The effect of multi-dimensional exploratory search on firm performance

by

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A thesis submitted to Macquarie University in fulfillment of the requirement for the degree of Doctor of Philosophy in the Faculty of Business and Economics

September 2017

Certificate of Originality

I hereby certify that this thesis is the result of my own research and that it has not, nor has any part of it, been submitted for a higher degree to any other university or institution. The sources of information used and the extent to which the work of others has been utilised, are acknowledged in the thesis. The thesis has also received the approval of the Ethics Review Committee (Human Research) at Macquarie University (Reference number: 5201401098).

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Abstract

This thesis investigates an overarching research question about how firms' performance is affected by exploratory search, internal and external environmental conditions, and firms' strategic change processes. Specifically, building on multiple theoretical lenses such as organizational learning theory, the knowledge based view of the firm, the theory of strategic renewal and higher order competences, the thesis extends the literature examining the relation between exploratory search and performance in a number of ways. First, drawing on organizational learning theory, the thesis conceptualizes and develops a measure of exploratory search in the regulatory environment (i.e., regulatory search). Second, building on the knowledge based view of the firm, the thesis examines the effects of regulatory and market search on firm performance in a contingency framework, with a focus on the moderating effect of internal environmental conditions, specifically slack, and external environmental conditions, specifically market environmental turbulence. Third, the thesis conceptualizes exploratory search as a complex and multi-dimensional construct (including both market and regulatory search), and frames the exploratory search and performance relation in the theoretical framework of strategic renewal. Using this framework, the thesis examines the mediating roles of research and development and marketing competences in the association between a firm's overall exploratory search orientation (representing managerial intentions to renew) and firm performance (representing renewal outcomes).

The format of the thesis is 'thesis by publication', consisting of three individual yet related papers. Paper 1 investigates the relation between regulatory search and firm innovativeness, and the moderating effect of slack on this relation. Regulatory search is conceptualized as a nonlocal and exploratory knowledge acquisition capability in a firm's regulatory

environment. Given there is no established scale for regulatory search, using survey data from the CEOs of Australian listed and private firms, a self-developed scale is used. Psychometric properties of the scale are examined with the results suggesting two independent factors, aligning with the knowledge requirements for the nonmarket strategies of anticipation (i.e., reactive regulatory search) and participation (i.e., proactive regulatory search). In relation to the direct effects of regulatory search factors on firm innovativeness, the results of the regression analysis indicate that only reactive search exhibits a positive and direct association with firm innovativeness. However, in relation to the moderating effects of firm slack, the results suggest that slack moderates the relation between the two regulatory search factors and innovativeness in different ways. Specifically, under a high (low) slack environment, reactive regulatory search negatively (positively) affects innovativeness, while under a high (low) slack environment, proactive regulatory search positively (negatively) affects innovativeness.

Paper 2 investigates the moderating effect of market environmental turbulence (MET) on the relation between exploratory search (in both the market and regulatory environments) and firm competitiveness. MET is used to indicate both potential changes in the regulatory environment through customers' potential collective actions, and a changing market environment through changing customer preferences and purchasing behaviours. Using both market search constructs (i.e., supply, demand, and geographical/spatial side search) from the existing literature and the self-developed regulatory search constructs (i.e., reactive and proactive regulatory search), the findings indicate that it is more effective for a firm to pursue demand side search and proactive regulatory search when MET is high, aligning with the strategies of 'demand pull' and 'influence' respectively. In contrast, supply side search and reactive regulatory search are more effective when MET is low, aligning with the strategies of 'technology push' and 'anticipation' respectively. The results suggest that, in addition to the contribution of a firm's market search, regulatory search contributes to firm performance.

Paper 3 investigates the intervening effects of research and development (R&D) and marketing competences (as firm-level strategic change processes) on the relation between exploratory search and firm performance. This investigation is placed in the theoretical framework of strategic renewal, suggesting that top management's intentional search actions play an important part in a firm's successful strategic renewal. Paper 3 conceptualizes managerial intentionality to renew as learning complexity, combining exploratory search in both the market and regulatory environments, and examines (1) how learning complexity affects R&D and marketing competences, and (2) how these competences affect the renewal outcomes (specifically, innovativeness and competitiveness). Using structural equation modelling, the empirical findings suggest that the learning complexity and innovativeness relation is mediated by R&D competence, representing the renewal channel of technological transformation, and the learning complexity and competitiveness relation is mediated by marketing competence, representing the renewal channel of marketing transformation.

In summary, the research conducted in this thesis, through its three individual papers, contributes to both literature and practice by focusing on the influence of both the environment and managerial actions on firm performance. Overall, the findings of the research suggest that firm performance is influenced by managerial actions (i.e., the actions of exploratory search), both internal (firm slack) and external (market environmental turbulence) environmental conditions, and firm strategic change processes (i.e., R&D and marketing competences).

CHAPTER 1

INTRODUCTION

1.1 Background

The literature suggests that knowledge based capabilities facilitate firms' adaptation to environmental changes, and lead to superior firm performance (Flier et al., 2003; Grant, 1996; Kogut and Zander, 1992). Drawing from organizational learning literature, this thesis focuses on one key type of knowledge based capability, namely, the ability to acquire knowledge from a firm's external environment through exploratory search (Katila and Ahuja, 2002; March, 1991; Rosenkopf and Nerkar, 2001). The thesis examines how exploratory search in that environment affects firm performance (in terms of innovativeness and competitiveness) from the theoretical perspectives of the knowledge based view of the firm and the theory of strategic renewal (Flier et al., 2003; Grant, 1996; Kogut and Zander, 1992; Sidhu et al., 2007). Importantly, given there has been limited investigation of the effect of search in the nonmarket/regulatory environment, the thesis contributes to the literature by focusing on the effects of exploratory search in both the market and nonmarket, regulatory, environments.

In addition, the thesis aims to study the moderating effects of (1) a characteristic of a firm's internal environment, specifically firm slack, and (2) a characteristic of a firm's external environment, specifically, market environment turbulence, on the relation between search and firm performance. Further, the mediating processes linking search and performance are investigated with a specific focus on how learning complexity (conceptualized by combining exploratory search in both the market and regulatory environments) leads to the invocation of higher order competences (i.e., research and development, and marketing competences), and in turn, how the use of these higher order competences leads to superior firm performance for strategic renewal purposes.

Hence, overall the thesis aims to address the overarching research question of how a firm's performance is affected by factors internal and external to the firm, including exploratory

search (in both the market and regulatory environments), the characteristics of the firm's internal (slack) and external (market environmental turbulence) environments, and a firm's ability to transform itself through the use of higher order competences (i.e., R&D and marketing competences). The key relations investigated in the thesis are depicted in Figure 1.1.

Figure 1.1 Overview of the thesis
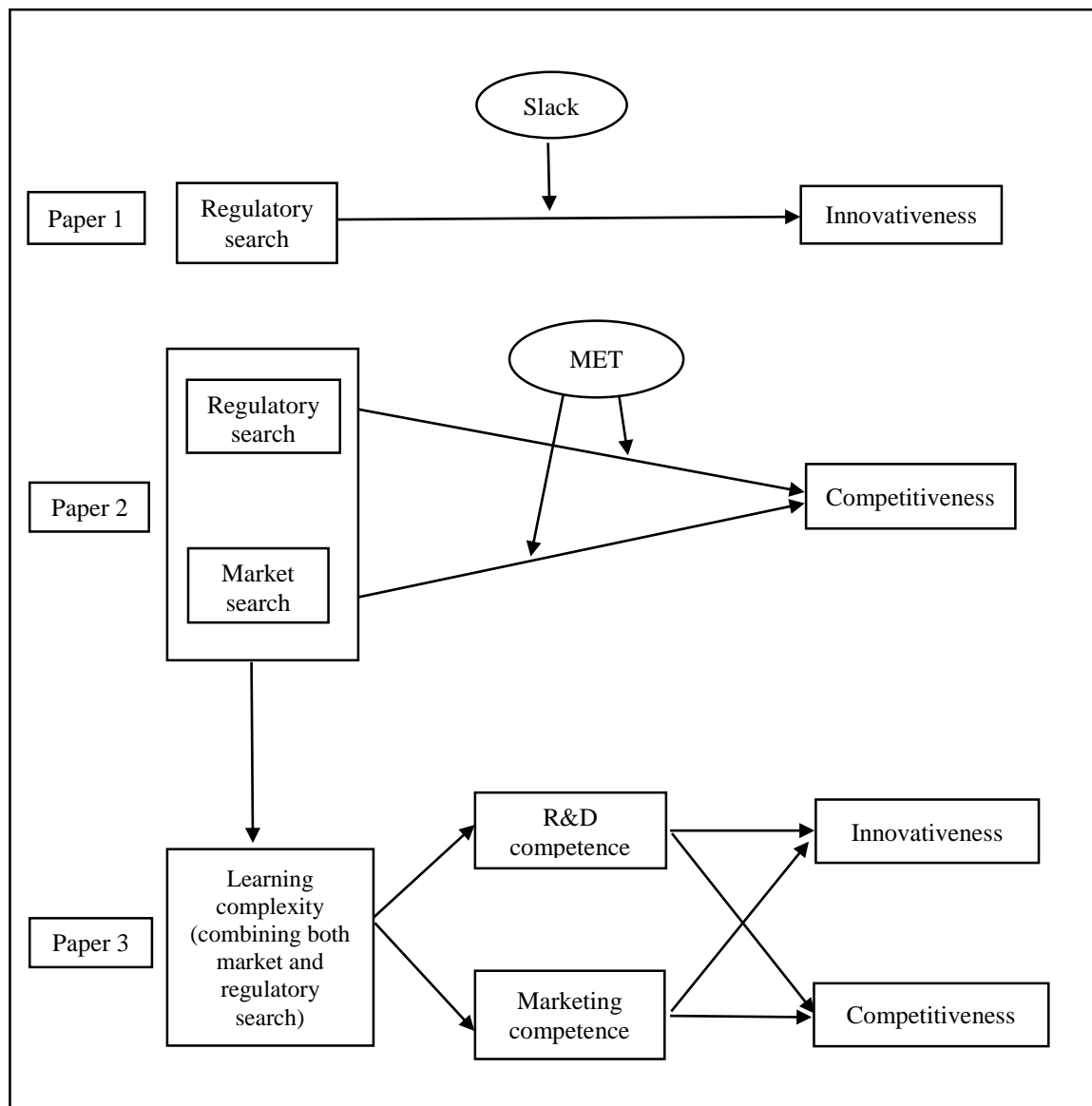
1.2 Research aims and objectives

1.2.1 The importance of regulatory search

The first aim of the thesis is to examine the importance of regulatory search as an additional and new construct in the exploratory search literature, and to examine the effect of regulatory search on firm innovativeness.

The environmental scanning literature emphasizes the relevance of searching the various sectors of a firm's task environment to its strategic decision-making process (Daft et al., 1988; Sawyerr, 1993). These environmental sectors, including the technology, customer, and regulatory sectors, attract management attention due to the perceived uncertainty in, and importance of, the sectors in affecting firm performance. However, the organizational learning literature, specifically those studies on exploratory search, primarily focuses on search (i.e., knowledge acquisition) in the market sectors of the environment to create or acquire new technologies, products and markets (Benner and Tushman, 2002; He and Wong, 2004; Sidhu et al., 2004, 2007). While it is imperative for firms to acquire knowledge on how market forces influence their performance, prior research has not examined how knowledge acquisition conducted in the nonmarket, specifically, the regulatory, environment affects firm performance.

Regulations, especially changes in regulations, have an important impact on a firm's resource allocation and its performance (Capron and Chatain, 2008). The nonmarket strategy literature suggests that a firm's regulatory competence significantly influences its innovativeness. Previous studies in this literature suggest that firms that are equipped with pertinent knowledge on regulations, and associated changes in regulations, are more likely to succeed in terms of bringing new products to market (i.e., through their ability to obtain timely regulatory approval) and in terms of new product performance. For example, in the pharmaceutical industry, De Carolis (2003) found that knowledge about how to deal with

relevant authorities (in her study, the U.S. Food and Drug Administration) was positively related to firm performance.

Similarly, Baron (1995) suggests that, with respect to a firm producing genetically modified agricultural products, the firm's knowledge in dealing with regulators, legislators and other interest groups in the public policy-making process, is crucial in influencing and/or obtaining the passage of laws favourable to the firm. More recently, Meyer et al. (2012) suggest that car manufacturers producing 'flex-fuel' engines (i.e., an innovation in engine technology allowing for adjustment to the mix of petrol and ethanol) enjoyed significant financial success in Brazil due to the Brazilian government's financial incentives to customers purchasing 'flex fuel' vehicles.

However, despite the importance of regulatory knowledge for firm performance, there has been a lack of research aimed at understanding how regulatory knowledge should be acquired in order to produce superior innovative outcomes. Motivated by this lack of research, this thesis applies Sidhu et al.'s (2007) conceptualization of nonlocal (i.e., exploratory) search in the market environment to exploratory search in the regulatory environment. Specifically, the thesis develops a measure of exploratory regulatory search, and seeks to demonstrate how regulatory search contributes to firm innovativeness.

Research question 1: How does a firm conduct exploratory search in the regulatory environment to acquire knowledge on future changes in regulations, and how does regulatory search contribute to a firm's nonmarket strategies and firm innovativeness?

1.2.2 The moderating effects of internal and external environmental conditions

The second aim of the thesis is to examine the moderating effects of a firm's internal and external environmental conditions on the relation between search and firm performance. Prior research into the effect of environmental conditions on the search/performance relation has concentrated on the external conditions of technological and competitive dynamism (e.g., Jansen et al., 2006; Lichtenthaler, 2009; Sidhu et al., 2007). By contrast,

there has been limited investigation of how a firm's internal environmental conditions influence this relation. Therefore, as well as examining the direct effect of regulatory search on firm innovativeness, this thesis addresses the gap in the literature by examining how the internal environmental condition of slack moderates this direct effect.

Slack represents a firm's internal resource munificence (Jansen et al., 2012). That is, slack represents the availability of excess internal resources needed to support effective regulatory search. It will be argued in the thesis that the availability of slack in the context of costly exploratory regulatory search is necessary to allow search to generate the knowledge and strategic variations which, in turn, are required for firm innovativeness. Slack may be absorbed (i.e., resources committed to operations and difficult to redeploy) or unabsorbed (i.e., resources which are uncommitted and readily available for use) (George, 2005). The thesis uses unabsorbed slack because of its unencumbered and easier redeployment to the firm's search process.

Research question 2: How does unabsorbed slack moderate the relation between regulatory search and firm innovativeness?

In relation to external environmental conditions, Danneels and Sethi (2011, p. 1026) note that the external environment is multi-faceted, and that "a firm's task environment is not a monolithic entity; it consists of customer, competitor, and technological sectors". As noted previously, past research focuses on the external environmental sectors of technology and competitor, and investigates how changes in these sectors (specifically, technological dynamism and competitive dynamism) affect the relation between exploratory search and firm performance (Jansen et al., 2006; Sidhu et al., 2007). However, a review of the strategic management literature on search and performance indicates that there has been little research into the customer sector of the external environment; that is, there has been little research aimed at understanding how customers and their changing preferences and actions affect the relation between search and performance.

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The focus on customers' changing preferences and actions is important because both the marketing literature and the literature on social movements (especially consumerism) suggest that the customer sector of the task environment significantly affects firm performance. In the marketing literature, past studies suggest that firms that are market-oriented (i.e., oriented towards addressing customer needs and expectations) are more likely to achieve competitive advantage than those that are not (Day, 1994; Jaworski and Kohli, 1993; Slater and Narver, 2000). In the literature of consumerism and, particularly, political consumerism (e.g., Holzer, 2006; Kotler, 1971), customers are viewed as political players in addition to their roles as economic agents. This literature argues that, when individual customers are properly mobilized, they can form a formidable political force by which they are able to participate collectively in political bargaining, and potentially influence public policy-making processes to protect and advance their interests. Accordingly, these collective actions may result in regulatory changes, which correspondingly affect firm performance.

Drawing on the dual role of customers as both economic agents and political players, and their potential influence in both the market and regulatory environments, this thesis extends and contributes to past research which has typically focused on the environmental conditions of technology and competitors by investigating how changes in customer preferences and actions affect the relation between exploratory search, in both the market and regulatory environment, and firm competitiveness. Using market environmental turbulence (MET) as the proxy for changing customer preferences, and firm competitiveness as a broad performance indicator (including both strategic and financial performance), the thesis addresses the following research question.

Research question 3: How does market environmental turbulence (MET) moderate the relations between (i) market search and firm competitiveness; and (ii) regulatory search and firm competitiveness?

1.2.3 The mediating effects of higher order competences on the relation between search and performance

The third aim of this thesis is to examine the mediating effects of higher order competences on the relation between exploratory search (in both the market and regulatory environments) and performance (in terms of both firm innovativeness and competitiveness). The strategic renewal literature, especially those studies using the lens of environmental adaptation, suggests that firms' long term survival and sustainable competitiveness are primarily the results of managerial intentional actions to renew (i.e., to adapt and change the firm) in order to achieve a 'fit' with environmental changes (e.g., Agarwal and Helfat, 2009; Flier et al., 2003; Lewin et al., 1999; Van Den Bosch et al., 1999; Volberda et al., 2001). On this basis, past research suggests that managerial intention to renew can be linked with firms' exploratory search activities (Flier et al., 2003), and empirically demonstrates that exploratory search in the market environment for new technological and market opportunities positively contributes to firm performance (He and Wong, 2004, Lichtenthaler, 2009; Sidhu et al., 2007).

However, a review of the literature indicates that there has been a lack of research aimed at understanding the processes linking managerial renewal intentions and renewal outcomes (reflecting superior firm performance). That is, there is an absence of research examining the processes through which managerial renewal intentions are translated into concrete organizational level changes, which then lead to superior renewal outcomes. Consequently, this thesis aims to address this gap in the literature by investigating the roles of research and development (R&D) and marketing competences as the change processes, or routines, linking renewal intentions and renewal outcomes.

