N=67	Percentage %
<b>(1) Country of origin</b>		
United States	54	80.60
Israel	10	14.93
Others	3	4.48
<b>Total</b>	<b>67</b>	<b>100.0</b>
<b>(2) Total sales (as at 2011)</b>		
Below \$100,000	11	16.42
\$100,000-\$200,000	15	22.39
\$200,000-\$400,000	11	16.42
\$400,000-\$800,00	10	14.93
\$800,000-\$1,600,000	9	13.43
\$1,600,000 and above	11	16.42
<b>Total</b>	<b>67</b>	<b>100.0</b>
<b>(3) Total assets (as at 2011)</b>		
Below \$100,000	12	17.91
\$100,000-\$200,000	8	11.94
\$200,000-\$400,000	11	16.42
\$400,000-\$800,00	8	11.94
\$800,000-\$1,600,000	29	43.28
\$1,600,000 and above	18	26.87
<b>Total</b>	<b>67</b>	<b>100.0</b>
<b>(4) Age (as at 2011)</b>		
Under 10 years	4	5.97
10-15 years	14	20.90
15-20 years	17	25.37
20-25 years	8	11.94
25-30 years	11	16.42
30 years and above	13	19.40
<b>Total</b>	<b>67</b>	<b>100.0</b>
<b>(e) Number of countries entered (export operation included)</b>		
Under 10	2	2.99
10-20	10	14.93
20-40	18	26.87
40-80	17	25.37
80 and above	20	29.85
<b>Total</b>	<b>67</b>	<b>100.0</b>

Looking at the table, the first prominent data is that 2 out of the 67 firms (2.98%) in the sample have entered fewer than 10 countries. According to the sample, these refer to a firm having viable operations (i.e. offices) in 9 countries and one in 8. The second important data is that there seems to be a convergence of firms (20 firms; 29.85% of the sample) having operations in 80 countries and more.

## 5.2 Regression analyses and findings

### 5.2.1 Normality tests

Before conducting the regression analysis, this study tested the normality of its data distribution using skewness and kurtosis diagnostics. The results of these, as presented in Table 5.3, indicate that all variables in the study have a skewness value between -2 and 2 and a kurtosis value between -3 and 3. According to Curran et al (1997), this indicates reasonable data normality and support for the normal distribution hypotheses.

**Table 5.3 Results of the skewness and kurtosis diagnostics**

Variables	Mean	S.D.	Skewness	Kurtosis
Assets	13.15	1.97	.246	.672
Sales	12.82	1.72	.706	.645
Employee	7.41	1.46	.596	.597
Age	22	9.17	.516	-.391
Performance	-0.01	0.68	-1.938	1.878
Marketing intensity	0.28	0.14	.078	.243
Country of origin	0.08	0.278	1.017	7.159
High-discretion slack	1.8	0.99	1.450	2.856
Low-discretion slack	0.89	1.28	.897	2.873
Innovation performance	0.16	0.16	1.458	2.766
Multinationality	0.09	0.09	.166	-.869
<b>All skewness value is between -2 and 2</b>				
<b>All kurtosis value is between -3 and 3</b>				

### 5.2.2 Findings of regression analyses

Using the three equations presented in Chapter 4, this study examined its hypotheses in four consecutive regression analyses. Following previous researchers, the study adopted the technique of stepwise regression (see Lu and Beamish, 2001; Lin, Cheng and Liu, 2009) and loaded its variables in the following order. In Model 1, it loaded the control and moderator variables. In Model 2, it added the independent variables. In Model 3, it added the squared



independent variables. In Model 4, it added the interaction constructs, i.e. multinationality multiplied by slack resources.

The results of the regression analyses are displayed in Table 5.4. Overall, all models tested indicated a good fit ( $F\text{-statics} > 1$ ) and fair explanatory capacity ( $R^2 > 0.09$ ; Field, 2009). Other important findings include results of Model 3 rejecting Hypothesis 1b and results of Model 4 rejecting Hypothesis 4.

The study tested firstly a baseline model, Model 1, which includes all seven control variables and the moderator variable. In essence, this model examines the extent to which the control and moderator variables can explain the variations in the dependent variables. The results indicate that, amongst the three indicators of firms' size, only assets were found to be in a positive relationship with innovation performance ( $b = 0.008, p < 0.05$ ). Firms' age was found to bear no relation to innovation performance, marketing intensity was positively related to innovation performance ( $b = 0.175, p < 0.01$ ), while corporate performance had a negative relationship ( $b = -0.030, p < 0.01$ ). Most importantly, firm's DOI is found in a positive relationship ( $b = 0.019, p < 0.05$ ) with innovation performance and the findings stay positive through all the other models. Additionally, judging by the value of  $R^2$  (0.196) and  $F\text{-statics}$  (7.236), the model itself seems to have reasonable explanatory power and is a good fit with the data involved.

Model 2 in Table 5.4 examines Hypothesis 2 and Hypothesis 1a. What it actually tests is the direct effect of slack resources, high- and low-discretion, on innovation performance. For low-discretion slack resources, the corresponding hypothesis is Hypothesis 2. For high-discretion slack resources, the corresponding hypothesis is Hypothesis 1a. As predicted by Hypothesis 2, the results show a positive and linear relationship between low-discretion slack resources and innovation performance ( $b = 0.14, p < 0.05$ ). As postulated in Hypothesis 1a, the same is revealed between medium-to-low levels of high-discretion slack and innovation performance ( $b = 0.22, p < 0.01$ ). Judging by the  $R^2$  value (0.270) and  $F\text{-statics}$  (9.285), Model 2 appears to possess good explanatory power and is a good fit with its variables.

Both findings detected in Model 2 stay true in the full model, i.e. Model 4. For Hypothesis 2, the results in Model 4 display a positive and linear relationship between low-discretion slack and innovation performance at a significance level lower than 0.01 ( $b = 0.011$ ). For Hypothesis

1a, the results convey a positive relationship between medium-to-low levels of high-discretion slack and innovation performance at a significance level lower than 0.01 ( $b=0.063$ ).