R&D and marketing competences, known as higher order competences, are strategic change routines, creating and modifying a firm's normal operating procedures that are known as lower order competences, such as technology and customer competences (Danneels, 2002,

2008; Eisenhardt and Martin, 2000; Teece et al., 1997; Winter, 2003). Continuing the thesis' overarching theme of exploratory search, the thesis conceptualizes learning complexity as the firm's overall exploratory search in both the market and regulatory environments, and uses learning complexity to reflect managerial intentions to renew and change. Integrating learning complexity (reflecting managerial intentionality), higher order competences of R&D and marketing (representing strategic change processes), and strategic renewal outcomes (firm innovativeness and competitiveness) in a mediating model, the thesis aims to address the following research question.

Research question 4: How do managerial intentional actions (proxied by learning complexity) invoke the use of higher order competences (i.e., R&D and marketing competences), and in turn, subsequently lead to superior strategic renewal outcomes?

1.3 Overview of the thesis

The format of the thesis is 'thesis by publication', consisting of three separate, yet related, papers (see Figure 1.1) addressing the research questions discussed in the previous section. The following sections present an overview of the three papers.

1.3.1 Paper 1: Searching in the nonmarket environment: The impact of regulatory search on firm innovativeness

Paper 1 addresses research questions 1 and 2, investigating the relation between regulatory search and firm innovativeness and the moderating effect of firm slack. Regulatory search is first conceptualized as a nonlocal search process, and, therefore, exploratory in nature, designed to be future oriented and focusing on changes in the regulatory environment[1]. Given there is no established scale for regulatory search, a self-developed scale is constructed. Then, using survey data collected from the CEOs of Australian listed and private firms in the healthcare, industrial machinery and financial service industries, the regulatory search scale is tested for its psychometric properties, with the results suggesting

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[1] Nonlocal search refers to searching in a distant domain of a firm's knowledge competence, and represents a form of exploratory search. Nonlocal/exploratory search is further discussed in the literature review chapter and in the individual papers.

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that nonlocal search conducted in the regulatory environment consists of two independent factors. These two factors align with the knowledge/information requirements for nonmarket strategies of anticipation (i.e., anticipating future regulatory changes ahead of competition without directly participating in public policy-making) and participation (i.e., directly participating in public policy-making to influence favourable regulatory outcomes). Accordingly, the two search factors are named as reactive regulatory search (aligning with the anticipative strategy) and proactive regulatory search (aligning with the participative strategy).

The two regulatory search factors are regressed on firm innovativeness, operationalized in respect to new product performance. The results indicate that reactive search exhibits a positive and direct association with firm innovativeness. In relation to the moderating effect of slack, the results suggest that slack moderates the relations between the two regulatory search factors and innovativeness in different ways. Specifically, under a high (low) slack environment, reactive regulatory search negatively (positively) affects innovativeness, while under a high (low) slack environment, proactive regulatory search positively (negatively) affects innovativeness.

1.3.2 Paper 2: The role of market environmental turbulence in moderating the effect of market and regulatory search on firm competitiveness

Paper 2 addresses research question 3, and investigates the moderating effect of market environmental turbulence (MET) on the relation between search and firm competitiveness. The literature suggests that MET reflects changing customer preferences that result in changes in their purchasing behaviour, and, therefore, indicates a changing market environment. However, Paper 2 argues that MET may also indicate potential changes in the regulatory environment. Specifically, Paper 2 argues that stability in, and predictability of, customer preferences (i.e., the inverse of MET), provide a foundation for mobilizing customers' common interests, and facilitate political coalition building and collective

bargaining in the public policy-making process. The resulting potential changes to regulations/legislations constitute changes in a firm's regulatory environment. In investigating the moderating effects of MET on the relation between exploratory search and firm performance, the paper employs the market search scales from the existing literature (specifically, Sidhu et al., 2007), including nonlocal search in the supply, demand, and geographical/spatial domains of the external environment, and also the self-developed regulatory search constructs (i.e., reactive and proactive regulatory search) detailed in Paper 1.

Using the survey data from the CEOs of Australian private and listed entities in the healthcare, industrial machinery and financial services industries, moderated regressions are conducted to examine the moderating effects of MET on the relation between market search and firm performance, and also the relation between regulatory search and firm performance. Firm performance is operationalized as firm competitiveness. The results suggest that it is more effective for a firm to pursue demand side search and proactive regulatory search when MET is high, aligning with the strategies of 'demand pull' and 'influence' respectively. In contrast, supply side search and reactive regulatory search are more effective when MET is low, aligning with the strategies of 'technology push' and 'compliance' respectively. Further, the results suggest that regulatory search contributes to firm performance, over and above the contribution of a firm's market search.

1.3.3 Paper 3: Managerial intentionality and firm strategic renewal: The mediating roles of higher order competences

Paper 3 addresses research question 4, and investigates the mediating effects of higher order competences, namely R&D and marketing competences, on the relation between managerial intentionality to renew and firm strategic renewal outcomes. Managerial intentionality is related to a firm's overall exploration orientation, and is referred to as learning complexity which combines both market search (supply, demand and geographical dimensional search),

and regulatory search (reactive and proactive regulatory search). Using the survey data from the CEOs of Australian private and listed entities in the healthcare, industrial machinery and financial services industry, factor modelling is used to examine if the search dimensions in the market and regulatory environments are distinct at a sub-construct level, yet convergent at the construct level to reflect an overall exploration orientation, and to represent managerial intentionality to renew. The results suggest that by excluding the items of reactive regulatory search, the model fit improved significantly. In addition, the results of alternative factor modelling, with factors of supply, demand, geographical and proactive regulatory search, support the dimensional search factors as distinct at the sub-construct level, but convergent at the construct level to reflect managerial intentionality.

To test the mediating effects of R&D and marketing competences, structural equation modelling using partial least squares is deployed, and measurement and alternative structural models for both direct and indirect effects are constructed. In relation to the direct effects, the results show that learning complexity, reflecting managerial intentionality, is related to both R&D and marketing competences, and, in turn, R&D and marketing competences are related to renewal outcomes of firm innovativeness and competitiveness. The use of both firm innovativeness and competitiveness is designed to reflect both a narrow strategic renewal outcome through new product performance (i.e., innovativeness), and a broad strategic renewal outcome through superior strategic market position and financial performance relative to competitors (i.e., competitiveness).

In relation to the mediating effect, both methods of indirect effect testing (Preacher and Hayes, 2004; 2008) and the four-step approach of Tippins and Sohi (2003) are used. The findings indicate that learning complexity and performance are mediated by higher order competences. In particular, the learning complexity and innovativeness relation is mediated by R&D competence, representing the renewal channel of technological transformation; and

the learning complexity and competitiveness relation is mediated by marketing competence, representing the renewal channel of marketing transformation.

1.4 Organization of the thesis

The thesis is organized as follows. Chapter 2 reviews the literature relating to the research question overarching the three papers; specifically how firm performance is affected by exploratory search in the market and regulatory environments, by internal and external environmental conditions, and by firms' higher order competences. Chapters 3, 4 and 5 comprise the three individual papers. Chapter 6 then draws the three papers together and provides a summary of the findings, implications and an overall conclusion to the thesis research.

While each of the three papers is designed to be stand-alone, and hence contains its own literature review relevant to each paper, the empirical data used for the papers are collected from one survey questionnaire with different measures being used for different papers. Given the empirical analysis conducted is different across the three papers, the methods are discussed separately in the individual papers.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the relevant literature is reviewed with respect to the relation between firms' exploratory search and firm performance, starting with the distinction between exploration and exploitation, and how these twin concepts are conceptualized in the contemporary strategic management research literature. The review then proceeds to focus on firms' exploratory search activities, and on the theoretical perspectives (specifically, the knowledge based view of the firm, organizational learning theory, and the theory of strategy renewal) explaining how exploratory search activities lead to superior firm performance. In addition, given that the thesis examines (1) exploratory search and performance in a moderating framework, and (2) the mediating effects of higher order competences, those studies in the literature that have examined the effects of various moderating factors, and higher order competences, are also reviewed. Finally, a summary of the literature review is provided. Figure 2.1 provides a flow chart of the progression of the chapter.

Figure 2.1 Flow of the literature review

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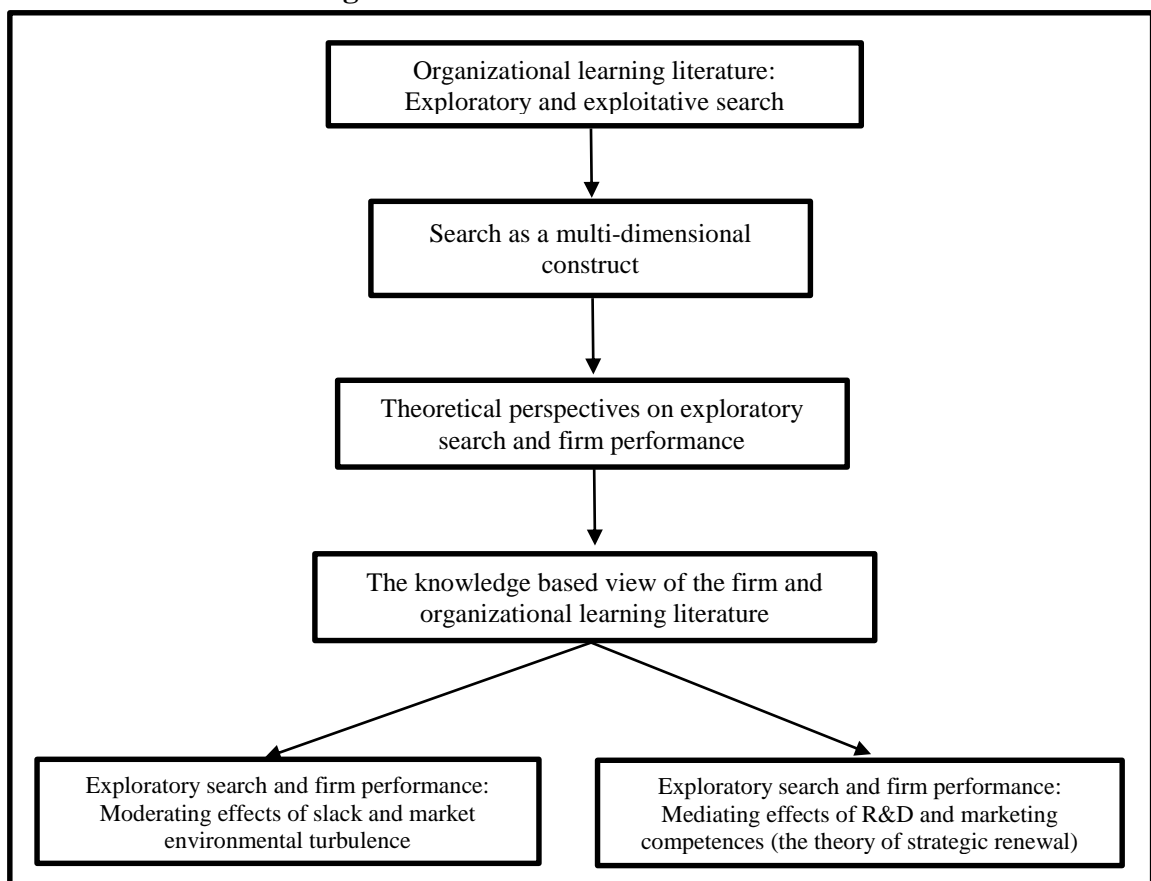
2.2 Organizational learning literature: Exploratory and exploitative search

The pioneering work of March (1991) specifies two different processes by which organizations adapt to their environments, namely, exploration and exploitation. March (1991, p. 71) states that exploration involves "variation, risk taking, experimentation, play, flexibility, discovery, innovation", whereas, exploitation involves "refinement, choice, production, efficiency, selection, implementation, execution". Since their introduction, these twin concepts have been applied in strategic management research to investigate innovation (Benner and Tushman, 2003), organizational design (Sigglekow and Levinthal, 2003), adaptation (Flier et al., 2003; Lewin et al., 1999), firm/organizational learning and firm performance (Baum et al., 2000; He and Wong, 2004; Sidhu et al., 2007).

While exploration and exploitation are widely used in these different research contexts, the consensus on the conceptualization of exploration and exploitation is that they coalesce around innovation and organizational/firm learning. In terms of innovation, Benner and Tushman (2002) and He and Wong (2004) suggest that exploitation focuses on improving existing technologies, products and markets, while exploration focuses on the acquisition and creation of new technologies, products and markets. In terms of learning, Baum et al. (2000) suggest that exploitation is learning conducted to acquire knowledge to refine and reuse existing routines, whereas exploration represents learning or knowledge acquisition through the processes of variation and experimentation. Similarly, Vermeulen and Barkema (2001, p. 459) suggest that exploration represents "search for new knowledge", and exploitation represents "ongoing use of a firm's knowledge base".

The distinction between 'acquiring new knowledge' and 'using or applying existing knowledge' is also reflected in the research on absorptive capacity. Past studies suggest that absorptive capacity is a firm's ability to utilize external knowledge (Lane et al., 2006) through (1) the process of exploratory learning to acquire new knowledge, known as

potential absorptive capacity, and (2) the process of exploitative learning to apply the knowledge acquired, known as realized absorptive capacity (Jansen et al., 2005; Zahra and George, 2002).

Additionally, past studies conceptualize exploration as nonlocal search or search scope, whereas exploitation is conceptualized as local search or search depth (Katila and Ahuja, 2002; Rosenkopf and Nerkar, 2001; Sidhu et al., 2004, 2007). Local search refers to knowledge acquisition (i.e., search) for solutions in the vicinity of a firm's existing expertise and competences, and nonlocal search refers to knowledge acquisition conducted beyond the existing expertise and competences of the firm (Rosenkopf and Nerkar, 2001; Sidhu et al., 2004, 2007). Similarly, search depth refers to the degree to which search revisits a firm's existing knowledge base, whereas search scope refers to the degree of new knowledge that is explored (Katila and Ahuja, 2002).

Empirical research has shown that firms have a tendency to pursue exploitation, i.e., local searching close to their existing expertise and knowledge. For example, Martin and Mitchell (1998) found that firms in product markets tend to introduce product designs similar to their existing products. Stuart and Podolny (1996) show that new patenting activities in semi-conductor firms tend to concentrate on the existing technological domain. Similarly, Rosenkopf and Nerkar (2001) suggest that, in the optical disk industry during the 1980s, firms, such as Sony and Phillips, produced incremental and exploitative innovations that only added features to the original compact disc standards without fundamentally changing the limitations of the CD standards, i.e., limited storage capacity and restrictive file formats.

While exploitation improves existing firm competences through specialization, Levinthal and March (1993) suggest that positive experience or feedback from exploitation may reinforce a short-term orientation building around a firm's existing knowledge competences, and, hence, introduce structural inertia, resisting changes and trapping the

firm in its existing competences. Similarly, Leonard-Barton (1992) suggests that the downside of exploitation is its potential to turn core competences into core rigidity; that is, specialization and repeated exploitation lead to limited exposure in 'non-dominant' technical areas and inhibit change and technological innovations. The threats of competence trap and core rigidity are further demonstrated in Tripsas and Gavetti (2000), who studied Polaroid's failed attempt to transition into the digital imaging field. Tripsas and Gavetti (2000) suggest that, by adhering to its traditional business model of 'selling cameras cheaply and making money from more profitable films', Polaroid missed the important opportunity to expedite its prototype digital camera to market, despite possessing superior sensor technologies and its prototype being developed earlier than competitors.

As a consequence, and by contrast, Rosenkopf and Nerkar (2001) call for searching beyond local and exploitative search, and, instead, conducting boundary spanning and exploratory search. Rosenkopf and Nerkar (2001) emphasize that internal searching (i.e., local search) generates the lowest impact on a firm's technological innovation, whereas external, broad searching for variation (i.e., nonlocal search) generates the highest impact on technological innovation. In a similar vein, research on absorptive capacity suggests that exploratory learning acquires new knowledge from the external environment, increases a firm's knowledge base and diversity, and enhances strategic flexibility and responsiveness. Exploratory learning also prevents the 'lock-out effect' and 'competency traps', and facilitates first mover advantage and the firm's long-term survival and enduring competitive advantage (Gupta et al., 2006; Jansen et al., 2006; Lichtenthaler, 2009; Zahra and George, 2002).

The emphasis on exploration for firms' superior performance is also echoed in evolutionary analysis of Schumpeterian competition[2]. For example, Nelson and Winter (2002) explain

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[2] Schumpeterian competition suggests that competition should be based on exploratory innovations, such as new technologies, as opposed to competition conducted on the basis of price (see Nelson and Winter, 1982, 2002; Schumpeter, 1950).

that smaller firms can 'beat the odds' and overtake their larger rivals through exploring for new technological possibilities and innovation, despite the larger rivals' greater spending power on research and development (R&D). Nelson and Winter (2002, p. 34) state that "a successful innovator today does not necessarily position it favourably to seize the important opportunities that will be presented tomorrow".

Deriving from, and building on, this literature, this thesis focuses on a firm's exploratory activities, specifically, exploratory search. In relation to the operationalization of a firm's exploratory search, Sidhu et al. (2007) measure it through the firm's knowledge acquisition behaviour. Sidhu et al. (2007) develop a scale including items reflecting search closer to a firm's existing knowledge domain (i.e., local and exploitative search) as a baseline, and items reflecting search in the domain distant from a firm's existing knowledge competence (i.e., nonlocal and explorative search). Sidhu et al. (2007) argue that the higher the score on the scale, the larger the amount of nonlocal and exploratory search.

2.3 Search as a multi-dimensional construct

It is noticeable in the research reviewed above that studies of exploratory search have predominantly focused on the technological domain. Although technological opportunities undoubtedly drive firm growth, opportunities arising from other market areas, such as the demand and geographical sides of the market, also play an important role in enhancing firm performance. In this regard, Sidhu et al. (2007) suggest that exploratory search should be extended to the demand side of the market environment to uncover latent customer needs, and the geographical side to detect potential diversification opportunities, in addition to the supply side for new technological opportunities. While extending exploratory search into a multi-dimensional construct is important, the research still largely focuses on the market environment and ignores the importance of the nonmarket, specifically, the regulatory, environment.