Model 3 tests the curvilinear prediction of Hypothesis 1b. Ideally, the model would show a negative relationship between squared high-discretion slack resources and innovation performance. According to Table 5.4, the results of Model 3 reject the curvilinear prediction. That is, the correlation between squared high-discretion slack and innovation performance was not found to be negative ( $b=0.10$ ,  $p<0.01$ ). Thus, Hypothesis 1b is rejected and its postulation of an inverted U-shaped relationship between high-discretion slack and innovation performance is unconfirmed. Furthermore, an insignificant relationship is found between low-discretion slack and innovation performance. These results indirectly support Hypothesis 2, which explicitly suggests that the relationship between low-discretion slack and innovation performance is linear. Judging by the  $R^2$  value (0.291) and  $F$ -statics (8.514), Model 3 has good explanatory power and is a good fit with its variables.

Similarly, all findings conveyed by Model 3 stay true in the full model (Model 4). For Hypothesis 1b, results of the full model still report a positive instead of a negative relationship between excess high-discretion slack and innovation performance ( $b=0.010$ ,  $p<0.01$ ). For Hypothesis 2, again an insignificant relationship is found between ‘abundant’ low-discretion slack and innovation performance.

Model 4 in Table 5.4 tests Hypothesis 3 and 4 and presents the ‘big picture’ of the study’s empirical investigation. In particular, it examines the extent to which multinationality will exert positive moderation effects on the relationship between slack, high- and low-discretion, and innovation performance. To do this, the study followed the advice of Frazier, Tix and Barron (2004) and operationalised the moderation effects as interactions between the moderator and independent variables. As result, the study proceeded to test the moderation effects with two interaction constructs (Baron and Kenny, 1986; Sharma, Durand and Gur-Arie, 1981). According to Table 5.4, the results show that a positive relationship was observed with the first interaction construct but not with the second ( $b=0.035$ ,  $p<0.05$ ). Empirically this means support is found for Hypothesis 3 but not for Hypothesis 4. Conceptually, this suggests that firms’ DOI may only exert positive moderation effects on the relationship between high-discretion slack and innovation performance. Overall, Model 4, with a  $R^2$  value of 0.309 and an  $F$ -static of 7.876, has reasonable explanatory power and is a good fit with the variables.

**Table 5.4 Regression analyses for Innovation performance**

<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
<b>Control Variables</b>				
Assets	0.013**	0.010*	0.011*	0.009*
Sales	-0.002	-0.008	-0.010	-0.010
Employee	-0.013	-0.004	-0.003	-0.002
Age	0.000	0.000	0.000	0.000
Marketing Intensity	0.175***	0.193***	0.189***	0.184***
Performance	-0.030***	-0.026**	-0.025**	-0.025**
Country of origin	-0.053	-0.061	-0.057	-0.056
<b>Moderator</b>				
Firm's DOI	0.019**	0.0015**	0.0014**	0.039**
<b>Independent Variable</b>				
High-discretion slack		0.177***	0.087***	0.063***
Low-discretion slack		0.204***	0.012***	0.011***
High-discretion slack (Squared)			0.004***	0.010***
Low-discretion slack (Squared)			0.001	-0.003
<b>Interaction Variables</b>				
Multinationality * High-discretion slack				0.208**
Multinationality * Low-discretion slack				0.003
$R^2$	0.196	0.270	0.291	0.309
Adjusted $R^2$	0.160	0.241	0.257	0.269
$F$ -statistic	7.236***	9.285***	8.514***	7.876***
N= 268, * $p < .10$ , ** $p < .05$ , *** $p < .01$ (All two-tailed tests)				

There is, however, a problem with having interaction constructs in a regression analysis. That is, as the interaction constructs are just independent variables multiplied by the moderator variable, the correlation it has with the dependent variable could thus be spurious (Baer and Oldham, 2006; Ames and Flynn, 2007). To avoid reporting spurious observations, the study reassessed the moderation effect using the same method that Lu and Beamish (2001) adopted. This involves checking whether including the interaction construct has improved a model's explanatory power ( $R^2$ ). If it has, then the observed moderation effects stand (with high-discretion slack); if it has not, the observed moderation effects are spurious (Lu and Beamish, 2001). In this case, the improvement in model fit (growth in  $R^2$ ) is evident ( $0.309 > 0.291$ ), suggesting the observed moderation effects are viable with high-discretion slack.

### **5.3 Chapter summary**

In summary, in the course of four regression analyses, the study has examined four hypotheses with data collected from 67 software development firms. The findings are presented in Table 5.5. Through testing the linear relationship between slack resources and innovation performance, the study found support for Hypothesis 2 and Hypothesis 1a. Through investigating the curvilinear relationship between slack and innovation performance, the study rejected Hypothesis 1b (Model 3). Through examining the effects of firms' DOI on the relationship between slack and innovation performance, the study found support for Hypothesis 3 but not for Hypothesis 4. In Chapter 6, the theoretical, methodological and managerial implications of these findings will be discussed and their overall contributions will be presented.

**Table 5.5 – Hypotheses and Findings**

<b>Hypotheses</b>	<b>Findings</b>
<b>Hypothesis 1a: The relationship between a medium-to-low level of high-discretion slack resources and innovation performance is positive and linear.</b>	<b>Supported</b>
<b>Hypothesis 1b: The relationship between high-discretion slack resources and innovation performance is curvilinear amongst IB entities (Inverted-U shaped).</b>	<b>Rejected</b>
<b>Hypothesis 2: The relationship between low-discretion slack resources and innovation performance is positive and linear.</b>	<b>Supported</b>
<b>Hypothesis 3: Multinationality exerts a positive effect on the relationship between high-discretion slack resources and innovation performance.</b>	<b>Supported</b>
<b>Hypothesis 4: Multinationality exerts a positive effect on the relationship between low-discretion slack resources and innovation performance.</b>	<b>Rejected</b>

## **CHAPTER 6: DISCUSSION AND CONCLUSION**

Chapter 6 discusses the findings of the regression analyses and concludes the thesis. The chapter is organised as follows. Firstly, the findings generated in the testing of each hypothesis are discussed in relation to their corresponding literature. Secondly, the theoretical, methodological and managerial implications of the study are presented. Thirdly, the limitations of the study are outlined and advice for future studies is provided. Lastly, a conclusion is made for this thesis.

### **6.1 Discussion on hypotheses testing**

The objective of this study is to explore how high- and low-discretion slack resources, under the influence of internationalisation, could shape IB entities' innovation performance. To attain it, the study conceived a conceptual model and examined it by testing four separate hypotheses. As a result, it was able to find support for Hypotheses 1a, 2 and 3 but not for 1b and 4. Discussions of these findings are presented below.

#### **6.1.1 High-discretion slack resources and innovation performance (H 1a and H 1b)**

Findings of the regression analyses indicate support for Hypothesis 1a but not for Hypothesis 1b. For 1a, this is because a positive and linear relationship was found between medium-to-low levels of high-discretion slack and innovation performance (Model 2). For 1b, this is because a positive, instead of a negative, relationship was detected between high levels of high-discretion slack resources and innovation performance (Model 3).

Within slack resources research, the findings supporting Hypothesis 1a can be understood in three ways. Firstly, the findings may have captured behaviours described in the slack research argument, according to which high-discretion slack can strongly encourage innovation (Wiseman and Bromiley, 1996; Greve, 2003; Greve, 2007). To recap, the argument suggests that firms, as entities pursuing full operational efficiency, tend to apply slack resources into activities such as innovation whenever they detect them. Secondly, the findings may have confirmed a natural property of high-discretion slack, that is, acting as buffering mechanism against threats and hazards. As covered in Chapter 2, being able to function as a buffering mechanism is why higher levels of high-discretion slack lead to higher levels of innovation performance (see also Subramaniam and Youndt, 2005; Geiger and Makri, 2006). Thirdly,

the findings have confirmed the argument that firms with a low-to-medium level of high-discretion slack often innovate with great caution. In the slack resource theory, the argument is how a low level of high-discretion slack relates positively to innovation performance (Wiseman and Bromiley, 1996; Baker and Nelson, 2005; George, 2005).

In addition to the research on slack resources, the findings that contradict Hypothesis 1b have also conveyed a few implications. Firstly, they have presented the possibility that abundant high-discretion slack does not erode firms' managerial disciplines in making innovation-related decisions. In retrospect, this was argued in the slack resource theory as the reason why excess high-discretion slack generates poor innovation performance (refer to Chapters 2 or 3; see also Geiger and Cashen, 2002; O'Brien, 2003; Lee and Grewal, 2004). Secondly, the findings may have undermined the idea that medium high-discretion slack brings firms maximum financial incentives from innovation. In the slack resource research, this idea is coined because excess high-discretion slack is deemed harmful to firms' effectiveness in decision-making (refer to Chapters 2 or 3; see also Judge, Fryxell and Dooley, 1997; Tan, 2003; Geiger and Makri, 2006).

#### **6.1.1.1 Potential reasons for the rejection (H 1b)**

To explain why Hypothesis 1b is rejected, the study, basing on innovation literatures and empirical data, conceives three possible explanations. Firstly, there could be an issue with how this study quantified high-discretion slack resources as its independent variable. Secondly, there could be unanticipated environmental forces that altered the effects of excess high-discretion slack on firms' innovation behaviours. Thirdly, there could be unexpected research noises generated by the latest global economic crisis that throws out firms' propensity and attitude towards innovation.

Surrounding the first reason, the study attributes the origin of the rejection (of Hypothesis 2) to two plausible imperfections in the study's research methodology. On the one hand, there is the measurement the study chose for high-discretion slack resources (i.e. the current ratio). The reason it is blamed is because, if the current ratio is poor in assessing high-discretion slack, there is a chance for findings opposing Hypothesis 1b to be resulted by a technical error. Looking back to Chapter 3, this suspicion is potentially reasonable as the study adopted the current ratio, over the other measurements, basing solely on its popularity (see Daniel et al., 2004). As popularity doesn't always translate into accuracy, the study may have been misguided in calculating high-discretion slack, costing it the chance to find full support for

Hypothesis 1b. On the other hand, there is the time lag the study implemented in measuring all independent variables. While the way of implementing it is widely acclaimed, the point here is that the study may have over- or underestimated how long innovation projects need to produce their full profit. In either case, the outcome would be again miscalculations of high-discretion slack resources, making the findings rejecting Hypothesis 1b somewhat questionable.

Concerning the second reason, the study associates the rejection (of Hypothesis 1b) with its failure to see the effects of environmental forces over firms' innovation performance. The logic here is that the environmental forces neglected in this study may have somehow reversed the usual effects of excess high-discretion slack on innovation behaviours. In effect, it is possible for excess high-discretion slack and good decision-making to coexist, preventing this study from capturing the curvilinear prediction of Hypothesis 1b. To verify this suspicion, the study turns to the research of environmental turbulence and innovation for further insights. According to Zhou, Yim and Tse (2005), not only is it possible for environmental forces to cause the suspected effects, but it could also happen in three different scenarios (Li and Atuahene-Gima, 2001; Danneels, 2007; Mason, 2007; Danneels and Sethi, 2011). These include scenarios where market demands are shifting unpredictably, technologies are advancing rapidly and competition is intensifying expeditiously. In all three scenarios, it was suggested that firms would all undertake intensive innovations just to remain undamaged by environmental forces. While doing so, researchers proposed that firms would most likely remain strategic in their decision-making (Danneels, 2007; Mason, 2007). After all, they would need to be flexible enough to withstand any changes that may arise in a turbulent environment (Li and Atuahene-Gima, 2001; Calantone, Garcia, and Droge, 2003). From the perspective of the slack resource theory, this means stringent decision-making at all levels of high-discretion slack and rejection for the curvilinear prediction of Hypothesis 1b.