Consequently, this thesis contributes to the literature on exploratory search by examining how exploratory search in both the market and regulatory dimensions affects firm performance. Specifically, Paper 1 investigates the direct effect of regulatory search on firm innovativeness and the moderating effect of slack on that relation, whereas Paper 2 investigates the direct effects of both market and regulatory search on firm competitiveness, and the moderating effect of market environmental turbulence. Paper 3 combines market and regulatory search in a composite construct, namely learning complexity, and investigates the mediating effect of higher order competences on the relation between learning complexity and firm innovativeness and competitiveness.

With respect to regulatory search, Paper 1 examines how regulatory search forms an integral part of a firm's nonmarket strategy-making, through which superior innovative outcomes can be achieved. Nonmarket strategy is defined as "a concerted pattern of actions taken in the nonmarket environment to create value by improving its (the firm's) overall performance…" (Baron, 1995, p. 146). Weidenbaum (1980) suggests nonmarket strategies may be passive, anticipative, and/or participative in nature. The passive strategy indicates that firms have no intention, and make no attempt, to take part in public policy-making processes, other than passively complying with existing regulations and legislations. Given that compliance with existing regulations is a baseline requirement for all firms' survival in a given industry, it is unlikely that firms will derive competitive advantage from passive compliance.

In contrast, the anticipative strategy describes a firm's strategic actions to anticipate regulatory developments affecting the firm without proactively participating in the political bargaining process leading to those developments (Hillman and Hitt, 1999). The anticipation of forthcoming regulations may lead to early compliance, and then to first mover advantage and/or to increased social legitimacy due to compliance ahead of

competitors. The participative strategy involves corporate political activities (e.g., lobbying) to participate in, and influence, the public policy-making process for favourable regulatory/legislative outcomes.

Based on this literature, this thesis focuses on both anticipative and participative strategies as they represent more active stances towards public policy-making relative to passive compliance, and require firms to consider regulations, specifically changes to regulations, as part of their forward planning and search process.

2.4 Theoretical perspectives on exploratory search and firm performance

In this section, the theoretical perspectives explaining the relation between exploratory search and firm performance are discussed with emphasis on both the knowledge based view of the firm and organizational learning literature. These two perspectives form the theoretical basis for Papers 1 and 2. An additional theoretical perspective relevant to Paper 3, namely, the theory of strategic renewal, is discussed in Section 2.4.3.

2.4.1 The knowledge based view of the firm and organizational learning literature

The knowledge based view (KBV) of the firm originates from the resource based view (RBV) of the firm (Barney, 1991), and suggests that knowledge resources (i.e., information and know-how) are the important sources of firm value creation (Felin and Hesterly, 2007; Grant, 1996; Kogut and Zander, 1992). Due to its origin in the RBV, and from the perspective of strategic management research, the KBV was first used to explain how acquisition, configuration and combination of knowledge resources lead to superior firm performance (e.g., Battor et al., 2008; Carrillo and Gaimon, 2004; Felin and Hesterly, 2007). Second, given that the KBV is intertwined with research on organizational learning, managerial cognition, decision making rights, and organizational structure, it has also developed into a theory of the firm to explain the existence of the firm, firm structure and

boundary conditions (e.g., Foss, 1996; Grant, 1996, 1997; Heiman and Nickerson, 2002; Nickerson and Zenger, 2004).

This thesis focuses on the former theoretical perspective of the KBV; i.e., that the acquisition, configuration and combination of unique and heterogeneous knowledge resources drive firm performance. The VRIO (Valuable, Rare, Inimitable and Organized) framework of the RBV (Barney, 1991) suggests that knowledge resources, as the source of firms' sustainable competitive advantage, are difficult to formalize, articulate and transfer between firms, especially when the knowledge is tacit and of a procedural nature[3] (Grant, 1996; Nonaka and Takeuchi, 1995; Wiklund and Shepherd, 2003). However, to obtain VRIO knowledge resources, knowledge acquisition (i.e., search) plays an important role.

How knowledge can be acquired from a firm's environment is largely addressed in the organizational learning literature. Comparing knowledge acquisition conducted in an exploratory (nonlocal) and exploitative (local) manner, March (1991) demonstrates, in his simulation study, that by importing external knowledge in an open system (through allowing employee turnover as a proxy for exploration), the average code knowledge (i.e., organizational level knowledge) maintains around its long term average. However, if only mutual learning is allowed in a closed system without external input of knowledge (i.e., learning is purely conducted between the organization and its members as a form of exploitation), the average code knowledge quickly degenerates in a changing environment.

In addition, placing the firm in a competitive environment, March (1991, p. 81) argues that "…returns to changes in knowledge depend not only on the magnitude of the changes in the expected value but also on changes in variability". Exploration, known to enhance variation and diversity in knowledge, is, accordingly, more likely to increase the variability of the

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[3] Procedural knowledge is defined as "knowing the procedures for how to do things and arises from experience with similar situations" (Wiklund and Shepherd, 2003, p. 1308).

returns to knowledge. This is clearly articulated in March (1991) who contrasts firms competing on the left hand side of the performance distribution (i.e., firms fighting for survival) with firms on the right hand side (i.e., firms competing for superior performance). March (1991) argues that it is the latter firms that would benefit significantly through exploration, highlighting the potential for above average returns from exploration.

Similarly, Taylor and Greve (2006) emphasize the important effect of variance-enhancing behaviour (as a form of exploration) on innovation. Studying teams creating and publishing comic books, Taylor and Greve (2006) find that multiple knowledge strands lead to the combination of these strands and, ultimately, to innovative outputs. The conception that knowledge acquisition precedes knowledge combination is also aligned with the conceptualization of absorptive capacity, in which application of knowledge through realized absorptive capacity (i.e., exploitative learning) is only made possible by the knowledge acquisition through potential absorptive capacity (i.e., exploratory learning).

Under the theoretical umbrella of the KBV and organizational learning literature, other empirical studies support the positive contribution of exploration and exploratory search to firm performance. For example, Katila and Ahuja (2002) find that search scope (measuring exploration) is positively related to the number of new products introduced. Wiklund and Shepherd (2003) find that the use of market and technological knowledge to discover environmental opportunities is also positively associated with firm performance. Sidhu et al.'s (2007) empirical investigation of the relation between firms' exploratory search orientation and innovativeness suggests that exploratory search orientation, including search in the sub-dimensions of supply, demand and geography, is positively related to a firm's new product performance. Lichtenthaler (2009) showed that exploratory learning as part of a firm's overall absorptive capacity is positively related to both firm innovation (i.e., new product performance) and firm performance (e.g., market share or profitability).

Building on these prior studies, this thesis extends the search literature by examining how both exploratory regulatory and market search affect firm performance. Specifically, Paper 1 investigates the effect of exploratory regulatory search on firm innovativeness. Paper 2 investigates the effects of both exploratory market and regulatory search on firm competitiveness. Paper 3 combines both market and regulatory search into a composite construct, namely, learning complexity, reflecting a firm's overall exploratory search orientation, and investigates how learning complexity affects both firm innovativeness and competitiveness. In addition, the thesis extends the literature by examining the moderating effects of slack and market environmental turbulence, and the mediating effects of higher order competences, on the relation between exploratory search and performance. The relevant moderating/contingency based literature is discussed in Section 2.4.2, and the mediating effect, based on the theory of strategic renewal, is discussed in Section 2.4.3.

2.4.2 Exploratory search and firm performance – moderating effects of slack and market environmental turbulence

A review of the studies on the relation between exploratory search and firm performance suggests that the common research practice is to investigate this relation in a moderating/contingency framework. This practice highlights the importance of environmental conditions in shaping the effectiveness of a firm's search, learning and adaptive processes. For instance, Jansen et al. (2006) investigate the moderating effects of both environmental dynamism and environmental competitiveness on the relation between exploration and firm financial performance. Environmental dynamism refers to the rate of change and the degree of (in)stability in the environment, representing changing technologies and demand for products and services. Jansen et al. (2006) argue that threats of obsolescence in a dynamic environment propel the need for exploration, and that firms capitalizing on the opportunities in this changing environment are more likely to generate new technologies and products, and have superior financial performance. Their empirical

results support the hypothesis that environmental dynamism positively moderates the relation between exploration and firm financial performance.

Environmental competitiveness refers to the degree of competitive intensity, specifically, the number of competitors and the number of areas in which there is competition. Jansen et al. (2006) argue that a competitive environment exerts pressures on price and efficiency, and, therefore, requires exploitative rather than explorative behaviour, because exploration conducted in this environment may be quickly diffusible due to competitors' ability to imitate. On this basis, Jansen et al. (2006) hypothesized that environmental competitiveness would negatively moderate the relation between exploration and financial performance. However, this hypothesis was not supported by their results.

Sidhu et al. (2007) similarly investigate how a condition of the external environment, specifically technological dynamism, moderates the relation between exploratory search and firm innovativeness (i.e., new product performance). Technological dynamism reflects the rate of change and unpredictability in the technological environment. Sidhu et al. (2007) suggest that the degree of technological dynamism can be used to proxy the life cycle of a technological paradigm. That is, a high level of dynamism indicates the early stage of the paradigm with a multitude of technological variations and possibilities to be explored. In contrast, a low level of dynamism indicates the maturity of the paradigm with an established dominant design to exploit and refine. Sidhu et al. (2007) then separately hypothesize how technological dynamism moderates the effects of supply, demand and geographical side search on firm innovativeness. Their findings suggest that dynamism positively moderates the relation between supply side search and innovativeness, but negatively moderates the relation between demand side search and innovativeness. No significant moderating effect was found for the relation between geographical side search and innovativeness.

Moreover, Lichtenthaler (2009) conceptualizes exploratory learning as potential absorptive capacity, and examines how both market and technological turbulence affect the relation between exploratory learning and firm performance (including financial and qualitative measures). Lichtenthaler (2009) finds that both technological and market turbulence positively moderate the relation between exploratory learning and firm performance.

These empirical findings suggest that, in general, exploration and exploratory search positively influence firm performance, and that this relation is affected by the characteristics of the firm's environment. However, these studies examine moderating factors of environmental dynamism, technological dynamism, and market dynamism. Hence, they only focus on the effects of external environmental conditions on the search and performance relation, and ignore the potential effects of a firm's internal environmental conditions.

An important internal environmental condition potentially affecting the search and performance relation is slack. Nohria and Gulati (1996, p. 1246) define slack as "the pool of resources in an organization that is in excess of the minimum necessary to produce a given level of organizational output". The literature suggests that slack can be a significant driver of a firm's research and development investment (Chen, 2008; Kim and Lee, 2008), its product exploration and exploitation (Voss et al., 2008), innovation (Nohria and Gulati, 1997, 1996), and financial performance (Tan, 2003). Using slack, specifically unabsorbed slack, to proxy for internal resource munificence (Jansen et al., 2012), Paper 1 (Chapter 3) examines how the relation between regulatory search and innovativeness is affected by the amount of slack that the firm holds.

In addition to examining the moderating effect of the internal environmental condition of slack, the thesis also examines the moderating effect of the external environmental condition - market environmental turbulence (MET). The review of the literature that has investigated

external factors moderating the exploratory search and performance relation shows that prior research has typically focused on the technological and competitor sectors of the environment, such as environmental dynamism (including both technology and market demands) (Jansen et al., 2006; Lichtenthaler, 2009; Sidhu et al., 2007) and environmental competitiveness (Jansen et al., 2006). However, prior research in the search and performance literature has not explicitly considered the customer sector of the external market environment, nor has it considered the regulatory environment of the firm.

This thesis contributes to this literature by investigating, in Paper 2 (Chapter 4), the effects of both the regulatory and market, specifically customer, sectors of the external environment, and changes therein, on the relation between exploratory search and firm performance. To do so, the thesis focuses on the role of customers as both economic agents and political players, and argues that their changing preferences can influence both the market and regulatory environments. As economic agents, changing customer preferences have been well-established in the literature as affecting firm performance (e.g., Atuahene-Gima and Li, 2004; Danneels and Sethi, 2011; Jaworski and Kohli, 1993).

In relation to the influence of customers on the regulatory environment, Paper 2 discusses the literature on consumerism and political consumerism (e.g., Holzer, 2006; Kotler, 1971). This literature suggests that customers' changing preferences (or the lack thereof) impedes (or supports) the mobilization of common interests and the formation of coalitions that cause changes in the regulatory environment. Hence, as political players, customers are able to exert collective political force to change a firm's regulatory environment.

2.4.3 Exploratory search and firm performance – mediating effects of R&D and marketing competences

In this section, the mediating effects of higher order competences on exploratory search and performance are discussed using the theoretical framework of strategic renewal. Floyd and Lane (2000) suggest that a firm's strategic renewal actions closely relate to the concept of

strategic change from the general evolutionary model (e.g., Burgelman, 1983; Nelson and Winter, 1982), and require "an iterative process of belief, action and learning, with the purpose of aligning the organization's strategy with changing environmental circumstances" (Floyd and Lane, 2000, p. 155). Floyd and Lane (2000, p. 155) emphasize the importance of organizational knowledge in bringing about organizational change, and state that strategic renewal is "an evolutionary process associated with promoting, accommodating and utilizing new knowledge and innovative behaviour in order to bring about change in an organization's core competencies and/or change in its product market domain".

The emphasis on the use of new knowledge to bring about organizational change can be directly linked to a firm's exploration and exploratory search activities and reflects managers' intention to change and renew (Flier et al., 2003). Empirical research has established the positive influence of exploratory search on renewal outcomes (reflected by superior firm performance) (see, e.g., Flier et al., 2003; Jansen et al., 2006; Sidhu et al., 2007). However, there has been a lack of empirical investigation into what the organizational change processes are, and, hence, a lack of understanding of how managerial intentional actions to explore and learn lead to organizational level changes, which then lead to superior performance outcomes.

The lack of empirical investigation on the mediating process of organizational change is surprising as most strategic renewal studies emphasize that strategic renewal requires an organizational or firm level change. This is apparent from Floyd and Lane's (2000) conceptualization of strategic renewal, discussed previously, that focuses on the processes of organizational change. Similarly, Volberda et al. (2001) define strategic renewal as a firm's activities to alter its path dependence, including important parameters of how managers behave towards each other and the way they invest for the future. Flier et al. (2003,

p. 2168) propose "strategic renewal as strategic actions to *align* organizational competencies with environment to increase competitive advantage" (emphasis added). More recently, Agarwal and Helfat (2009, p. 282) explain strategic renewal by specifically defining 'renewal' as 'a type of *change*', which is synonymous to '*refreshment*' and '*replacement*' (emphasis added).

In order to understand the change processes linking managers' international actions to effect organizational change, this thesis focuses on the roles of higher order competences, specifically, research and development (R&D) and marketing competences. Research differentiates lower and higher order competences (e.g., Winter, 2003). Lower order competences address operational issues by using the knowledge capability specific to current technologies and markets, and are akin to the static operating routines discussed in King and Tucci (2002). Danneels (2002) suggests that lower order competences may be technological competence (i.e., the ability to make a given new product) and customer competence (i.e., the ability to sell to or serve certain customers). These lower order competences are static and inert in nature, are prone to early and local returns, and trap the firms in their own competences in a changing external environment (Levinthal and March, 1993).

Higher order competences, in contrast, are known as dynamic capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997), 'the competence to build new competences' (Danneels, 2008, p. 519), meta-capabilities (Collis, 1994), or change routines (King and Tucci, 2002). Danneels (2008, 2002) suggests that the higher order competences may be R&D and marketing competences, which are not specific to a given new technological or customer domain. Rather, they are change routines, which add, reconfigure and recombine first order competences. For example, Danneels (2008) suggests that R&D competence refers to a firm's ability to change lower order technological competences, reflecting the firm's ability

to explore new technological domains. R&D competence may be a firm's ability to change engineering and manufacturing know-how or the ability to patent. On the other hand, marketing competence refers to a firm's ability to change lower order customer competences, reflecting the firm's ability to explore new market opportunities. Marketing competence may be the ability to build customer relationships or reconfigure sales forces and distribution channels.

In addition, R&D and marketing competences, as higher order competences, are also strategic routines (Eisenhardt and Martin, 2000), corresponding to a firm's strategic postures of being technologically innovative and market oriented (Danneels, 2008). For example, the organizational transformations achieved through the use of R&D and marketing competences, such as developing patenting capability or reconfiguring the sales force, contribute to the value-adding strategies to be innovative (e.g., the patenting capability developed can be used to produce new products catering for an emerging environmental niche) and market driven (e.g., the reconfigured sales force can be used to better promote and market the new or existing products to customer needs).

The literature on the theory of strategic renewal and higher order competences motivates and directs the research conducted in Paper 3 (Chapter 5). Paper 3 introduces the concept of learning complexity, conceptualized as the combination of both market and regulatory search, and proxying for managerial intentionality to renew. Then, following an intentionality-process-outcome model for a firm's strategic renewal, Paper 3 uses learning complexity as managerial intentionality, higher order competences as strategic change routines (processes), and firm performance as strategic renewal outcomes. The resulting mediating model suggests that the intentionality to renew invokes the use of higher order competences (i.e., R&D and marketing competences) as change processes. In turn, the

change processes effect organizational changes for superior strategic renewal outcomes (i.e., superior firm performance).

2.5 Summary of the literature review

In this chapter, the relevant literature has been reviewed in relation to organizational learning, the knowledge based view of the firm and the theory of strategic renewal as theoretical perspectives on the relation between exploratory search and firm performance. The chapter also reviewed the relevant literature on factors internal and external to the firm as moderators of the relation between exploratory search and performance, and higher order competences as the mediating processes in that relation. The adoption of multiple theoretical lenses informs both the theory and the empirical analysis of how firms' superior performance and long term survival are determined by internal and external environmental conditions (i.e., slack and market environmental turbulence), managerial intentional actions (to explore), and firms' strategic change processes (i.e., R&D and marketing competences).

In the remaining parts of this thesis, the three papers are presented to address the research questions specified in Chapter 1 and further discussed in this chapter. Specifically, in Chapter 3, Paper 1 examines the relation between regulatory search and firm innovativeness, and the moderating effect of firm slack. In Chapter 4, Paper 2 examines the moderating effects of market environmental turbulence on the relation between exploratory search (both market and regulatory search) and firm performance. In Chapter 5, Paper 3 examines the mediating effects of R&D and marketing competences on the relation between exploratory search (reflecting managerial intentionality) and firm performance.