Through comparison, this study notices similarities between its sample and firms undergoing technological turbulence. According to Lippoldt and Stryzowski (2009), this observation is justified, as the rapid rate in which new technologies emerge has already led the global software sector into an age of turmoil. In reaction, leading software entities, including those sampled in this study, have already raised their R&D spending, just as the research of environmental turbulence suggested (see Table 6.1 from OECD, 2007; as reported in Lippoldt and Stryzowski, 2009). Based on the similarities, this study concluded that the



rejection of Hypothesis 1b may have been caused by the turbulent nature of the global software development sector.

The study believes that the third possible reason for the rejection of Hypothesis 1b is related to the time frame (i.e. 2008-2011) within which its research data is collected. In the process of forming the research methodology, this study may have inadvertently chosen an abnormal time period to collect its data. In retrospect, this assessment is potentially reasonable considering the year 2008 and beyond happens to be when the latest global economic crisis was in effect (Tong and Wei, 2011). If the influence of the crisis is wide and effective enough, it is possible that the findings of this study, such as the ones corresponding with Hypothesis 1b, are adversely affected. In the terminology of innovation strategy research, an economic crisis of this scale is typically described as a situation of extensive “exogenous influences” (Garcia, 2002; Danneels and Sethi, 2011). In reaction to this situation, a study by Garcia, Calantone and Levine (2003) suggests that firms with substantial resources would typically launch a radical pursuit of innovation (see also Schweitzer, Gassmann and Gaubinger, 2011). As radical innovation is by definition highly risky, the authors surmised that firms, to avoid worsening their situation, would have handled set innovation with strict decision-making (see Garcia, Calantone and Levine, 2003, p.331; Lewin, Long and Carrol, 1999). The rationales above may explain how and when substantial high-discretion slack resources may have a constructive effect on firms’ innovation related decision-making. They may also confirm the speculation that an economic crisis has compromised some of this study’s findings regarding excess high-discretion slack resources.

In summary, to understand why Hypothesis 1 is rejected, this study theorises that there are three possible reasons. Firstly, the methodology of this study is called into question, more specifically, the measurement chosen for high-discretion slack resources. Secondly, the possibility that there are unexpected environmental factors reversing the effects of substantial high-discretion slack resources is considered. Thirdly, the time frame within which this study collected its data is suspected to be abnormal, as it happens to be when the latest economic crisis took place.

**Table 6.1 R&D investments by top software companies (OECD, 2007)**

Company	Country	R&D investment		Net sales		Employee		R&D intensity	
		EUR (millions)	CAGR 3 years (%)	EUR (millions)	CAGR 3 years (%)	Number	CAGR 3 years (%)	R&D as % of sales	R&D per employee (EUR thousands)
<b>Software</b>									
1. Microsoft	USA	5 581.52	12.2	37 540	11.2	71 533	9.2	14.9	78.0
2. Oracle	USA	1 586.97	16.6	12 191	14.9	56 133	11.4	13.0	28.3
3. SAP	DEU	1 088.63	6.2	8 512	4.7	34 550	5.3	12.8	31.5
4. CA	USA	662.09	3.5	3 226	6.9	16 000	0.0	20.5	41.4
5. Symantec	USA	578.27	51.2	3 513	43.3	16 000	55.0	16.5	36.1
6. Cadence Design Systems	USA	358.88	3.0	1 127	0.9	5 000	-1.1	31.8	71.8
7. Adobe Systems	USA	309.70	14.1	1 667	19.1	5 734	19.7	18.6	54.0
8. Sega Sammy	JPN	298.73	n.a.	3 704	n.a.	5 407	n.a.	8.1	55.2
9. Intuit	USA	285.34	14.4	1 727	14.4	7 000	2.5	16.5	40.8
10. Synopsys	USA	271.27	12.1	841	3.0	4 756	3.8	32.3	57.0
<b>Computer services</b>									
1. IBM	USA	4 559.15	4.3	77 258	3.9	329 373	1.4	5.9	13.8
2. Unisys	USA	330.28	-1.9	4 882	0.9	36 100	-0.3	6.8	9.1
3. SunGard Data Systems	USA	207.53	12.0	3 318	15.7	15 000	19.5	6.3	13.8
4. DST Systems	USA	110.88	-3.7	2 132	1.8	10 500	-3.5	5.2	10.6
5. Indra Sistemas	ESP	85.90	6.0	1 202	11.2	7 584	7.6	7.1	11.3
<b>Internet</b>									
1. Google	USA	508.23	145.5	5 204	140.7	5 680	n.a.	9.8	89.5
2. Yahoo!	USA	498.07	56.0	4 457	76.7	9 800	39.6	11.2	50.8
3. Check Point Software Technologies	ISR	42.85	20.7	491	10.7	1 414	5.5	8.7	30.3
4. United Online	USA	33.92	17.3	445	46.3	900	28.9	7.6	37.7
5. F5 Networks	USA	26.58	20.3	239	37.5	792	n.a.	11.1	33.6

### 6.1.2 Low-discretion slack resources and innovation performance (H 2)

Findings of the regression analysis have offered support to Hypothesis 2. This confirms that a positive and linear relationship exists between low-discretion slack and innovation performance (Model 2 & 3). This also confirms that abundant low-discretion slack resources have no compromising effects on firms' innovation-related decision-making (Model 3).

These findings may carry four implications for the theory of slack resources. Firstly, findings of the positive relationship may support the argument that low-discretion slack, at a substantial level, generally encourages innovation. Within slack resource theory, the reason this could happen is tied in with firms' desires for tangible resources and higher profits (Geiger and Cashen, 2002; Huang and Chen, 2010). Secondly, findings of the positive relationship could have also implied that low-discretion slack can act as a viable buffering mechanism against threats. For theorists of slack resources, this is an important reason why high borrowing power (i.e. low-discretion slack) can stimulate firms to pursue innovation

(Martinz and Artz, 2006; Yang, Wang and Cheng, 2009). It is therefore also an important reason why high borrowing power could produce innovation performance. Thirdly, findings of ‘no compromising effects’ lend support to the argument that abundant low-discretion slack does not induce overconfident decision-making in innovation. The concept comes from George (2005), who argued that if low-discretion slack undermines decision-making, the relationship between it and innovation performance would not be linear (see also Nohria and Culati, 1995; Lin, Cheng and Liu, 2008). Lastly, findings of the positive relationship, specifically the lower part of the relationship, may reflect additionally how scarce low-discretion slack resources could stifle innovation. While low innovation performance can also be caused by bad decisions, the deduction above is more reasonable as a firm in debt does not often act carelessly in innovation (Nohria and Culati, 1996; Geiger and Cashen, 2002). Regarding this finding, the slack resource theory suggested that the likely causes for it are twofold. For one, it could have been caused because low-discretion slack offers little room for innovation. Secondly, it may also have been caused by reasons specified in the ‘threat rigidity’ argument. That is, as a low reserve of low-discretion slack stands for low equity level (Shimizu, 2007), the finding may have been caused by firms’ reactions to bankruptcy alerts (see also Staw, Sandelands and Dutton, 1981; Tan and Peng, 2003; Herold, Jayaraman and Narayanaswamy, 2006).

### **6.1.3 Moderation effects of multinationality (H3 and H4)**

Findings of Model 4 provide support for Hypothesis 3 and but not 4. Conceptually speaking, this means that firms’ DOI is found to have positive moderating effects on the relationship between innovation performance and high-discretion slack. At the same time, it means firms’ DOI has no identifiable effects on the relationship between firms’ low-discretion slack and innovation performance.

With regard to the findings that support Hypothesis 3, the study believes that they have primarily conveyed support for one of the study’s argument. That is, firm’s DOI tends to shape innovation performance via interacting with high-discretion slack.

Beyond this argument, the findings also expressed several aspects of the multinationality construct. Firstly, they have supported the argument suggesting there are three ways for firms’ DOI to improve innovation performance. In the multinationality construct, this stands for the reason why internationalisation could uplift firms’ performance in innovation (Tseng et al., 2007; Kafouros and Buckley, 2008). Secondly, they may have also reflected how the resource

and knowledge output of internationalisation could improve firms' capabilities in innovation. According to authors such as Kafouros et al (2009), this refers to two ways for a firm's DOI to lower its costs in innovation and also drive up its innovation performance (see also Hitt, Hoskisson and Kim, 1997; Filipescu, Rialp and Rialp, 2009). Thirdly, the findings underlying Hypothesis 3 could have also shown how the customer output of internationalisation could improve firms' innovation performance. As explained by Jeong (2003), supplying more customers is an effective way in which internationalisation could improve firms' sales, and then performance, in innovation (see also He and Wong, 2004; Wang and Kafouros, 2009).

#### **6.1.3.1 A potential reason for rejection (H4)**

From the standpoint of the slack resource theory, the findings conflicting with Hypothesis 4 could be seen as reflecting a scenario the study failed to anticipate. That is, when firms hold only low-discretion slack, their propensity to innovate may be not affected by their DOI. Conceptually speaking, this scenario is potentially justifiable from the perspective of slack resource theory. As holding low-discretion slack means having only borrowing power, when it happens, firms are constantly reminded that they have no readily available resources. As a result, to secure their chance of survival, firms may adopt a defensive mode, which sees them unwilling to spend their borrowing power on innovation any more than necessary. When situations like this arise (also covered in Chapter 2), the only opportunity firms would have to spend more on innovation would be to seize projects of predictable returns (see Chapter 2; see also George, 2005; Huang and Chen, 2010). For this reason, it is not surprising that growth in international diversification could not enlarge firms' innovation performance. Under the circumstances just described, they would most likely decline to extend their newly acquired knowledge into innovation projects with uncertain returns; they may decline to expand their production and sales of innovation with considerable investment; and they may have no plan to set up costly innovation facilities overseas just to get access to cost-effective resources.

#### **6.1.4 Control variables**

Out of the five control variables, three were found to have significant relationships with innovation performance. These include firms' size, marketing intensity and performance. For firms' size, findings have reported a positive and significant relationship between assets (an indicator of size) and innovation performance. This potentially confirms the study's speculation that firms of different sizes tend to perceive and react to the same amount of slack resources very differently (see Chapter 4 for more details). This is because, as firms' size

increases, the study argues, the chance for them to see a degree of slack resource as abundant dramatically decreases. Since different perceptions, as argued by the slack resource theory, induce different innovation performance, findings have thus supported the study's speculation (Nohria and Gultati, 1997; Lin, Liu and Cheng, 2009).

In terms of firms' marketing intensity, findings have also shown a positive and significant relationship between it and innovation performance. This may have confirmed an argument from the study around effective innovation systems, which is also the reason the study chose to control market intensity. That is, to achieve profitable innovation and superior innovation performance, having technological expertise is only a part of the equation for firms (Kotabe, Srinivasan and Aulakh, 2002; Bruni and Verona, 2009; Leenders and Wierenga, 2008). It was also argued that firms need additional marketing activities in order to learn customers' present and future needs. Without them, innovations are expected to be unprofitable and firms' innovation performance is expected to be inferior. Because innovation performance was found to grow alongside market intensity, it is therefore possible that the argument above has been supported by the findings.

In terms of firms' performance, findings have conveyed a negative relationship between it and innovation performance. This means that as firms' performance decreases, firms' innovation performance increases. In comparison, the meaning of this relationship is inconsistent with why the study adopted performance as a control variable. The study argues that this inconsistency could imply that a low level of performance could motivate firms to pursue higher performance through innovation. According to Wiseman and Bromiley (1996), scenarios like this are not rare in risk-taking and innovative companies. In fact, these authors suggested that, when firms are in adversity, such as when they are short in earnings, it is likely that they will seek to resolve the adversity through risk-taking. In this case, the risk taken is innovation, which somewhat explains why innovation performance increases when firms' performance decreases.

## **6.2 Theoretical implications**

Through analysis, the study found several of its empirical findings to be theory-building. Firstly, there are the findings associated with the relationship between slack resources, high- and low-discretion, and innovation performance. Secondly, there are the findings regarding the effects of firms' DOI in moderating the relationship between slack resources and

innovation performance. The specific theoretical implications of these findings are discussed as follows.