CHAPTER 3

Paper 1 – Searching in the nonmarket environment: The impact of regulatory search on firm innovativeness

Abstract

This paper investigates the relation between regulatory search, a nonlocal and exploratory knowledge acquisition capability in a firm's nonmarket environment, and firm innovativeness using survey data from CEOs of Australian listed and private firms. A self-developed scale is used to measure regulatory search with the results suggesting that nonlocal search conducted in the regulatory environment consists of two independent factors, namely, reactive and proactive regulatory search. The results indicate that only reactive search exhibits a positive and direct association with firm innovativeness. However, the results suggest that slack moderates the relations between the two regulatory search factors and innovativeness in different ways. Specifically, under a high (low) slack environment, reactive regulatory search negatively (positively) affects innovativeness, while under a high (low) slack environment, proactive regulatory search positively (negatively) affects innovativeness.

Keywords

1. Introduction

Research shows that firms' ability to adapt through innovation and self-renewal largely depends on their knowledge capability (Eisenhardt and Martin, 2000; Sidhu et al., 2007), which, in turn, depends on how firms search in, and learn from, their environment (Nelson and Winter, 1982). Search and learning may be conducted in the market environment comprising technological search from the supply side (e.g., Katila and Ahuja, 2002; Nerkar, 2003; Sidhu et al., 2007), consumer preference search from the demand side, and diversification search from the spatial (geographic) side (e.g., Nerkar and Roberts, 2004; Sidhu et al., 2007).

While it is crucial for firms to pursue search in the market environment, the strategy literature offers limited coverage on search in the nonmarket environment, especially the regulatory environment.[4] This environment is important because legislations and regulations play a crucial part in determining firm survival and prosperity (Baron, 1997, 1995). For example, the importance of the regulatory environment is reflected in the detrimental and potentially prohibitive costs of non-compliance, especially for firms in heavily regulated industries (e.g., banking and financial services). For instance, the Bank of America agreed to pay a record US$16.65 billion to settle with the US Department of Justice relating to the sale of faulty mortgage backed securities over the period leading up to the financial crisis in 2008. The importance of the regulatory environment is also visible in corporate political activities, such as lobbying and campaign contributions, designed to generate 'influence rents', i.e., superior profits generated through influencing regulatory and legislative outcomes toward a firm's advantage (Ahuja and Yayavaram, 2011; Choi et al., 2014; Doh et al., 2012).

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[4] Baron (1995) suggests that a firm's nonmarket environment includes social, political and legal environments. The regulatory environment, in this paper, is used as a general term to capture both the political and legal environments.

Research suggests that a firm's knowledge capabilities in the regulatory environment are highly relevant for firm performance. For instance, Bonardi et al.'s (2006) empirical findings in the utility industry show that internal factors, such as a firm's experience with regulators, significantly influenced the firm's rate of return. In addition, Somaya et al. (2007) examined the effect of patent law expertise on patenting performance using a sample of Fortune 500 companies and found that in-house patent expertise significantly predicted patenting performance.

This paper aims to contribute to the literature by examining the influence of a firm's knowledge acquisition capability in the regulatory environment and investigating how regulatory search affects the firm's innovative performance. We do so by (1) conceptualizing regulatory search as a nonlocal search capability, (2) developing a scale for its measurement, and (3) examining the regulatory search-innovativeness link in a contingency framework.

The conceptualization of regulatory search as a nonlocal search capability is consistent with Sidhu et al.'s (2007) focus on nonlocal search in the supply, demand and spatial dimensions of the market environment. Sidhu et al. (2007) argue that search can be operationalized on a local to nonlocal continuum. Local searching close to the firm's existing area of competence, a form of exploitative learning, is likely to lead to myopic learning and trap a firm in its own competence (Levinthal and March, 1993; March, 1991). By contrast, nonlocal search (i.e., searching at a distance from the firm's existing competence), a form of explorative learning, increases the firm's knowledge stock and enhances its ability to respond and adapt to environmental changes (Li et al., 2013; March, 1991; Sidhu et al., 2007, 2004).

In the context of the regulatory environment, we propose that regulatory search conducted in a nonlocal manner should be 'future' oriented, that is, it should focus on the evolution,

developments or changes in future laws and regulations rather than on existing laws and regulations. The conceptualization of future orientation draws on the nonmarket strategy and corporate political activity/behaviour literature (e.g., Baron, 1995; Baysinger, 1984; Boddewyn and Brewer, 1994; Doh et al., 2012; Hillman and Hitt, 1999; Keim and Zeithaml, 1986; Oliver and Holzinger, 2008). This literature explicates that the regulatory environment is dynamic and, to respond to this dynamic environment, a firm either positively anticipates the changes in laws and regulations in the future, or actively participates in the public policy-making process to instigate or influence changes to existing laws and regulations, and/or new laws and regulations, favouring the firm. Regardless of the strategies of anticipation or participation, we argue that the key to the success of these strategies lies in the firm's 'future' oriented knowledge capability.

In addition, regulatory search conducted in a nonlocal manner focuses a firm's searching on 'others' in the firm's environment, representing a form of boundary spanning search.[5] The focus on others draws on the literature on exploratory learning (e.g., Levinthal and March, 1993; Li et al., 2013; March, 1991; Sidhu et al., 2004). Researchers in this literature argue that search with an emphasis on the firm itself is unlikely to be sufficient to provide the firm with the requisite capability to respond and adapt to environmental changes. Rather, response and adaptation need to be based on knowledge acquisition from outside the boundary of the firm.

The nonmarket strategy and corporate political behaviour literatures also suggest that the legal and political markets are dynamic and involve multiple other interested parties. In this context, we suggest that a firm's regulatory search is used to detect changes in the regulatory environment and to acquire knowledge on how those changes may affect others, and,

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[5] 'Others', according to the political markets literature (e.g., Bonardi et al., 2006, 2005; Buchanan and Tullock, 1962), may include suppliers, competitors, regulators, judicial systems or activist groups. This is further explained in the literature and hypotheses development section.

subsequently and indirectly, the firm itself. In addition, regulatory search can also be used to acquire knowledge on how others influence the process of public policy-making to the potential detriment of the firm. This knowledge then feeds into a firm's strategy making process by anticipating the indirect impact on the firm, and/or participating in the public policy-making process to pre-empt or counteract the actions of the opposing interests.

Consistent with our conceptualization of regulatory search as a nonlocal search capability, an eight-item scale was developed. Using the survey data from the CEOs of a sample of Australian listed and private firms, the scale was subjected to psychometric tests of unidimensionality, reliability, and discriminant validity. It was found that the scale formed two factors, reactive and proactive regulatory search, which reflect knowledge acquisition processes corresponding to the positive anticipation and direct participation political strategies respectively. Our finding of a two-factor construct for regulatory search (1) provides a contrast to the one-factor constructs found by Sidhu et al. (2007, 2004) in the supply, demand and spatial dimensions of the market environment, and (2) contributes to the search literature by demonstrating empirically that the various nonlocal search choices in the regulatory environment can coalesce around the distinct political strategies of positive anticipation and direct participation.

The scale is used to examine how regulatory search affects firm innovativeness in a contingency framework. Prior research, specifically Sidhu et al. (2007), examined the association between search (specifically, in the supply, demand and spatial dimensions of the market environment) and firm innovativeness. Sidhu et al. (2007) found that the association was contingent on the level of technological dynamism in the external environment. We extend this contingency analysis by investigating how the association between search (in the regulatory environment) and a firm's innovativeness is conditional on a firm's resource munificence (Jansen et al., 2012), proxied by organizational slack.

Organizational slack has been argued as an important internal environmental condition affecting search effectiveness (George, 2005). Our results of the moderated regression analysis support this with slack being found to moderate the relation between the two regulatory search factors and innovativeness differently. Specifically, under a high (low) slack environment, reactive regulatory search negatively (positively) affected innovativeness, while under a high (low) slack environment, proactive regulatory positively (negatively) affected innovativeness.

The paper is organised as follows. In the next section, we first review the literature on search and introduce the concept of regulatory search. We then provide theory to develop hypotheses for the main effect of regulatory search on firm innovativeness and for the moderating effect of slack. In the following sections we discuss the method including the development of the regulatory search scale and the measurement of the other variables, the results, and, finally, we present the discussion, implications and limitations.

2. Literature review and hypotheses development

2.1 Search

Evolutionary economics (Nelson and Winter, 1982) suggests that firms fend off environmental selection pressure through the process of searching and discovery to ensure their adaptation to the external environment (Dosi and Nelson, 1994). Searching is a learning process which requires "exploring the new possibilities and exploiting the old certainties" (March, 1991, p. 71). Exploration involves processes of experimentation, risk taking and discovery, and exploitation involves the processes of refinement, selection and implementation (March, 1991). On this basis, Sidhu et al. (2007) argue that exploitative learning largely draws knowledge from the vicinity of a firm's areas of competence, therefore representing a process of local search. Explorative learning, by contrast, gathers knowledge from regions less near to the firm's competence, and, therefore, represents a process of nonlocal or distal search.

The conceptualization of firms' knowledge acquisition process as local-nonlocal highlights, on the one hand, the tendency, due to inertia (Leonard-Barton,1992), that firms are more likely to search within the familiar territory of their own locale, and therefore, trap themselves in their own competence area (Levinthal and March, 1993). On the other hand, in order to break from inertia and to be innovative and adaptive, Sidhu et al. (2007) emphasize the need to conduct nonlocal search, and argue that the extent of nonlocal search determines how well firms can create variations in their strategic decision-making process to adapt to environmental contingencies.

Sidhu et al. (2007) also argue that the effects of nonlocal search on innovativeness can be further enhanced if the search is conducted in different dimensions, including searching; (1) from the supply side of the market environment to capitalize on technological advancements, (2) from the demand side to capture the opportunities arising from changes in customer preferences, and (3) from the spatial side to gain the benefits of geographical diversification. While this multi-dimensional construction of firms' nonlocal search behaviour in the market environment has been hypothesized and found to influence firm innovativeness, a gap in the search literature to date is that it has not considered the relevance of nonmarket search, especially search in the regulatory environment. We fill this gap by first providing a theoretical construction and measure of regulatory search, and by examining how regulatory search affects firm innovativeness.

2.2 Regulatory search

Regulatory search, in this paper, is framed as a process of knowledge acquisition from a firm's regulatory environment. The regulatory environment captures both legal and political components, and is considered as part of a firm's nonmarket environment (Baron, 1995). Our investigation of the regulatory environment contrasts with the focus on the (economic) market environment by Sidhu et al. (2007), where supply, demand and/or spatial side search is conducted.

Consistent with Sidhu et al. (2007), we emphasize that regulatory search should be conducted in a nonlocal fashion. Nonlocal search in the regulatory environment reflects a firm's acquisition of information beyond that information which is needed for passive compliance with existing laws and regulations. Passive compliance requires the understanding of how the existing laws and regulations directly affect a firm in the normal conduct of its business, such as how workplace safety regulations affect the firm's manufacturing processes. We argue that searching for information to ensure passive compliance is a form of localized search as it focuses on the application of the existing laws and regulations to the firm itself. By contrast, regulatory search, as a nonlocal search process, is (1) 'future' oriented (i.e., directed towards acquiring knowledge about changes, developments and evolutions in laws and regulation), and (2) directed beyond the boundary of the firm itself and towards obtaining knowledge about how laws and regulations affect 'other' organizations in the firm's environment.

Our specification of future orientation in regulatory search is similar to Danneels and Sethi's (2011) conceptualization of future-oriented market scanning, in which the authors suggest that a firm's searching in the (economic) market environment should be forward looking in order to understand the future needs of customers. In terms of regulatory search, future orientation implies that a firm's knowledge acquisition should focus on the evolution of the regulatory environment and, specifically, developments in the laws and regulations comprising that environment. These developments may relate to how laws and regulations may be interpreted (or re-interpreted), administered or changed in the future, or the enactment of new laws and regulations.

In addition, we propose that nonlocal regulatory search shifts a firm's knowledge acquisition process from being focused on the firm itself to being focused on 'others' (i.e., other firms with which the focal firm interacts or other constituents in the process of influencing laws

and regulations). Regulatory search, in this regard, is a form of boundary spanning search and is similar to the boundary spanning search conducted in the (economic) market environment to explore new products (Carlile, 2002; Li et al., 2013) or new geographical regions (Sidhu et al., 2007, 2004). In the context of the regulatory environment, knowledge acquisition about 'others' is designed to better understand how a firm is influenced by the regulations affecting other firms, and how other organizations in the focal firm's regulatory environment influence the public policy-making process. From the perspective of political markets (Buchanan and Tullock, 1962), we suggest that 'others' in a firm's regulatory environment may come from the demand side of public policy-making, such as firms, consumers, activists and competitors; or the supply side, such as legislators, regulatory agencies and the judicial system, who provide, enforce and interpret public policies (Bonardi et al., 2005).

2.3 Regulatory search and firm innovativeness

Research on nonmarket strategy highlights the importance of the regulatory environment to a firm's survival and prosperity. Nonmarket strategy is defined as "a concerted pattern of actions taken in the nonmarket environment to create value by improving its (the firm's) overall performance…" (Baron, 1995, p. 146). Given the importance of the regulatory environment, Baron (1995) suggests that firms should develop nonmarket strategies to shape their competitive position in the market environment. Empirically, research has demonstrated that nonmarket strategies positively affect firm performance. For example, Shaffer et al. (2000) show that nonmarket strategies, such as actions taken on public relations, testimony before Congress and administrative agencies, filing petitions and lobbying, are positively related to a sample of airlines' financial performance. Furthermore, in the pharmaceutical industry, De Carolis (2003) found that knowledge competence and expertise in dealing with relevant authorities (in her study, the U.S. Food and Drug Administration) was positively related to firm performance.

We argue that a part of the concerted pattern of actions in the regulatory environment for value creation and better innovative outcomes involves a firm's knowledge and information acquisition as the inputs for nonmarket strategy making. To positively contribute to firm innovativeness, regulatory search identifies the key issues a firm needs to address, and the opportunities a firm can capitalize on, in the changing environment of the firm's regulatory domain (Baron, 1995).[6] From an exploratory learning perspective (March, 1991; Sidhu et al., 2004), regulatory search conducted with a 'future' orientation and directed at 'others' creates variations in and diversity of a firm's knowledge stock and enlarges a firm's knowledge pool (Katila, 2002; Katila and Ahuja, 2002).

The 'future' oriented search emphasizes 'what-if' scenarios and requires the consideration of how a firm's new product performance might be affected by developments and/or changes in the laws and regulations. Regulatory search directed at 'others' may involve a firm searching vertically along its rent chain of resource providers or distributors, or laterally among its competitors and complementary product providers. When combined with the future orientation, the vertical or lateral regulatory search helps to understand how a firm may be affected by the laws and regulations affecting others. This is largely consistent with the anticipative political strategy as outlined in Weidenbaum (1980) and Boddewyn and Brewer (1994).

The anticipative political strategy describes a firm's strategic actions to anticipate regulatory developments affecting the firm without proactively participating in the political bargaining process leading to those developments (Hillman and Hitt, 1999). We argue that a firm's ability to anticipate largely depends on the knowledge acquired through regulatory search (Oliver and Holzinger, 2008). For instance, searching vertically for the impact of the introduction of a carbon tax on suppliers is important to a firm from an efficiency

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[6] Consistent with He and Wong (2004) and Sidhu et al. (2007), innovativeness is investigated as an outcome variable, representing the performance of a firm's new product development program.

perspective. A 'what-if' analysis would indicate that the introduction of a carbon tax would be likely to increase the supplier's cost of production. This, in turn, would lead a firm to anticipate the scenario of increases in its input cost due to the supplier's potential action of passing on the costs, which in turn would lead to strategies to manage the increased cost.

Regulatory search conducted laterally to anticipate the effects of regulations on competitors and complementary product providers also has an important impact on firm innovativeness. For instance, lateral searching on the impact of regulations on competitors may indicate to a firm if the first mover advantage can be obtained. For instance, through regulatory search on the effects of the introduction of stricter environmental regulations on firms and their competitors, Mazda and Toshiba were able to anticipate higher compliance costs for their competitors, and subsequently gain competitive advantage through the earlier inventions of 'clean' engines using hydrogen rotary technology, and acid-free and renewable batteries respectively (Shrivastava, 1995a, 1995b; Shrivastava and Hart, 1994).

In addition to the first mover advantage, we argue that knowledge acquired about a supplier's potential noncompliance may cause a firm to discontinue that relationship in anticipation of a potential loss of sales due to the negative publicity generated from the firm's association with the noncompliant supplier. This is the so-called negative reputational effect in the compliance literature (Fombrun, 1996; Raymond, 2004). Additionally, knowledge of noncompliance by competitors may lead a firm to highlight its own compliance track record to enhance its public image and social legitimacy.

Hillman and Hitt (1999) argue that while positive anticipation of the effects of regulatory changes is an important nonmarket/political strategy, a direct participation strategy, consisting of participating in and influencing the public policy-making process, is also essential in a competitive business environment. Applying Hillman and Hitt (1999), proactive regulatory search involves focusing a firm's search and information acquisition

on the changes in laws and regulations effected by the key players (e.g., legislators and interest groups) in the regulatory environment, and how the firm may, through participation, interact with those players. Regulatory search of this form is crucial for devising strategies to influence legislative outcomes and is normally conducted alongside a firm's corporate political activities. That is, firms acquire knowledge through engaging in purposeful lobbying activities to understand how different interest groups trade off policy issues and strategize actions to influence public policy-making processes (Baysinger, 1984).

To demonstrate the importance of regulatory search to effect favourable legislative outcomes, we use the example of Calgene Inc, investigated in Baron (1995). Calgene is a biotechnology firm producing genetically engineered (GE) food. As an innovation, GE allows tomatoes to ripen longer and, therefore, to taste better. However, obtaining regulatory approval for the innovation was difficult due to the lack of an established approval process. Calgene proactively influenced both sides of the policy-making process, including the supply side through lobbying Congress and developing a relationship with the relevant authorities (e.g., the U.S. Federal Drug Administration and the Environmental Protection Agency); and also the demand side, by addressing the concerns of interest groups opposing genetically modified products by providing positive and mollifying commentary through the media. While recognising the importance of the nonmarket strategies employed, we argue that the success of these strategies hinges on the firm's in-depth understanding of how legislators, regulators and interest groups behave in negotiating the policies and processes for approving genetically modified products. We suggest that this in-depth understanding is largely obtained through nonlocal searching in the regulatory environment.