### **6.2.1 Slack resources and innovation performance (Research Gap 1)**

Through conceptual development and empirical investigation, the study has shown how slack resources, as tangible resources, could shape innovation performance in the IB context. In doing so, it has made two contributions to the IB research of innovation. Firstly, there is the argument around why slack resources, both high- and low-discretion, could serve to shape firms' innovation performance. Secondly, there are the rationales around how slack resources could shape firms' innovation performance.

Regarding whether slack resources are antecedents like knowledge to IB entities' innovation performance, the study revealed that the answer is yes and explained why this is the case. In addressing the relationship between low-discretion slack and innovation performance, the study argued based on the inherent properties of low-discretion slack resources. That is, when it comes to innovation, firms' low-discretion slack is fully capable of serving as a buffering mechanism, as well as a level of innovation capacity. Taking both properties into consideration, the study contended, based on Martinz and Artz (2006), that firms would be drawn to innovation as a result of their desire for higher profits (see also Bourgeois and Singh, 1983; Wiseman and Bromiley, 1996; Lin, Cheng and Liu, 2009). In explaining how high-discretion slack is able to foster innovation, the study presents the 'slack search' argument. Using its propositions, the study revealed that a firm's motivation for innovation is its deeply embedded desire to apply uncommitted production capital and pursue full operational efficiency (see Chapter 2 and 3; see also Daniel et al, 2004; Chen and Miller, 2007; Yang, Wang and Cheng, 2009). Therefore, when a firm sees a reserve of high-discretion slack, its immediate reaction would then be to seek out useful ways of applying it, such as innovation.

Secondly, concerning how slack resources could shape innovation performance, the study offers two explanations using disciplines of the slack resource theory. Starting with how low-discretion slack resources shape innovation, the study illustrated that there are two different phases to this process. Firstly, when firms sustain a fair stock of low-discretion slack resource, they are inherently granted with risk buffers, confidence and capacity with which to pursue innovation (Bourgeois and Singh, 1983; George, 2005). However, because their confidence at this stage is supported solely by borrowing power, when developing innovation, they also tend to be highly cautious every step of the way. As caution gives way to confidence, a series

of profitable innovations would thus be carried out. In consequence, a reasonable degree of innovation performance is also achieved. Secondly, when firms' low-discretion slack is scarce, the study proposed that they would therefore fall under the influence of the 'threat rigidity' mentality (Staw, Sandelands and Dutton, 1981; Shimizu, 2007). In essence, this stands for a tendency to suspend all innovation because scarcity in low-discretion slack resources means heavy financial liability and danger of bankruptcy. Authors such as Voss, Sirdeshmukh and Voss (2008) suggested that, when this occurs, a drop in firms' innovation performance is therefore imminent, as no innovation projects will still be running.

With regard to how high-discretion slack resources shape innovation, this study also discussed it in two different phases. In the first, a firm's reserve of high-discretion slack is rather low. When this is the case, the output of the reserve would therefore be risk buffers and confidence, with both being motivators for innovation. Additionally, because the level of high-discretion slack is low, the output will also involve caution and stringent decision-making in innovation. Combining all outputs together, many authors agreed that a cautious, yet somewhat bold, process of innovation would therefore be engendered (Nohria and Gulati, 1996; George, 2005; Lin, Cheng and Liu, 2009). They also contended that a substantial level of innovation performance would be achieved. When firms' high-discretion slack stock is medium, this study explained, by drawing on the slack resource research, the outputs of the stock would be again caution and confidence. The only difference is that firms with a medium level of slack resource are equipped to take on innovation projects in higher numbers and those with higher potential returns (Nohria and Gulati, 1997; Tan and Peng, 2003; George, 2005). In consequence, more financial rewards would be created.

Through making the two above-mentioned contributions, the study believes that it has, to some extent, addressed the first research gap it identified in the IB research of innovation. To recap, this gap refers to the lack of substantial research attention paid to whether and how IB entities' tangible resources could serve to affect their innovation performance. By drawing on the slack resource theory, the study illustrated and examined the effects of slack resources on innovation performance. While not all of the related hypotheses were supported, a significant relationship was found between innovation performance and both types of slack resources. Basing on the findings, the study argues that the fact this significant relationship was found implies that tangible resources do affect innovation performance in the IB context. Moreover, it implies that more attention should be paid to exploring these effects in the IB research.

### **6.2.2 Moderation effects of multinationality (Research Gap 2)**

The investigation focusing on the effects of firms' DOI over innovation performance has generally yielded theory-building materials in two fields of research.

Firstly, to the studies of slack resources, the study displays the potential for firms' DOI to moderate the relationship between high-discretion slack and innovation performance.

Secondly, to the IB innovation research, the study has addressed the second research gap it identified.

To the slack resource research specifically, this study demonstrated the importance for its IB-related studies to count firms' DOI as a variable of importance. Conceptually speaking, it did so through applying the multinationality construct to analyse how interactions between slack and firms' DOI could alter innovation performance. More specifically, between slack and the resource outputs of internationalisation, the study argued that the interaction could bring more innovation capabilities and less expense. Between slack and the customer output of internationalisation, the study argued the interaction could produce higher purchasing power and higher revenues. Between slack and the knowledge output of internationalisation, the study argued the interaction could yield higher innovation capabilities and innovation of a higher value. By making these analogies, the study believes it has shown how important it is for future studies of slack resources to regard firms' DOI as a variable to consider. Even if the effects of firms' DOI are not explored as a part of the main research interests, the study still recommends that future studies adopt it as a control variable. Empirically speaking, the study found support for its argument that firms' DOI could interact positively with high-discretion slack resources in shaping innovation performance (Hypothesis 3). In a way, this reflects the influences that firms' DOI could bring to a study in the slack resource research. Also, this shows the necessity for slack resource researchers to see internationalisation as a viable predictor of innovation performance.

By drawing on the multinationality construct, the study has addressed the second research gap it identified in the IB innovation research. In essence, this gap refers to how IB innovation research has rarely covered the full effects of internationalisation on innovation performance. Although the networking stream of IB research may count as an exception, what it covered is still just one out of the three ways for the effects to unfold. In addressing



the research gap, the first step the study took is introducing the construct of multinationality. Using its disciplines, the study presented all three ways for internationalisation to affect firms' innovation performance. After that, the study proposed the argument that, for firm's DOI to contribute to innovation performance, it has to interact positively with an antecedent like slack resources. Beyond this, the study also tested and found some support for its arguments, specifically the one suggesting positive interactions between firm's DOI and high-discretion slack. Beside this, the study also found a positive relationship wherein firm's DOI positively influence innovation performance. By performing tasks described above, the study believes it has at least to some extent addressed the second research gap it identified in the IB innovation research. By doing so, it has shown how internationalisation could strongly shape firm's innovation performance. More importantly, it may have also advised future IB studies of innovation to consistently regard firms' internationalisation as a salient variable that affects innovation performance.

### **6.3 Methodological implications**

This study offers two methodological implications. Firstly, the time frame selected in this study (2008-2011) is probably not the best time for a study of slack resource theory and innovation to be conducted. As it has been already pointed out in section 6.1.3, this is largely due to the detrimental effects of the 2008 economic crisis not having completely dissipated after four years. To a study such as this, these effects are particularly troublesome as firms, still recovering from the crisis, are not behaving the way they normally would towards slack resources. In effect, the study found a positive relationship between abundant high-discretion slack resources and innovation performance, deviating greatly from the slack resource theory. If later studies of the slack resource theory wish to pick the same time frame, this study could serve as a typical example of why they should not. However, in furthering the slack resource research, the failure of this study may further contribute an interesting research topic. That is, how has the 2008 economic crisis changed firms' behaviour towards slack resources and innovation?

Secondly, in accounting for the possibility that innovation performance is shaped by many factors, the study adopted multiple variables that could have valid influences. These include firm-specific factors like size, performance and age, which are regarded as a part of the study's control variables. Secondly, there are firms' slack resource reserve and multinationality, which are adapted as the independent variables and moderator. Through

analysis, the study showed that most of these factors were found to have a significant relationship with innovation performance. To the study's best knowledge, few prior studies have adopted all the above factors for one study, so the methodology of this study may help further research into innovation performance.

#### **6.4 Managerial implications**

Findings of this study express several managerial implications. Firstly, slack resources are found (amongst IB entities) to precede innovation and innovation performance. These findings suggest firms should not be afraid to take risks and be innovative, especially when they are shielded by a reasonable level of slack resources. Otherwise, they may miss an ideal opportunity to carry out profitable innovations and acquire superior innovation performance. In addition, these findings also encourage less resourceful firms that are planning to innovate to be extremely cautious in their selection, development and commercialisation of innovation projects. If they are not cautious, positive returns may not be guaranteed.

Secondly, firms' DOI is identified as shaping innovation performance by interacting with high-discretion slack resources. In a way, this suggests that firms with a high DOI and a reasonable stock of high-discretion slack should consider taking advantage of their DOI when developing innovation. In practice, this could mean that firms should proactively spend their high-discretion slack (e.g. cash) to acquire cost-effective and novel resources/capital from foreign locations. By doing so, it is highly likely that the firms will achieve considerable reductions in their innovation expenditures and, additionally, a renewal of their competitive advantages (von Zedtwitz and Gassmann, 2002; Kotabe, Srinivasan and Aulakh, 2002; Knight and Causgil, 2004). This could also mean that firms should spend their high-discretion slack establishing and maintaining business networks. Through this, they may acquire great product knowledge with which they could add value to innovation projects and execute them with great proficiency (Venaik, Midgley and Devinney, 2005; Ambos, Ambos and Schlegelmilch, 2006; Zhang, Macpherson and Jones, 2006). This could also mean that firms should not hesitate to apply their high-discretion slack to launching their innovations internationally. While it is arguable that doing so may not always produce positive outcomes, the findings of this study suggest that it generally presents more customer revenues than coordination expenses (Capar and Kotabe, 2003; Kurokawa et al., 2007; Kafouros et al., 2008). Lastly, this could suggest that firms, as entities pursuing high innovation performance, should contemplate expanding their international presence.

Thirdly, firms' DOI is found to have no observable interaction with low-discretion slack in shaping innovation performance. If this reflects reality, then the finding suggests that firms with only low-discretion slack to spend on innovation should not use internationalisation to boost their innovation performance. The reason for this is probably associated with the risk involved in international product launching. Also, this could have something to do with how vulnerable firms with only low-discretion slack tend to be.

## **6.5 Limitations**

There are several limitations to the present study that future researchers may wish to avoid. Firstly, in terms of operationalising innovation performance, the study, due to the availability of data, selected the R&D-over-revenue ratio as its proxy for measurement. While this ratio has been used widely in previous studies of innovation (Geiger and Cashen, 2002), more recent studies have dropped it due to its relative inaccuracy in measurement. According to Huang and Chen (2010), the most popular measurement of innovation performance right now is through looking at patent citation statistics (Dutta and Weiss, 1997; Miller, 2004; Schoenecker and Swanson, 2002). As much as the study wanted to adopt this more up-to-date measurement, the data source it adopted has offered no clear information on either patenting or patent citations. For this reason, the study expects to have slightly over- or under-estimated firms' innovation performance, resulting in its investigation being imperfect. Therefore, if future studies are to explore the same research problem (i.e. what affects innovation performance in an IB context), the advice is twofold: use a data source that provides patenting and patent citation information and measure innovation performance using patent citations.

Secondly, the study examined its conceptualisations with a sample comprised of only software development companies. Although doing so is commendable in the sense of eliminating the noises associated with industrial differences, it fundamentally limits the study to an exploration of one industry. As a result, the findings of the study may be interpreted as capturing only the behavioural patterns of software engineering enterprises, which is neither suitable nor justified for generalisation. Ultimately, the study and its findings may face generalisability challenges. To evade these adverse consequences, future studies may wish to be more diverse in choosing industries when it comes to sample construction.