In summary, we propose that regulatory search positively contributes to a firm's innovativeness through nonmarket strategies of anticipation and participation. Specifically, the more regulatory search a firm conducts, the more likely that it acquires knowledge on

various emerging opportunities in the regulatory environment, which, in turn, leads to strategy making for innovation through, for example, first mover advantage, enhanced efficiency and/or better reputation and social legitimacy.

H1: The amount of regulatory search is positively associated with firm innovativeness.

2.4 The moderating effect of organizational slack

Nohria and Gulati (1996, p. 1246) define slack as "the pool of resources in an organization that is in excess of the minimum necessary to produce a given level of organizational output". Slack can be in the form of financial or human resources. The literature suggests that slack has a significant impact on a firm's research and development investment (Chen, 2008; Kim and Lee, 2008), its product exploration and exploitation (Voss et al., 2008), innovation (Nohria and Gulati, 1997, 1996), and financial performance (Tan, 2003).

Slack is used in this paper to proxy for internal resource munificence (Jansen et al., 2012) and focuses on measuring the supportiveness of the internal resources in pursuing regulatory search. Research differentiates slack as absorbed (i.e., resources tied to the operations and difficult to redeploy) or unabsorbed (i.e., resources which are uncommitted and readily available for use) (Singh, 1986; Voss et al., 2008). We focus on the unabsorbed slack resources given their easier deployment to a firm's search process (George, 2005; Jansen et al., 2012).

We propose that slack positively moderates the effect of regulatory search on firm innovativeness. At a higher level of slack, we suggest that the internal environment is more munificent to conduct regulatory search which requires considerable financial and human resources to explore various nonlocal search options. From a real options perspective (McGrath, 1999), abundant firm resources allow the concurrent pursuit of multiple nonlocal search options in the regulatory environment, thereby increasing a firm's chance of success of its newly developed products. For instance, in a high resource munificent environment,

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regulatory search allows firms to engage and build political ties with multiple political parties. Especially in election seasons, these multiple ties increase a firm's chance of maintaining the success of its new product programs, regardless of which political party may gain government.

By contrast, at a lower level of internal resource munificence, the lack of resources limits a firm's search options and ability to capitalize on emerging opportunities. In addition, the pursuit of regulatory search diverts the limited resources that could have been invested in the development of the firm's new products. On this basis, we propose that slack positively moderates the effect of nonlocal regulatory search on innovation. Specifically, the higher (lower) the level of slack, the more (less) effective nonlocal regulatory search is in affecting firm innovativeness.

H2: Organizational slack moderates the association between regulatory search and firm innovativeness; specifically, the higher (lower) the slack, the more (less) effective regulatory search is in influencing firm innovativeness.

3. Method

A mail-based survey was used to collect data from Australian listed and private firms in the healthcare, industrial machinery and financial service industries. Firms in these industries are both heavily regulated in Australia and compete extensively based on their innovative new products. These firms offer an ideal research context to investigate how regulatory search affects firm innovativeness[7]. The firms were selected from Capital IQ from their respective industries, with a population of 578 firms in healthcare, 790 in industrial machinery, and 761 in financial services, totalling 2129 firms across the three industries.

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[7] The Australian Innovation System Report (Australian Government, 2016: 34) shows manufacturing and financial (and insurance) services to rank second and third out of twelve industrial sectors in terms of the importance of innovation; and technological advancements over the past two decades have radically transformed healthcare into a sector heavily dependent on innovation (Bowen, 2017). With respect to regulation impact and cost, the Australian Innovation System Report (Australian Government, 2016: 73) shows Australian businesses generally "to have to negotiate higher levels of business regulation" than the majority of other OECD countries; and the Australian Centre for Health Research (2017) and Deloitte (2017) articulate the high levels of regulation currently and increasingly affecting the Australian health and financial services sectors respectively (the latter significantly affected by both domestic and international regulatory 'repair' following the Global Financial Crisis (Deloitte, 2017)).

The contact details of the firms were further validated by phone and information available on companies' websites. During this purification process, 1172 firms were discarded due to the contact details not being corroborated. The final purified population contained 957 firms.

A key informant approach was adopted with a pre-tested survey questionnaire being sent to the Chief Executive Officers (CEOs) of 930 companies. Consistent with Sidhu et al. (2007), we targeted CEOs because research on organizational strategy suggests that top managers are the most appropriate source for organizational and strategic level information (Conant et al., 1990). Subsequent to the initial mail-out, one follow-up mailout was performed.[8] Collectively, 135 questionnaires were received. We deleted four responses due to significant incompletion, and hence the final response rate was 14.1%, which is comparable to past studies where top management, especially the CEO, has been used as the target respondent (Sidhu et al., 2007, 2004). The 131 firms in the sample were characterised by an average of 33.7 years of operations, 349.5 full time equivalent employees, and $281 million of annual income. All respondents were CEOs or equivalent with an average managerial experience of 21 years.

To test non-response bias, we conducted t-tests on the mean values of key variables between early and late respondents (Armstrong and Overton, 1977). No significant differences were found, which suggests that non-response bias is unlikely to be a problem. Additionally, common method bias was tested using Harman's (1967) single-factor test, which showed that the highest variance explained by a single factor was 20.3%, which was well below the 50% threshold suggested by Podsakoff et al. (2003), indicating that common method bias is unlikely to be a concern.

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[8] The research ethics protocol of the authors' university allows only one follow-up to be performed.

3.1 Measure of regulatory search

Items to measure regulatory search were self-developed to reflect the conceptualization of nonlocal search/exploratory learning. To ensure content validity, the questionnaire was pilot-tested and further modified on the basis of feedback from both academic researchers in the relevant area and senior business executives. In addition, based on a careful review of the literature on strategy, political markets and corporate political activity, we produced seven statements to capture the nonlocal search orientation in the regulatory environment. Consistent with our theorization, statements were developed to capture the 'future' and 'others' orientation in regulatory search. For instance, the word 'developments' is used to capture the changes in laws and regulations, and, therefore, to reflect the 'future' orientation of regulatory search. Also, 'others' are specified in various statements to capture other parties who are affected by and/or affect the regulatory changes, such as resource providers, complementary product providers, legislators, and other interest groups. For example, the statement "We are well aware of regulatory developments affecting our resource providers" reflects vertical searching in the adjacent domain of the resource providers along the rent chain. Lateral searching into competitors and complementary product providers is reflected in the statements "We acquire little information on regulatory developments affecting our competitors" and "A close watch is kept on regulatory developments affecting organizations providing complementary products to ours".

In addition, the statement "We are in close contact with legislators to gain an understanding of new legislative trends affecting us", reflects the firm's building of a personal relationship with legislators for knowledge acquisition. The statement "We actively seek information through the collective lobbying efforts of trade/professional/political associations", emphasizes the knowledge acquisition process through collective lobbying efforts. Further, the statement "We strategically monitor other interest groups in their efforts to change regulations affecting our organization", reflects knowledge acquisition about how other

interest groups affect the legislative process. Finally, to capture the knowledge requirement of firms expanding into a foreign jurisdiction, we included the statement "We are on a constant watch for regulatory developments in foreign jurisdictions where we may operate or are operating". In line with Sidhu et al. (2007), a relatively near (i.e., local) regulatory search statement, focusing on knowledge acquisition affecting the firm itself, was also used to serve as a baseline comparison to more distal search options. This statement was "We are well aware of current regulatory developments uniquely affecting our organization".

Hence, in total, eight items were developed with respondents asked to indicate whether the statements describe the search behaviour of their organizations on seven-point Likert-type scales with anchors of '1 = Strongly disagree' and '7 = Strongly agree'. Consistent with Sidhu et al. (2007), we also assume that a relatively nonlocal-oriented firm would report high scores on the items representing the pursuit of multiple nonlocal search options in the regulatory domain, providing a high average score for the scale. We took care to use words in plural form to indicate that information collected is at the organizational level. To counter the bias of response set, we reverse-coded the statement "We acquire little information on regulatory developments affecting our competitors". The tests for individual item reliability, construct reliability and discriminant validity for the regulatory search construct are reported in the Results section.

3.2 Measure of firm innovativeness

Following past studies such as He and Wong (2004) and Sidhu et al. (2007), we measure firm innovativeness in terms of the performance of its new product development program. We collected perceptual data as the financial performance of new products is not publicly reported, especially for private firms. Lichtenthaler's (2009) three-item, seven-point Likert-type scale was used to measure perceived performance, anchored at '1 = Strongly disagree' and '7 = Strongly agree'. The three items are (1) "The overall performance of our new product development program has met our objectives"; (2) "From an overall profitability

standpoint, our new product development program has been successful"; and (3) "Compared with our major competitors, our overall new product development program is far more successful". The construct reliability coefficient was 0.84 and well above the recommended threshold of 0.7 (Nunnally, 1978).

3.3 Measure of slack

A firm's internal resource munificence was proxied by slack (Jansen et al., 2012) and designed to capture the unabsorbed firm financial and human resources. Slack was measured by a four-item, seven-point Likert-type scale based on Danneels and Sethi (2011) and anchored at '1 = Strongly disagree' and '7 = Strongly agree'. The four items are (1) "All available resources are locked up in current projects"; (2) "My organization has a reasonable amount of resources in reserves"; (3) "We have ample discretionary financial resources"; and (4) "We can always find the "manpower" to work on special projects". The construct reliability coefficient for slack was 0.73.

3.4 Control variables

Consistent with Sidhu et al. (2007), we controlled for firm size, age, formalization, and technological environmental turbulence. Size was measured by the log-transformed employee numbers to proxy for a firm's structural complexity that might negatively influence firm innovativeness. Age, measured by the log-transformed number of years since incorporation, might also negatively influence innovativeness due to inertia.

Formalization was measured using Sidhu et al.'s (2007) five-item, seven-point Likert-type scale to reflect the potential rigidity caused by an overemphasis on rules that might discourage innovativeness. The items are (1) "Whatever situation arises, written procedures are available for dealing with it"; (2) "Rules and procedures occupy a central place in the organization"; (3) "Written records are kept of everyone's performance"; (4) "Employees in our organization are rarely checked for rule violations"; and (5) "Written job descriptions

are formulated for positions at all levels". The scale was anchored at '1 = Strongly disagree' and '7 = Strongly agree' and its construct reliability was 0.54. Although the reliability is relatively low, we kept this variable for consistency with Sidhu et al. (2007).

Also, consistent with Sidhu et al. (2007), the dynamism in the technological environment was measured by environmental technological turbulence using the four-item, seven-point Likert-type scale of Danneels and Sethi (2011). The four items are (1) "The technology is changing rapidly"; (2) "Technological changes provide big opportunities"; (3) "A large number of new products have been made possible through technological breakthroughs"; and (4) "Technological developments are rather minor". The scale was anchored at '1 = Strongly disagree' and '7 = Strongly agree' and its construct reliability was satisfactory at 0.84.

4. Results

4.1 Regulatory search

We performed exploratory factor analysis on the eight-item regulatory search scale and report the results in Table 1. A scree test showed the eight items formed two factors. The factor loadings show RS1 (i.e., Regulatory Search item 1) to RS4 forming one factor and RS5 to RS7 forming the other. While RS5 had similar loadings around 0.5 on both factors, we allocated RS5 to the second factor on a theoretical basis, as it represented an important means of knowledge acquisition through personal contact with the legislator. RS8 was deleted due to a low individual loading below 0.4. With respect to individual reliability, Table 1 shows that the factor loadings were either higher than or close to the minimal threshold of 0.55 (Falk and Miller, 1992), indicating satisfactory individual reliability.

Table 1 Factor analysis results of regulatory search

Items	Factor 1: Reactive Regulatory Search	Factor 2: Proactive Regulatory Search
RS1[*] We are well aware of current regulatory developments uniquely affecting our organization.	**0.78**	0.25
RS2 We are well aware of regulatory developments affecting our resource providers.	**0.79**	0.18
RS3 A close watch is kept on regulatory developments affecting organizations providing complementary products to ours (e.g., computer hardware and software).	**0.54**	0.32
RS4 We acquire little information on regulatory developments affecting our competitors.	**0.55**	0.12
RS5 We are in close contact with legislators to gain an understanding of new legislative trends affecting us.	0.5	**0.51**
RS6 We actively seek information through the collective lobbying efforts of trade/professional/political associations.	0.19	**0.78**
RS7 We strategically monitor other interest groups in their efforts to change regulations affecting our organization.	0.2	**0.87**
RS8 We are on a constant watch for regulatory developments in foreign jurisdictions where we may operate or are operating.	0.39	0.34
Cronbach's alpha[**]	**0.78**	**0.80**

[*]RS stands for Regulatory Search

[**]The calculation of Cronbach's alpha did not include RS8 due to a low individual loading.

Construct reliability and unidimensionality were initially assessed based on Cronbach's alpha. The results in Table 1 show that Cronbach's alphas for the two regulatory search factors were 0.78 and 0.80, above the recommended threshold of 0.7. To further ensure unidimensionality, we performed a confirmatory factor analysis (CFA) on the two search factors. The χ^2_{df} statistic and fit indices (i.e., CFI (Comparative Fit Index) and TLI (Tucker Lewis Index)) are: factor 1 (four items): $\chi^2_{df}=4.63_{(2)}$ and not significant at 5%, CFI=0.98, TLI=0.95; and factor 2 (three items): $\chi^2_{df}=0_{(0)}$ (p=0.00), CFI=1, TLI=1.[9] On the basis of Cronbach's alpha and/or CFA, the two regulatory search factors exhibited reasonable construct reliability and unidimensionality.

Discriminant validity of the two regulatory search factors was validated by a significant chi-square difference between a one-factor model and two-factor model ($\chi^2_{df=}58.08_{(1)}, p<0.001$) in favour of a two-factor model. In addition, we calculated the 95% confidence interval

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[9] The factor model for factor 2 appeared to be just identified with no extra degree of freedom, and hence the χ^2_{df} statistic was 0 and the fit indices (i.e., CFI and TLI) were calculated to be 1.

between the two regulatory search factors. This ranged from 0.4 to 0.65, which further indicated that the two factors were discriminant from each other.

Our empirical finding of two independent factors within the regulatory search dimension is different from the finding of Sidhu et al. (2007), in which dimensional search (specifically, supply, demand and spatial search) formed only one factor in each dimension. By contrast, regulatory search was found to comprise two factors: (1) knowledge acquisition to understand the regulatory developments affecting the firm's suppliers, complementary product providers and competitors (as 'others') as well as the firm itself (reflected in RS1 through RS4); and (2) knowledge acquisition to actively influence the legislative and political processes (reflected in RS5 to RS7).

To facilitate our discussion, we term factor 1 as reactive regulatory search as the search processes align with a firm's nonmarket strategy of anticipating developments in the laws and regulations without the explicit intention to actively participate in, or influence, the political process. In this respect, we argue reactive regulatory search reflects a firm's tendency to pursue search options to collect information about 'others' (i.e., suppliers, complementary product providers and competitors) in order to anticipate the effects of future legislative changes on a firm through the consideration of these changes on 'others'.

We term factor 2 as proactive regulatory search. This is because the search processes are conducted concurrently with a firm's corporate political activities, such as individual lobbying through relational contacts, collective lobbying through trade and professional associations, and strategically monitoring and counteracting other interest groups' efforts to affect the legislative outcomes. We argue that these search options reflect a firm's intentional actions to proactively influence the political process and align with the firm's nonmarket strategy of participation.

4.2 Results of regression analysis

Given our finding of two regulatory search factors, we entered both in the regression analysis for hypotheses testing. Table 2a contains descriptive statistics and a correlation matrix for the key variables in our regression analysis. There are no significant correlations among the independent variables, indicating that multicollinearity was not a concern. This was further supported by the variance inflation factors being within the range of 1 to 2, well below the recommended threshold of 10. The additional review of the descriptive statistics at the item level in Table 2b indicate that the data used for the regression analysis appear to be normal with neither excessive kurtosis nor excessive skewness.

Table 3 reports the OLS regression results of the main effects of the two regulatory search factors on firm innovativeness and the moderating effect of slack on the main relation. We adopted hierarchical moderated regression by estimating three models. Model 1 estimated the effects of slack and the control variables on firm innovativeness. Model 2 added the main effects of the two regulatory search factors/variables. Model 3 incorporated the additional interaction terms, therefore providing a full model to investigate the contingency effects of regulatory search on firm innovativeness.

The results of Model 1 show that firm slack and environmental technological turbulence significantly affect firm innovativeness in the directions predicted (β_{slack}=0.23, p<0.05 and $\beta_{\text{tech-turbulence}}$=0.26, p<0.01). Consistent with Sidhu et al. (2007), the effects of firm size, age and formalization were not significant. Overall, Model 1 explained 16% of firm innovativeness and was significant at 0.1%.

Table 2a Mean, standard deviation (SD), and correlation matrix[a,b]

	Variable	Mean	SD	1	2	3	4	5	6	7
1	Age	3.31	0.91							
2	ETT	4.91	1.31	-0.04						
3	Formalization	4.42	0.91	-0.04	0.08					
4	Innovativeness	4.65	1.30	-0.11	0.25**	0.07				
5	PRS	4.21	1.40	0.05	0.23**	0.25**	0.01			
6	RRS	5.18	1.03	-0.03	0.19*	0.32***	0.19*	0.53***		
7	Slack	3.49	1.25	-0.03	0.011	0.13	0.26**	0.02	0.09	
8	Size	4.18	1.55	0.34	-0.03	0.25**	0.06	0.14	0.05	0.1

[a] Significance levels (two-tailed): $^+p<0.10$, $^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$
[b] ETT stands for Environmental Technological Turbulence; PRS stands for Proactive Regulatory Search; RRS stands for Reactive Regulatory Search.

Table 2b Descriptive statistics at the item level[a,b]

	Items	Mean	Median	Min	Max	Standard Deviation	Kurtosis	Skewness
1	RS1	5.85	6.00	1.00	7.00	1.17	1.64	-1.12
2	RS2	5.10	5.00	1.00	7.00	1.24	0.31	-0.65
3	RS3	4.74	5.00	1.00	7.00	1.43	-0.20	-0.51
4	RS4	5.07	6.00	2.00	7.00	1.46	-0.58	-0.67
5	RS5	4.20	4.00	1.00	7.00	1.79	-1.00	-0.12
6	RS6	4.50	5.00	1.00	7.00	1.59	-0.87	-0.34
7	RS7	3.99	4.00	1.00	7.00	1.57	-0.90	-0.04
8	FOR1	4.16	4.00	1.00	7.00	1.57	-0.77	-0.25
9	FOR 2	4.58	5.00	1.00	7.00	1.48	-0.18	-0.54
10	FOR 3	4.60	5.00	1.00	7.00	1.60	-0.88	-0.28
11	FOR 4	3.23	3.00	1.00	7.00	1.51	-0.53	0.46
12	FOR 5	5.62	6.00	1.00	7.00	1.43	1.18	-1.25
13	ETT1	4.48	5.00	1.00	7.00	1.74	-1.02	-0.21
14	ETT2	5.62	6.00	1.00	7.00	1.21	1.13	-1.01
15	ETT3	4.72	5.00	1.00	7.00	1.63	-0.83	-0.28
16	ETT4	4.77	5.00	1.00	7.00	1.71	-0.78	-0.44
17	PIN1	4.59	5.00	1.00	7.00	1.43	-0.57	-0.45
18	PIN2	4.66	5.00	1.00	7.00	1.50	-0.35	-0.57
19	PIN3	4.65	5.00	1.00	7.00	1.55	-0.66	-0.35
20	SLA1	3.18	3.00	1.00	7.00	1.54	-0.41	0.66
21	SLA2	3.08	3.00	1.00	7.00	1.65	-0.86	0.56
22	SLA3	3.63	4.00	1.00	7.00	1.82	-1.28	0.10
23	SLA4	4.15	4.00	1.00	7.00	1.64	-0.83	-0.15

[a] RS stands for Regulatory Search; FOR stands for Formalization; ETT stands for Environmental Technological Turbulence; PIN stands for Performance-Innovativeness; SLA stands for Slack.
[b] The item numbers correspond to the items listed in the measurement section.

Table 3 OLS regression results[a,b]

Variables	Model 1	Model 2	Model 3
Intercept	2.99***	2.07*	4.02***
Size	0.07	0.09	0.07
Age	-0.20	-0.19	-0.15
Formalization	0.03	-0.06	-0.04
Environmental Technological Turbulence	0.26**	0.25**	0.26**
Slack	0.23*	0.22*	0.23**
Reactive Regulatory Search		0.34**	0.20
Proactive Regulatory Search		-0.08	-0.02
Reactive Regulatory Search X Slack			-0.29***
Proactive Regulatory Search X Slack			0.18*
Financial Services industry dummy	-0.58*	-0.79*	-0.72*
Healthcare industry dummy	-0.39	-0.45+	-0.39
R^2	0.16	0.21	0.29
F	3.44***	3.56***	4.33***
Change in R^2		0.05	0.08
F		3.48*	6.37**

[a] Unstandardized regression coefficients are reported.

[b] Significance levels (two-tailed): $^+p<0.10$, $^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$

The results of Model 2 showed mixed support for Hypothesis 1. Reactive regulatory search positively and significantly influenced innovativeness ($\beta_{\text{reactive search}}=0.34$, $p<0.01$) as predicted. However, proactive regulatory search exhibited a negative sign and the effect was not significant. This corroborated the correlation coefficients between reactive and proactive regulatory search, and firm innovativeness shown in Table 2; that is, a significant correlation existed between reactive search and firm innovativeness, but no significant correlation existed between proactive search and firm innovativeness. The control variables exhibited similar directional relations and significance levels as in Model 1. Model 2 showed a significant improvement in fit compared with Model 1. Specifically, the improvement of R^2 was 0.05 and significant ($F=3.48$, $p<0.05$).

Model 3 included the two regulatory search variables and also their interaction terms with slack. To perform the moderated regression, we mean-centred the independent and moderating variables. The results showed that slack significantly and negatively moderated the relation between reactive regulatory search and innovativeness ($\beta_{\text{reactive search X slack}}=-0.29$,

$p<0.001$). This was the opposite of the prediction for slack in Hypothesis 2, and means that, at the lower (higher) level of slack, reactive search was positively (negatively) related to innovativeness. On the contrary, and consistent with the prediction in Hypothesis 2, slack was found to significantly and positively moderate the effect of proactive search on firm innovativeness ($\beta_{\text{proactive search X slack}}$=0.18, $p<0.05$), which means that, at the lower (higher) level of slack, proactive search was negatively (positively) related to innovativeness.[10] Compared with Model 2, Model 3 showed a significant improvement in fit, specifically, with an improvement in R^2 of 0.08 which is significant (F=6.37, $p<0.01$). A summary diagram of the moderated regression results is provided in Figure 1.

Figure 1 A summary diagram for the results of the moderated regression analysis[a]
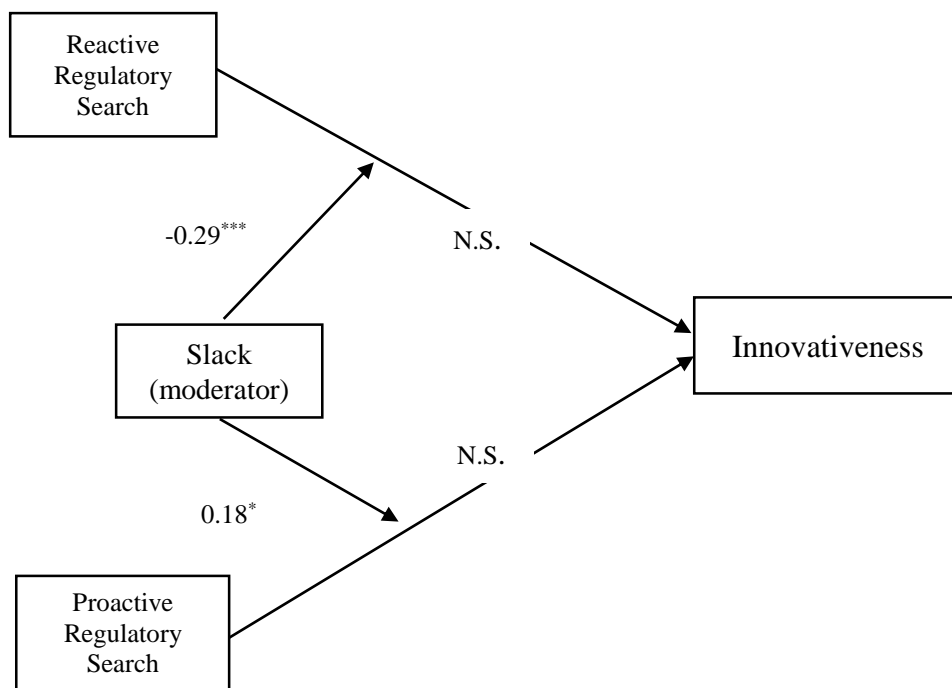
[a] Significance levels (two-tailed): $^+p<0.10$, $^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$
N.S. stands for not significant

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[10] In relation to the industry dummies, across the three models overall the financial services dummy was significant and negative, which indicated that firms in this industry had lower innovative performance, possibly due to the heavier regulations in the financial services industry that may impede innovation. The healthcare dummy showed a negative but not significant sign, indicating that the regulated nature of this industry may have some potential impact on firm innovativeness.

5. Discussion, implications and limitations

This paper contributes to the strategic search literature by introducing regulatory search as an additional dimensional search to augment the market dimensional search proposed by Sidhu et al. (2007). We framed a firm's regulatory search as an important non-market knowledge capability, and investigated how knowledge acquisition in the regulatory environment affects firm innovativeness in a contingency framework. In doing so, we first conceptualized regulatory search as a nonlocal search capability consistent with Sidhu et al.'s (2007) conceptualization that dimensional search in the market environment should be conducted in a nonlocal manner. We specifically defined nonlocal search in the regulatory environment to be both 'future' and 'others' oriented. We produced statements in our scale development according to our conceptualization. Different from Sidhu et al.'s (2007) results that dimensional search in the supply, demand and spatial sides of the market environment formed one factor for each dimension, our regulatory search scale contained two independent factors, namely, reactive and proactive regulatory search, supported by construct reliability, unidimensionality and discriminant validity tests.

Based on this empirical result, we categorized a firm's regulatory search to be either reactive or proactive, which corresponds to the nonmarket strategies of positive anticipation and proactive participation in the nonmarket strategy literature (e.g., Baron, 1995; Boddewyn and Brewer, 1994; Hillman and Hitt, 1999). The strategies of anticipation and participation also align with Oliver and Holzinger's (2008) typology of political strategies of compliance and influence. Oliver and Holzinger (2008, p. 505) state that "…there are two means by which they (i.e., firms) can take advantage of political opportunities: (1) they can actively influence their political environments, or (2) where influence is impossible or not desired, they can actively comply with public policies or regulations…". On this basis, we suggest reactive regulatory search relates to the compliance strategy and implies knowledge acquisition is focused on how future changes of laws and regulations affect others (e.g.,

competitors) in a firm's environment. This allows the firm to be better and earlier compliant ahead of competition when the changes occur so that it can reap the benefits of enhanced reputation/social legitimacy and first mover advantage.

By comparison, we relate proactive regulatory search to the influence strategy of Oliver and Holzinger (2008), which centres on a firm's ability to target legislators and acquire information by using various corporate political activities, such as individual and collective lobbying, as outlined in Hillman and Hitt (1999). Proactive regulatory search reflects a firm's explicit intention to participate in the political process in order to influence the legislative outcomes.

Based on this discussion, we suggest that there are important practical implications for the development of a firm's regulatory search processes. In particular our results indicate that reactive and proactive regulatory search are independent search processes to be used for two different political strategies. A compliance-focused strategy, on the one hand, requires the comprehensive use of anticipative reactive regulatory search. Specifically, this means firms should have their planning routines systemised with the nonlocal search process to acquire intelligence on how regulatory developments in both the firm's industry and other industries (i.e., suppliers' and complementary product providers' industries) affect the focal firm. On the other hand, an influence-focused strategy requires the development of proactive regulatory search. The search processes in this regard may incorporate identifying the political issues and their salience (e.g., narrowly or widely salient issues in Oliver and Holzinger (2008)), having the capability to acquire information on salient issues through, for example, the network connection of ex-politicians appointed to the firm's board, and also monitoring how other interest groups shape the legislative process.

In addition, our study contributes to the strategic search literature by linking regulatory search with innovativeness in a contingency framework. With regard to the main effect,

mixed support was found for the effect of regulatory search on firm innovativeness. We found that reactive search significantly contributed to the success of a firm's new product development program, but found no significant effect for proactive search. In the moderated model with slack as the moderator, our results showed that neither of the two regulatory search factors were significant when the interaction terms were included in the regression analysis. This finding highlights the contingent nature of regulatory search in affecting firm innovativeness and is consistent with the results of Sidhu et al. (2007), in which the effectiveness of market search was found to be contingent on the level of technological dynamism.

In terms of the moderated effect, we found slack significantly moderated the relation between the two forms of regulatory search and firm innovativeness in different ways. For proactive search, the moderating effect of slack was as hypothesized, indicating that in a high (low) slack environment, the concurrent pursuit of multiple nonlocal search options was more (less) effective. This is because these search options might be well (insufficiently) supported by the abundant (scarce) internal resources, which then increase (decrease) the chance of success of one or more search options. By contrast, for reactive regulatory search, the moderating effect was opposite to our hypothesis, that is, the higher (lower) the slack, the less (more) effective the reactive regulatory search is.

We propose that the reason for this divergence in results may lie with the different potential payoff (i.e., economic rents) from searching to anticipate (i.e., reactive search) and participate (i.e., proactive search). As noted earlier, the economic rents generated from searching to anticipate relate to the first mover advantage and positive reputational effects through better and earlier compliance. Oliver and Holzinger (2008, p. 513) suggest there is a relatively limited payoff from searching to anticipate and state that "such advantage will be eroded by eventual increases in compliance among rivals." On this basis, we argue that

pursuing various nonlocal reactive search options supported by a high slack environment is subject to diminishing returns and/or negative returns as the investments (resulting from a high slack environment) in these reactive search options may not be sufficiently recovered from the rents generated.

In contrast, Oliver and Holzinger (2008, p. 513) claim that searching to participate is most promising as it "helps to define what constitutes as a successful public policy in the first place, and thus, they are able to shape public policy to fit a firm's unique advantages and interests", and "also gives firms the great opportunities to craft resources and competencies that are unique, intangible, or difficult to imitate…". These statements suggest that proactive regulatory search is likely to generate its greatest payoff when supported by a high slack environment.

We argue that this is especially the case in a situation where the law-making body, such as a parliament, is fragmented and when no political party dominates the policy-making process. Paun (2009, p. 11) states that "the spectre that haunts the Westminster model is an inconclusive election, in which no one party wins an overall majority". Paun (2011) further discussed the fragmented regulatory and legislative bodies of democracies in various countries around the world. Specifically, Paun (2011) observed that Canada had been governed by a minority government for the period from 2004 to 2011; the U.K. general election in 2010 also failed to return a majority government; and similarly, the Australian election in September 2010 resulted in the first 'hung parliament' since 1940. Hence, we suggest that in a pluralistic political environment, where multiple political parties may influence the political and legislative outcomes, a proactive search is most beneficial for firm innovativeness when the firm's internal resources are sufficiently abundant to support these nonlocal search initiatives.

This study is subject to limitations which provide opportunities for future research. First, the data were gathered through a single survey. Despite careful design of the survey questionnaire, assurance of respondent anonymity to mitigate common method bias, and Harman's (1967) single-factor test suggesting the potential for such bias is low, we cannot completely rule out the influence of single respondent survey on our results.

Also, the cross-sectional nature of our research suggests associations between the independent and dependent variables, consistent with our theory. We assumed that, for the firms in our sample, nonlocal search in the regulatory environment is an established organizational-level capability or routine. On this basis, firms searching non-locally, either in a reactive or proactive manner, are unlikely to only start the nonlocal search process at the time of our survey due to the time-consuming nature of the search capability development process. Therefore, to further validate our findings and establish causality on how regulatory search affects innovativeness, we suggest that future research collects data for the dependent variable with a time lag, or uses longitudinal data to cover a longer time period. In addition, our finding of the contingent effect of regulatory search on firm innovativeness suggests that it is highly relevant to pursue an analysis of how other environmental variables, such as industry competition and changes in consumer preferences, affect the relation between regulatory search and firm innovativeness.

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CHAPTER 4

Paper 2 - The role of market environmental turbulence in moderating the effect of market and regulatory search on firm competitiveness

Abstract

This paper investigates the effect of search on firm competitiveness when considering market environmental turbulence (MET) as an important environmental contingency. Adding to the conventional wisdom that MET indicates a changing market environment, we argue that MET also indicates potential changes in the regulatory environment. Using both market search (i.e., supply, demand, and spatial side search) constructs from the existing literature and self-developed regulatory search constructs (i.e., reactive and proactive regulatory search), our findings suggest that it is more effective for a firm to pursue demand side search and proactive regulatory search when MET is high, aligning with the strategies of 'demand pull' and 'influence' respectively. In contrast, supply side search and reactive regulatory search are more effective when MET is low, aligning with the strategies of 'technology push' and 'anticipation' respectively. Further, our findings suggest that regulatory search contributes to firm performance, in addition to the contribution of a firm's market search.

Keywords

1. Introduction

The knowledge based view of the firm suggests that knowledge based resources are the key determinants of firm performance (Felin and Hesterly, 2007; Grant, 1996; Kogut and Zander, 1992; Sidhu et al., 2007; Wiklund and Shepherd, 2003). Firms acquire knowledge through search routines conducted in their external environment, which then allow them to be competitive and responsive to environmental changes (March, 1991; Nelson and Winter, 1982; Sidhu et al., 2004). The literature suggests that search effectiveness is determined by how search is conducted in various sectors of the environment, and is contingent on the dynamism or turbulence in those environmental sectors. To this end, Sidhu et al. (2007) argue that nonlocal (i.e., exploratory) search should be performed in the market dimensions (i.e., sectors) of supply, demand and space (i.e., geography), and find that the effects of dimensional search on firm performance vary depending on technological dynamism.

While technological dynamism, representing the rate and unpredictability of technological change in the environment, is an important environmental contingency (Sidhu et al., 2007), the environment is multi-faceted, suggesting that dynamism or turbulence in other sectors of the environment may also have an important impact on the relation between search and firm performance[11]. A review of the literature suggests that there has been a lack of emphasis on these other sectors. This is especially evident with regard to the customer/consumer sector, with Priem (2007, p. 219) explicitly stating that "despite this (*i.e., consumers'*) critical role, consumers have received relatively little attention in the strategic management literature".

Consequently, in this paper we seek to fill this gap by investigating how turbulence in the customer/consumer sector of a firm's environment moderates the relation between search and firm performance. In relation to search, this paper is distinguished from prior research

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[11] Danneels and Sethi (2011, p. 1026) argue that "a firm's task environment is not a monolithic entity; it consists of customer, competitor, and technological sectors".

because it focuses not only on searching in the market environment and its dimensions of supply, demand and space (Nerkar and Roberts, 2004; Sidhu et al., 2007; Wiklund and Shepherd, 2003), but also on searching in the nonmarket environment, specifically the regulatory environment[12]. A review of the literature suggests that regulatory search has been relatively under-researched, despite the strategic significance of regulations on a firm's resource allocation process (Capron and Chatain, 2008). Contributing to the search literature, this paper provides a conceptualization of regulatory search and develops a scale for its measurement. The conceptualization of regulatory search accords with the notion of exploratory and nonlocal search (March, 1991; Sidhu et al., 2004; 2007), with an important theoretical extension that regulatory search should also reflect a firm's strategic intent.