Thirdly, when designing its empirical research, the study did not take into account the environmental forces and the 2008 global economic crisis. Looking back, this is probably the

most important deficiency of the study and its conceptualisation. Notwithstanding the fact that past slack resource research has made little reference to context, the study should have realised the likelihood of firms behaving differently in different contexts. In retrospect, the study believes that the unexpected effects may have directly changed firms' innovation behaviours, which in turn led to the rejection of Hypothesis 1b (i.e. excess high-discretion slack leads to inferior innovation performance). To avoid the same mistake the study made with environmental forces, future studies may choose to collect their data within a time frame with no major environmental pressures. They may also choose to measure and then control the conceivable environmental forces that may influence their slack resource research.

Fourthly, this study conducted its investigation with a relatively small sample, compared with prior enquiries into slack resources research. While 67 firms offer a reasonable pool of data, the number is still less than ideal relative to, for instance, the 250 firms studied by Geiger and Cashen (2002). Due to this limitation in sample size, the study and its findings may again face issues of generalisation. For future studies seeking to attain robust findings, this deficiency suggests that forming a bigger sample size could be a more effective research method.

## **6.6 Recommendations for future research**

As argued in Chapter 2, this study believes that there are two important research gaps existing in the IB research of innovation. Based on this belief, it proposes that future studies will continue exploring how slack resources, rather than knowledge, could shape innovation performance in the IB context. To help these studies achieve robust findings, the study offers the following recommendations.

Firstly, in the process of sample building, the study recommends that future studies involve firms from multiple high-tech industries. Doing so can lead future research to two favourable outcomes. To begin with, it could increase the sample size of future investigations and in turn increase the generalisability of findings. Furthermore, it could increase the diversity in the studies' samples, making their findings less limited to firms coming from only one industry/occupation. As a result, it could also lead future studies to produce more generalisable findings.

Secondly, in the process of data collection, the study recommends that future studies search for and adopt a data source that provides patenting and patent citation information. Huang

and Chen (2010) argued that, by doing so, studies will be able to measure firms' innovation performance highly accurately. Furthermore, as accuracy is guaranteed in the measurement of innovation performance, the study argues that more robust findings will be achieved.

Thirdly, when selecting the time frame within which to collect data, the study recommends that future studies avoid choosing a time of great turbulence and change. The study expects future studies to be able therefore to produce insightful findings that are of great generalisability. If not, the study, based on its own investigation, argues that future studies may achieve mixed findings when testing certain arguments. More importantly, they may face issues with generalisability.

Fourthly, based on the conceptualisations of this study, future studies could conduct more in-depth research into the link between tangible resources and innovation performance. For instance, they may wish to pay more attention to whether slack resources could change firms' innovation behaviours. They may also want to investigate how firms change their innovation operations when confronted with great environmental turbulence. Moreover, they may want to find out how tangible and intangible resources could interact to shape firms' innovation performance.

## **6.7 Conclusion**

This thesis explores the way slack resources precede innovation performance amongst internationalised software development companies. The reason for doing so is connected to two research gaps the study identified in the IB studies of innovation performance. Firstly, there is a lack of discussion around the way that tangible resources could shape firms' innovation performance. Secondly, some of the IB innovation research into how internationalisation could alter firms' innovation performance is not without imperfections.

To address the research gaps, the study presented two conceptual constructs from the managerial literature on innovation performance. For the first gap, the study introduced the slack resource theory to illustrate how uncommitted tangible resources could lead firms to a specific level of innovation performance. For the second gap, the study introduced the multinationality constructs and proposed three ways for firms' DOI to interact with slack resources and then change innovation performance. After integrating the two constructs, the study proposed the argument that slack resources and firm's DOI can both shape firm's innovation performance in the IB context. However, for the latter, it needs to interact with

slack resources to be able to do so. Following this argument, an examinable conceptual model is developed and four hypotheses are devised.

Through examining the set model, the study made two important findings. Firstly, it found that the relationship between slack resources, high- and low-discretion, and innovation performance is positive and linear overall. The implications of this finding are twofold. To begin with, it supports the role of slack resources as an antecedent to innovation performance. Furthermore, it rejects that there is a hypothesised curvilinear relationship between high-discretion slack and innovation performance. To account for the latter implication, the study conceived three reasons to explain why the curvilinear relationship is undetected. These include a reason related to the measurement of high-discretion slack; a reason related to the effects of unexpected environmental forces; and a reason related to the unanticipated effects of the 2008 global economic crisis. A potential contribution of the first finding is that it confirms the study's postulation that, in an IB context, tangible resources can precede innovation performance.

Secondly, the study found that while firms' DOI can interact positively with high-discretion slack when shaping innovation performance, they cannot seem to do so with low-discretion slack. The study considers the findings carry three implications. Firstly, it suggests that being multinational can lead firms to achieve better innovation performance. Secondly, it indicates that the outputs of firms' DOI could make firms' innovation-related spending, specifically with high-discretion slack, more fruitful and profitable. Thirdly, it indicates that for some reason having a high DOI and healthy borrowing power (i.e. low-discretion slack) does not yield high innovation performance. To rationalise the third implication, the study ascribed the finding with low-discretion slack to a scenario it did not anticipate. Basically, this refers to a case where firms with only low borrowing power refuse to exploit the three outputs of internationalisation due to the fact they all appear too costly and risky. One primary contribution from the second finding to the IB innovation research is that internationalisation is found to augment innovation performance. More importantly, it is found to do so through interacting with firms' readily available slack resources.

In summary, the study reveals by conceptual development and empirical investigation the connection between tangible resources and innovation performance in an IB context, and to some extent addressed two of the gaps in IB innovation research. For IB researchers, this study has shed light on a new area of innovation performance research. Moreover, it has also

conceptually enriched the networking stream of IB research and empirically demonstrated the contributions of firms' DOI to innovation performance.

## **6.8 Final remarks**

The way innovation performance is shaped in the IB context has been for decades an important research problem for the IB researchers. This study examined the role of slack resources and internationalisation with four years of data collected from 67 software development MNCs. The results showed that salient effects are generated by both slack resource and internationalisation in altering firm's innovation performance. Considering the research problem concerning the generation of innovation performance is still not fully addressed, it is hoped that this study has provided insights for future researchers.

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