Specifically, exploratory or nonlocal search in the regulatory environment should reflect a firm's strategic intent of either anticipating changes in the regulatory environment or directly participating in the public policy-making process (Boddewyn and Brewer, 1994; Oliver and Holzinger, 2008). On this basis, search to anticipate (which we term reactive regulatory search) represents knowledge acquisition on developments in laws and regulations in order to anticipate their effects on the firm. In contrast, search to participate (which we term proactive regulatory search) represents an independent search process with an explicit intention to actively influence the public policy-making process. By adding both reactive and proactive regulatory (nonmarket) search to the relation between market search and firm performance, we also seek to highlight the important effect of regulatory search on firm performance, in addition to the effects of market search.

In relation to firm performance, this paper is further distinguished from prior research in that we use competitiveness as a more holistic measure of overall firm performance. This contrasts with the measure of new product performance commonly used in innovation

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[12] Baron (1995) suggests that a firm's nonmarket environment consists of the social, legal and political environments. The regulatory environment, in this paper, captures both legal and political environments.

research (e.g., He and Wong, 2004; Sidhu et al., 2007). Firm competitiveness incorporates consideration of a firm's strategic performance and long-term financial performance (Schilke, 2014).

In relation to the moderating influence of turbulence in the customer sector of the environment, market environmental turbulence reflects the rate of change and uncertainty in customer preferences or needs (Danneels and Sethi, 2011; Kohli and Jaworski, 1990). The conventional wisdom suggests that market environmental turbulence reflects customers' changing economic behaviour (e.g., to purchase or not purchase a given product) due to changes in their preferences, therefore indicating a changing market environment. However, the notion of 'political consumerism' suggests that customers may also transform into political players with capability to influence the public policy-making process in the nonmarket regulatory environment, if their common interests (i.e., their preferences) can be properly mobilized (Holzer, 2006; Kotler, 1971). In this paper, we argue that stability in, and predictability of, customer preferences provide a foundation for mobilization, and facilitate coalition building and collective actions to induce changes in a firm's regulatory environment. By investigating the dual role of market environmental turbulence, this paper contributes to the literature by suggesting that customers' potential actions based on their preferences in both the market and regulatory environments affect firms' search effectiveness.

In the sections below, we first review the literature on market search. We then provide the conceptualization of regulatory search, and the theory to develop hypotheses for the moderating effects of market environmental turbulence on the relations between supply, demand, spatial and regulatory search, and firm competitiveness. We then discuss the method including the measurement of variables, and the results of the data analysis and regressions. Further, we discuss our results and their implications for theory and practice, and the limitations of our research.

2. Literature review and hypotheses development

2.1 Market search

Knowledge based competence, such as the ability to search information and know-how about customer needs and technology, is a source of new value creation and competitive advantage (Felin and Hesterly, 2007; Kogut and Zander, 1992; Nelson and Winter, 1982; Sidhu et al., 2007; Wiklund and Shepherd, 2003). However, Sidhu et al. (2004, p. 915) suggest that firms' searching tends to exhibit 'short-sightedness', and state that "organizations in a variety of industries exhibit competitive myopia − a tendency not to engage in exploration by disregarding new but distant developments".

On this basis, Sidhu et al. (2007) propose that search should be conducted in a nonlocal fashion. Nonlocal search refers to searching in the relatively distant domain of a firm's knowledge competence, and is consistent with the notion of exploratory learning in the seminal work of March (1991). Nonlocal search creates variations (e.g., new organizational forms, technologies and practices), enhances a firm's ability to adapt to environmental changes, and ultimately ensures the firm's long-term survival and prosperity (Sidhu et al., 2007). Nonlocal search conducted in the market environment acquires knowledge not only from the supply side of a firm's market environment, which focuses on the discovery of new technologies and ways of production, but also from the demand and spatial/geographical sides (Sidhu et al., 2007). Demand side search emphasizes knowledge acquisition to explore market structures and segments, product use patterns, and customer needs and preferences. Spatial/geographical side search targets diversification opportunities from different geographical regions. However, while Sidhu et al.'s (2007) multi-dimensional and nonlocal search covers the important areas of the market environment, it does not include knowledge acquisition from the regulatory environment.

2.2 Regulatory search

Regulatory search is conceptualized as a knowledge acquisition capability involving a firm's nonlocal search in its regulatory environment. The regulatory environment, which captures both legal and political components, forms part of a firm's nonmarket environment (Baron, 1995). Regulatory search, as a nonlocal search capability, is designed to respond to changes in the regulatory environment. Regulatory search acquires knowledge on (1) how the changes affect others (e.g., suppliers and competitors) as well as the firm itself, and (2) how others (e.g., legislators and other interest groups) instigate and influence the changes in the regulatory environment. The emphasis on 'changes' and 'others' indicates that regulatory search is forward looking (i.e., future oriented) (Danneels and Sethi, 2011) and boundary spanning (Carlile, 2002; Li et al., 2013), and consistent with Sidhu et al.'s (2007, 2004) exploratory search orientation.

In addition, we suggest that nonlocal search in the regulatory environment should reflect a firm's strategic intent and be aligned with its political strategies. The literature on corporate political strategy (e.g., Boddewyn and Brewer, 1994; Choi et al., 2014; Oliver and Holzinger, 2008) suggests that, to achieve competitive advantage, a firm may follow a political strategy of positive anticipation or one of direct participation and influence. The strategy of positive anticipation requires a firm to anticipate the development of laws and regulations affecting all firms in the industry with the objective of achieving early compliance and first mover advantage. The strategy of direct participation/influence has the objective of influencing a favourable regulatory outcome for the firm.

The effectiveness of these strategies lies with a firm's intention and ability to obtain necessary information/knowledge on the development of legislative and regulatory processes, with the knowledge obtained serving as a critical input to a firm's strategy making process. On this basis, we argue that regulatory search should manifest as either reactive regulatory search (i.e., search to anticipate) or proactive regulatory search (i.e.,

search to participate/influence). Specifically, reactive regulatory search is a form of nonlocal search aimed at understanding how the developments (i.e., changes) in laws and regulations affect others in a firm's environment, which, consequentially and indirectly, affect the firm. For instance, reactive regulatory search may involve knowledge acquisition on the effects of regulatory changes on the suppliers' industry, reflecting searching vertically along the firm's rent chain, or on the effects of regulatory search on competitors and complementary product providers, reflecting a lateral search.

By contrast, proactive regulatory search is a nonlocal search process designed to obtain necessary information to allow a firm to participate in, and influence, the political process of public policy-making. Proactive regulatory search gathers information/knowledge to understand how future laws and regulations are influenced by the actions of others, including actions from both the supply side of the public policy-making process, such as elected politicians, and also the demand side, such as various interest groups (Bonardi et al., 2006). This information may then be used by the firm to facilitate its participation in, and to influence, the public policy-making process. Knowledge acquisition of this type is, arguably, conducted concurrently with a firm's pursuit of corporate political activities (Baysinger, 1984; Hillman, 2005) such as lobbying or having ex-politician(s) on the board.

2.3 Market environmental turbulence

Market environmental turbulence measures the rate of change and uncertainty in customer preferences and needs (Atuahene-Gima and Li, 2004; Danneels and Sethi, 2011; Jaworski and Kohli, 1993). Market environment turbulence, as an important environmental contingency, has been found to moderate the relation between: top management team size and financial performance (Haleblian and Finkelstein, 1993); absorptive capacity (i.e., the ability to utilize external knowledge) and firm innovative performance (Lichtenthaler, 2009); the willingness to cannibalize (e.g., sacrifice existing sales for new product sales)

and future-oriented market scanning, and new product exploration (Danneels and Sethi, 2011); and firm innovativeness orientation and performance (Tsai and Yang, 2013).

Despite the extensive use of market environmental turbulence as a moderator in various contexts, to our knowledge it has not been used to investigate how turbulence in customer needs or preferences affects the relation between a firm's search processes and firm competitiveness. Hence, in the sections below, we discuss and hypothesise how market environmental turbulence may moderate this relation. In so doing, we argue that market environmental turbulence indicates both changing market and regulatory environments.

2.4 The moderating effects of market environmental turbulence on the association between market search and competitiveness

2.4.1 Demand side search

Demand side search is an information acquisition process centred on the firm's customers (specifically, customer needs) (Sidhu et al., 2007), and resembles the 'outside-in' capability described in Day (1994). 'Outside-in' refers to how external factors, such as changing customer needs, drive the firm's performance. Specifically, the 'outside-in' capability reflects the ability to sense market opportunities and to link with customers (i.e., creating and managing customer relationships) (Day, 1994). On this basis, demand side search conducted in a nonlocal fashion reflects a firm's exploration orientation (Sidhu et al., 2004), better detects both customers' express and latent needs (Slater and Narver, 2000), avoids competency traps (Zahra and George, 2002), and increases firm knowledge on "customer needs being served, market preferences and product use and substitution patterns" (Sidhu et al., 2007, p. 22).

We suggest that the effectiveness of demand side search, in capturing market share and sustaining a positive financial outcome compared with competitors, depends on the level of market environmental turbulence. At a high level of turbulence, the environment may feature changes to product preferences (Atuahene-Gima et al., 2006), require a broad range

of customer needs to be addressed, and exhibit a strong tendency for customers to search for new products (Hult et al., 2004). In a high turbulent market environment, nonlocal search from the demand side, designed to achieve knowledge diversity on customer preferences, increases a firm's strategic flexibility in the product market (Brown and Eisenhardt, 1998), which, in turn, facilitates a firm's identification of emerging opportunities with respect to product niches (Jansen et al., 2006; Tsai and Yang, 2012) and enables the firm to be innovative and differentiated compared with competitors (Hult et al., 2004).

In contrast, a low turbulent market environment implies customer satisfaction with existing product offerings, few changes in customer product expectations, and a low demand for innovative products. At a low level of market environmental turbulence, demand side search is likely to be ineffective. This is because limited opportunities exist in a low turbulent market suggesting limited or no payoff from nonlocal search from the demand side. Compared with competitors who choose to postpone or pursue less nonlocal search in a low turbulent market, a firm pursuing greater demand side search will be worse off due to limited recovery of the search costs.

H1: Market environmental turbulence moderates the effect of demand side search on firm competitiveness in a way that at the higher (lower) level of environmental turbulence, demand side search is positively (negatively) associated with firm competitiveness.

2.4.2 Supply side search

Supply side search is an information acquisition process centred on technology. Specifically, nonlocal supply side search involves searching beyond a firm's existing technological competence (Sidhu et al., 2007). Technology-focused search resembles the 'inside-out' capability according to Day (1994). 'Inside-out' focuses on how a firm's internal technical competence drives firm performance and assumes that a firm's technological development is independent of, and not guided by, market/customer requirements. In contrast, the marketing literature suggests the importance of considering

customer/market needs as an antecedent to, or as determining, technological development, with Narver et al. (2004, p. 343) describing this as the strategy of "finding needs and filling them" instead of "making products and selling them". Similarly, Lukas and Ferrell (2000, p. 240) argue the importance of customer/market needs preceding and informing technological development when they explain that "consumers apply technology in their bounded context and naturally will influence the development of a new product to match their needs…".

The above research suggests that if supply side search for technological innovations is to lead to enhanced firm competitiveness, it must be conducted with knowledge of the marketability of these innovations. We argue that this is even more important when the market environment is highly turbulent. A high level of turbulence indicates a significant amount of market uncertainty, created by fast changing and less predictable customer needs. In this environment, a firm's effort to reduce uncertainty through supply side search is likely to be unproductive as the uncertainty originates from the demand/market side. Therefore, a firm that focuses its knowledge acquisition on technological possibilities independent of the knowledge of the changes in market/customer needs that these technologies can fill, is likely to experience what Levinthal and March (1993) term the failure trap. This means that technological innovations generated through supply side search but without addressing changes in customer needs are likely to trap the firm in an "endless cycle of failures and unrewarding change" (Levinthal and March, 1993, p. 106)[13].

In contrast, a low turbulent market environment is characterized by stable and predictable customer preferences. From a firm's perspective, the stability and predictability in customer preferences creates relative certainty and clarity in terms of what customers require. In this

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[13] Admittedly, it is possible for some technological innovations to address the market needs by chance in a firm's repeated attempts to innovate. However, we argue that, on average, technological innovations generated from the supply side search, without conducting demand side search to understand the marketability of these innovations, are likely to experience continued commercial failures.

environment, supply side search is likely to be beneficial because it allows the firm to increase its technological diversity and its ability to innovate, which, in turn, may differentiate the firm from competitors due to its enhanced ability to address customer needs. Hence, as for demand side search, we hypothesize that the effect of supply side search on firm competitiveness is expected to be moderated by market environmental turbulence. However, based on the above arguments, we expect the nature of the moderation to be different for supply side search compared with demand side search. We hypothesize as follows.

H2: Market environmental turbulence moderates the effect of supply side search on firm competitiveness in a way that at the higher (lower) level of environmental turbulence, supply side search is negatively (positively) associated with firm competitiveness.

2.4.3 Spatial side search

Spatial side search involves boundary spanning geographical search to identify opportunities and threats in various geographical regions (Sidhu et al., 2007). Spatial side search captures the benefits from geographical diversification and allows firms to access novel ideas from different regions that might not exist in their current location (Sidhu et al., 2007). Sidhu et al. (2007) argue that spatial side search positively influences firm performance and that this relation should not be affected by the level of environmental turbulence, especially the turbulence caused by changing customer preferences. This is because market environmental turbulence mainly influences the consideration of a firm's product scope decisions, and, hence, should not affect a firm's decision to break into a new geographical location.

H3: Market environmental turbulence has no moderating effect on the relation between spatial side search and firm competitiveness.

2.5 The moderating effect of market environmental turbulence on the association between regulatory search and competitiveness

Market environmental turbulence, indicating potential changes in the regulatory environment, is also an environmental contingency affecting the relation between regulatory search and firm competitiveness. Generally speaking, customers, as voters, are constituents of the elected politicians, and can instigate changes to laws and regulations through expressing their concerns (i.e., preferences) to their elected members of legislature. This is reflected in the literature on consumerism (e.g., Baumann et al., 2015; Clarke, 2008; Holzer, 2006; Kotler, 1971; Neilson, 2010; Newman and Bartels, 2011), which suggests that customers as economic agents can turn into political players to affect the public policy-making process through their collective actions in a firm's regulatory environment.

According to Kotler (1971, p. 49), consumerism is 'inevitable', 'enduring', and defined as "a social movement seeking to augment the rights and power of buyers in relation to sellers". However, Holzer (2006) argues that the power of individual consumers/customers derived from deciding to purchase or not purchase a given product is largely an economic one, and not sufficient for political bargaining. Rather, for customers to form a viable political force, mobilization of their common interest is required for them to exert influences over the public policy-making process (Ali, 2015; Baumann et al., 2015; Kotler, 1971).

The social movement literature suggests that the keys for successful mobilization lie with the existence of a social grievance that may have originated from a change of power relation or structural conflicts of interest (Jenkins, 1983), sophisticated organization/campaign structures such as social movement organizations (Clarke, 2008; McCarthy and Zald, 1977), recruitment networks (Clarke, 2008; Klandermans and Oegema, 1987), and/or formation of a collective identity (Polletta and Jasper, 2001). We argue that stability and predictability in customer preferences provide a foundation for an effective mobilization process, because stability and predictability in customer preferences: (1) accentuate the social discontent

generated from customers' grievances when those grievances (reflecting a firm's inability to serve their needs) are not frequently changing; (2) assist with the recruitment of customers of a similar grievance; (3) facilitate the emergence of sophisticated structures such as consumer advocacy organizations representing the interests of customers of a similar grievance; and (4) assist with the formation of a collective identity (e.g., a 'green consumerism' as described in Sparks and Shepherd, 1992).

For instance, a high level of pesticides in imported agricultural products may cause social grievance due to the potential adverse effects on the health of customers. A stable customer preference for organic and quality products facilitates the identification, recruitment and the mobilization of these individual customers. The mobilized interest is then likely to raise the awareness of the use of pesticides from the imported agricultural products as a salient regulatory issue among the general public (Bonardi and Keim, 2005), and offer the commitment and solidarity needed for a wider societal acceptance of collective actions (Polletta and Jasper, 2001). Consequentially, these collective actions are likely to induce changes to a firm's regulatory environment (e.g., introducing higher food safety standards, closer regulatory scrutiny, and tougher enforcement and penalties for non-compliant imported agricultural products).

Therefore, market turbulence, or its inverse, stability, in customer preferences, indicates an environment in which individual customers are more likely to coalesce around critical regulatory issues and collectively influence public policy-making processes to advance their interests. On the contrary, a high level of market environmental turbulence, characterized by changing and less predictable customer preferences, impedes the mobilization process and the formation of collective actions, meaning that changes in the regulatory environment are not likely to be forthcoming.

From a firm's perspective, under different levels of market turbulence we propose that the effects of reactive (i.e., anticipative) and proactive (i.e., participative) regulatory search on firm competitiveness will be different. When market turbulence is low, we argue that reactive regulatory search, aligning with the nonmarket strategy of positive anticipation (Boddewyn and Brewer, 1994), is more effective in achieving competitiveness.

To illustrate this effect, we continue our use of the example of pesticides in the imported agricultural products. Anticipating the changes in the regulations, the reactive regulatory search conducted by a firm (e.g., a cereal manufacturer) may involve knowledge acquisition up its rent chain to understand whether its suppliers (i.e., its overseas growers) can comply with the expected tougher domestic regulations on the food safety standards relating to the use of pesticides. We argue that the anticipation of suppliers' non-compliance, ahead of its competition, would allow the cereal manufacturer to strategize either sourcing products from a more compliant supplier or negotiating with the current supplier to ensure the tougher regulations can be complied with, before they are introduced. Therefore, on the one hand, early compliance with the potential introduction of the tougher food safety standards caters for the market segment of quality conscious customers. On the other hand, compliance ahead of competition would establish the firm as an industry compliance leader, which then leads to first mover advantage through enhanced social legitimacy (Chiu and Sharfman, 2011), reputation (Oliver and Holzinger, 2008), and customer retention and loyalty (Stanaland et al., 2011).

Further, if we expand our discussion from a regulatory environment characterised by one regulatory issue (i.e., the potential introduction of tougher safety standards on the imported agricultural products) to multiple regulatory issues, we argue the benefits of reactive regulatory search are even more pronounced when market turbulence is low. This is because reactive search up and down a firm's rent chain, and also laterally among competitors and complementary product providers, increases a firm's understanding of how a number of

critical regulatory issues affect others, and therefore, indirectly affect the firm. This, in turn, allows the firm to devise a comprehensive set of strategies for competitive advantage.

In contrast, proactive regulatory search, which aligns with the influence strategy (Oliver and Holzinger, 2008), involves acquiring necessary knowledge to understand how others (e.g., customers' and their collective actions) affect the political process (e.g., advocating for tougher regulations on the imported agricultural products) in order for the firm to influence the same process as a response (e.g., lobbying against the tougher regulations because of the cost of compliance of the additional regulations). A low turbulent market environment is not conducive to effective proactive regulatory search because the stability and predictability in customers' preferences help to frame the social issue (Benford and Snow, 2000), enhance the issue's salience (Keim and Zeithaml, 1986) and facilitate coalition building for collective actions. The consequences of collective actions serve to increase customers' bargaining power to instigate or influence changes in the regulatory environment to advance their (the customers') interests (Bonardi and Keim, 2005), and to weaken the individual firm's bargaining power. In this situation of bargaining weakness relative to customers, it is unlikely that the firm will be successful in influencing legislative and regulatory changes favourable to the firm. Hence, from the firm's perspective, the search costs associated with proactive regulatory search are likely to outweigh the benefits obtained.

In addition, it is especially problematic for a firm to proactively search in a fragmented and less turbulent customer/consumer market. This is because diverging, stable and predictable customer preferences assist the formation of multiple interest groups (i.e., consumer advocacy groups) each reflecting a different and unique strain of customer preferences. As a result, the existence of multiple interest groups makes the political market less attractive and more complex for a firm to navigate and influence (Bonardi et al., 2006). Therefore, we argue that, in a low market turbulent environment, proactive search in the regulatory

environment is unlikely to produce a favourable legislative outcome and, hence, is likely to yield an unfavourable performance outcome.

By contrast, when market environmental turbulence is high, frequent changes in customer preferences do not facilitate the identification and/or mobilization of customers' common interests. The resulting lack of collective actions from customers may lead to regulatory issues going unnoticed from the legislators' perspective, and to the absence of changes to laws and regulations. From the firm's perspective, we argue that, in this condition of unstable and uncertain customer preferences, the cost of reactive regulatory search (i.e., anticipatory search) is likely to outweigh the benefits obtained. This is because search for an earlier compliance with potential legislative changes will not generate a payoff if those changes are not forthcoming due to the lack of collective actions from customers.

In comparison, a high turbulent market environment implies more opportunities for a firm to advance its political agenda and pursue its own interest through participation in the public policy-making process. In a high turbulent market environment, the political environment is more attractive to the firm (Bonardi et al., 2006) because changing and fragmented customer preferences pose a barrier to mobilize their (the customers') common interests and identities, which, in turn, weakens customers' collective bargaining power in the public policy-making process. We propose therefore that, in a high turbulent market environment, proactive regulatory search can effectively pave the way for favourable legislative outcomes which, in turn, may improve firm competitiveness.

H4a: Market environmental turbulence moderates the effect of reactive regulatory search on firm competitiveness in a way that at the higher (lower) level of environmental turbulence, reactive regulatory search is negatively (positively) associated with firm competitiveness.

H4b: Market environmental turbulence moderates the effect of proactive regulatory search on firm competitiveness in a way that at the higher (lower) level of environmental turbulence, proactive regulatory search is positively (negatively) associated with firm competitiveness.

3. Method

3.1 Data

Firms in the Australian healthcare, industrial machinery and financial service industries were used in our mail-based survey for data collection. Firms in these industries are not only market driven (i.e., they compete on the basis of producing products/solutions to fulfil customer needs) but also heavily regulated by Australian laws. This offers an ideal research context to investigate how both market and regulatory search affect firm competitiveness. The firms were selected from Capital IQ from their respective industries, with a population of 578 firms in healthcare, 790 in industrial machinery, and 761 in financial services, totalling 2129 firms across three industries. The contact details of the firms were further validated by phone and information available on companies' websites. During this purification process, 1172 firms were discarded due to the contact details not being corroborated. The final purified population contained 957 firms.

In line with Sidhu et al. (2007), we used the key informant approach by targeting the CEOs of 930 companies using a pre-tested survey questionnaire. The selection of CEOs as the key informants conforms to the research practice of the organizational strategy literature that suggests top managers are the most appropriate source for organizational and strategic level information (Conant et al., 1990). CEOs' contact details were initially obtained from Capital IQ and validated by phone and company websites. One follow-up mailing was performed subsequent to the initial mail-out. In total, 135 questionnaires were received, although four responses were deleted due to incomplete responses. The final response rate was 14.1%, which is comparable to past studies where top management, especially the CEO, was used as the target audience (Sidhu et al. 2007). The 131 firms in the sample were characterised by an average of 33.7 years of operations, 349.5 full time equivalent employees, and $281 million of annual income. Respondents were all CEOs or equivalent with an average managerial experience of 21 years.

We conducted t-tests on the mean values of key variables between early and late respondents to test non-response bias (Armstrong and Overton, 1977) and noted no significant differences. This suggests that non-response bias is unlikely to be a problem. In addition, Harman's (1967) single-factor test was conducted, which showed that the highest variance explained by a single factor was 20.3%, which was well below the 50% threshold suggested by Podsakoff et al. (2003), indicating that common method bias is not likely to be a concern.

3.2 Measurement of variables

3.2.1 Market and Regulatory Search

Market search from the supply, demand and spatial sides were measured using Sidhu et al.'s (2007) exploitation and exploration scale. One item each was added to the demand and spatial side search scales respectively. The new items were added to reflect the knowledge gathered on the marketability of the existing products to new customers and new geographic regions, which were not reflected in the original scales. Regulatory search was measured using a self-developed eight-item scale.

The market search scales were first purified by using Cronbach's alpha and confirmatory factor analysis (CFA). This resulted in one item being dropped from the supply side search, two items from the demand side search, and one item from the spatial side search. Then, based on the refined market search scales, we calculated the construct reliabilities (i.e., Cronbach's alphas), all of which were above the recommended threshold of 0.7. The results of CFA on the refined market search scales in terms of the chi-square, Comparative Fit Index (CFI), and Tucker Lewis Index (TLI) are reported as follows: (1) supply side search: $\chi^2_{df} = 11.03_{(5)}$ (p=0.051), CFI=0.97, TLI=0.98; (2) demand side search: : $\chi^2_{df} = 12.42_{(5)}$ (p=0.03), CFI=0.95, TLI=0.91; and (3) spatial side search: : $\chi^2_{df} = 0.93_{(2)}$ (p=0.63), CFI=1, TLI=1. All scale items, together with Cronbach's alphas for the search constructs, are shown in Table 1.

In relation to the development of the regulatory search scale, statements were produced to reflect (1) the characteristics of the future (i.e., 'changes') and 'others' orientation, and (2) the knowledge requirements for both anticipation and participation/political influence strategies. With respect to (1), the word 'developments' was used to capture changes in laws and regulations, and, therefore, to reflect the 'future' orientation of regulatory search.

The word 'others' was used to capture other parties who are outside a firm's boundary and are affected by and/or affect the regulatory changes, such as resource providers, complementary product providers, legislators, and other interest groups. With respect to (2), in order to distinguish the knowledge requirements for different political strategies, statements were produced to capture whether the search reflects the strategic intention to anticipate legislative and regulatory changes or to influence the public policy-making process. For example, the statement "We are well aware of regulatory developments affecting our resource providers" reflects the anticipation strategy; while "We actively seek information through the collective lobbying efforts of trade/professional/political associations" reflects the strategic intent to influence the public policy-making process.

The factor analysis of the regulatory search measure indicated two factors (shown in Table 1), with four items loading onto the reactive regulatory search factor, and three items loading onto the proactive regulatory search factor. One item was deleted due to low individual loadings on both factors. Construct reliabilities based on Cronbach's alpha were above the recommended threshold of 0.7.

Table 1 Measures of market and regulatory search

Search Scale Items	Cronbach's alpha
Supply Side Search	
1. We are well aware of technological and technical developments within our industry. 2. Our information gathering efforts cover all industries that employ the sort of technology that we use. 3. A careful watch is kept on industries that are technologically related to ours. 4. We acquire little information on opportunities to leverage off our existing production/technical capabilities in new product domains.[*] 5. We closely monitor companies not active in our product area but that have skills and know-how comparable to ours. 6. In our organization, there is close surveillance of technological advancements in supplier industries.	0.8
Demand Side Search	
1. Marketing strategies of companies targeting our customers are closely followed by us. 2. We have a finger on the pulse as far as changes in the preferences of our customers are concerned. 3. Developments in industries that fulfil the same customer needs as we do, albeit with a completely different product, are well known to us. 4. Little information is gathered on preferences of customer groups that we do not currently serve.[*] 5. We keep close track of the activities of companies that offer products complementary to ours (e.g. cameras and memory cards are complementary products because they are used together by customers).[*] 6. We know the product and process innovation efforts of our customers well. 7. We closely monitor the marketability of our existing products to new customers.[**]	0.78
Spatial Side Search	
1. We are knowledgeable about all important opportunities in the geographic regions in which we operate.[*] 2. We hardly acquire any intelligence about potential opportunities in new geographic markets. 3. We are well informed about the price and quality aspects of products in neighbouring geographic regions. 4. We closely follow the activities of companies in our industrial sector but operating outside our geographic area. 5. We actively seek information on the marketability of our existing products in new geographic regions.[**]	0.73
Reactive Regulatory Search[***]	
1. We are well aware of current regulatory developments uniquely affecting our organization. 2. We are well aware of regulatory developments affecting our resource providers. 3. A close watch is kept on regulatory developments affecting organizations providing complementary products to ours (e.g. computer hardware and software). 4. We acquire little information on regulatory developments affecting our competitors.	0.79
Proactive Regulatory Search[***]	
1. We are in close contact with legislators to gain an understanding of new legislative trends affecting us. 2. We actively seek information through the collective lobbying efforts of trade/professional/political associations. 3. We strategically monitor other interest groups in their efforts to change regulations affecting our organization.	0.81

[*] Items were deleted due to low individual loadings and/or for the purpose of improving fit as a result of confirmatory factor analysis.

[**] Additional items added.

[***] The unpurified regulatory search items consist of eight items. The eighth item, "We are on a constant watch for regulatory developments in foreign jurisdictions where we may operate or are operating", exhibited low individual loadings for both the reactive and proactive regulatory search constructs.

Unidimensionality was further assured through the results of CFA: (1) reactive regulatory search: $\chi^2_{df} = 4.63_{(2)}$ (p=0.1), CFI=0.98, TLI=0.95; and (2) proactive regulatory search: $\chi^2_{df} = 0_{(0)}$ (p=0.00), CFI=1, TLI=1[14].

The discriminant validity of the search construct (including both market and regulatory search) was tested in two ways. First, we compared the square roots of the average variance extracted (AVE) for the five search factors (i.e., supply, demand, and spatial side search, and also reactive and proactive regulatory search) with the correlations among these search factors and other variables (shown in Table 2). Discriminant validity was supported as the square roots of the AVE for each search factor on the diagonal were larger than the correlations off the diagonal. In addition, we calculated the 95% confidence interval between the pairs of search factors. None of the confidence intervals contained one. This further indicated that the search factors were discriminatory to each other.

3.2.2 Competitiveness

Firm competitiveness was measured using Schilke's (2014) six-item competitive advantage scale, which includes consideration of a firm's strategic and financial performance, and an additional item relating to financial performance. The six items from Schilke (2014) are: (1) "We have gained strategic advantages over our competitors"; (2) "We have a large market share"; (3) "Overall, we are more successful than our major competitors"; (4) "Our EBIT (earnings before interest and taxes) is continuously above industry average"; (5) "Our ROI (return on investment) is continuously above industry average"; and (6) "Our ROS (return on sales) is continuously above industry average". The seventh item is "Our sales growth rate is continuously above industry average". In line with He and Wong (2004), sales growth

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[14] The factor model for factor 2 appeared to be just identified with no extra degree of freedom, and hence the χ^2_{df} statistic was 0 and the fit indices (i.e., CFI and TLI) were calculated to be 1.

Table 2 Mean, standard deviation (SD), correlation matrix and discriminant validity[a,b]

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1 Competitiveness	4.33	1.30	1										
2 Demand side search	4.70	0.96	0.37***	(0.65)									
3 Supply side search	4.52	0.95	0.28**	0.37***	(0.68)								
4 Spatial side search	4.50	1.10	0.31***	0.40***	0.38***	(0.66)							
5 Reactive regulatory search	5.18	1.03	0.17	0.42***	0.31***	0.21*	(0.71)						
6 Proactive regulatory search	4.21	1.40	0.06	0.33**	0.30***	0.33***	0.53***	(0.78)					
7 Market environmental turbulence	4.26	1.10	0.12	0.18*	0.24**	0.15+	0.15+	0.10	1				
8 Slack	3.40	1.25	0.34***	0.11	0.14	0.12	0.09	0.02	0.12	1			
9 Formalization	4.42	0.91	0.27**	0.25**	0.17+	0.16+	0.32***	0.25**	0.10	0.13	1		
10 Age	3.13	0.91	0.01	-0.07	-0.02	0.10	-0.04	0.05	0.12	-0.03	-0.04	1	
11 Size	4.18	1.55	0.29***	0.03	0.02	0.11	0.05	0.14	0.11	0.10	0.25**	0.34***	1

[a] Significance levels (two-tailed): +p<0.10, *p<0.05, **p<0.01, ***p<0.001

[b] The items on the diagonal in parentheses are the square roots of the average variance extracted for the respective constructs. The items off the diagonal are the correlation coefficients between constructs. Discriminatory validity test is conducted by comparing the magnitudes of correlation coefficients and the square roots of the average variance extracted.

3.2.3 Market environmental turbulence

Consistent with Danneels and Sethi (2011), market environmental turbulence was measured by a four-item scale: (1) "Customers' preferences change quite a bit over time"; (2) "Our customers tend to look for new products to satisfy their needs all the time"; (3) "We are witnessing demand for our products and services from customers who have never bought them before"; and (4) "New customers tend to have needs that are different from those of our existing customers". The construct reliability coefficient (i.e., Cronbach's alpha) for market environmental turbulence was 0.65.

3.2.4 Control variables

Firm size, age, formalization, and slack were controlled. Size was measured by the log-transformed employee numbers to proxy for a firm's structural complexity that might negatively influence firm innovativeness. Age, measured by the log-transformed number of years since incorporation, might also negatively influence innovativeness due to inertia. We measured formalization using Sidhu et al.'s (2007) five-item scale to reflect the potential rigidity caused by an overemphasis on rules that might discourage innovativeness. The items are: (1) "Whatever situation arises, written procedures are available for dealing with it"; (2) "Rules and procedures occupy a central place in the organization"; (3) "Written records are kept of everyone's performance"; (4) "Employees in our organization are rarely checked for rule violations"; and (5) "Written job descriptions are formulated for positions at all levels". The construct reliability coefficient for formalization (i.e., Cronbach's alpha) was 0.54. Although the reliability is relatively low, we kept this variable for conformity with Sidhu et al. (2007). Slack was included as a control variable due to its positive influence on firm innovation, and was measured by a four-item scale based on Danneels and Sethi (2011). The four items are: (1) "All available resources are locked up in current projects"; (2) "My organization has a reasonable amount of resources in reserves"; (3) "We have ample discretionary financial resources"; and (4) "We can always find the "manpower" to work on

special projects". The construct reliability coefficient (i.e., Cronbach's alpha) for slack was 0.73.

Seven-point Likert-type scales were used for all constructs discussed above and anchored at '1=Strongly disagree' and '7=Strongly agree'.

4. Results

We report the descriptive statistics and correlation matrix in Table 2. There are no significant correlations among the independent variables, indicating that multicollinearity was not a serious concern. This was further confirmed by the variance inflation factors which are well below the recommended threshold of 10.

We performed hierarchical moderated regressions to investigate the moderating effects of market environmental turbulence on the relation between market search, regulatory search and firm competitiveness. The regression results are reported in Table 3, and contain three separate models. Model 1 incorporates only the control variables. Model 2 adds the market search dimensions of supply, demand and spatial side search and also the respective interaction items. Model 3 includes the two regulatory search constructs and their respective interaction terms in addition to the terms in Model 2. To perform the moderated regressions, we mean centred all independent and moderating variables.

Table 3 Regression analysis[a,b]

Variable	Model 1	Model 2	Model 3
Intercept	1.36^{+}	2.38^{***}	2.5^{***}
Control Variables			
Size	0.2^{**}	0.19^{**}	0.21^{**}
Age	-0.09	-0.11	-0.12
Formalization	0.24^{*}	0.11	0.11
Slack	0.3^{***}	0.29^{***}	0.25^{**}
Market Environmental Turbulence (MET)	0.06	-0.05	-0.06
Market Search			
Supply side search		0.14	0.14
Demand side search		0.39^{**}	0.4^{**}
Spatial side search		0.12	0.15
Non-market Search			
Reactive regulatory search			-0.002
Proactive regulatory search			-0.11
Interactions			
Supply side search x MET		-0.3^{*}	-0.25^{*}
Demand side search x MET		0.22	0.3^{+}
Spatial side search x MET		-0.02	-0.08
Reactive regulatory search x MET			-0.21^{+}
Proactive regulatory search x MET			0.18^{*}
R^2	0.22	0.37	0.42
F	6.89^{***}	6.22^{***}	5.53^{***}
Changes in R^2		0.15	0.05
F		4.65^{***}	2.68^{*}

[a] Significance levels (two-tailed): $^{+}p<0.10$, $^{*}p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$

[b] Unstandardized regression coefficients are reported.

The results of Model 1 show that firm size, formalization and slack were significant in the predicted direction ($\beta_{size}=0.2$, $p<0.01$, $\beta_{formalization}=0.24$, $p<0.05$ and $\beta_{slack}=0.3$, $p<0.001$). Market environmental turbulence and firm age did not significantly affect firm competitiveness. Overall, Model 1 explains 22% of firms' competitiveness and was significant at 0.001.

Model 2 focuses on the direct effects and moderated effects of market search. Apart from the significant direct effect of demand side search on firm competitiveness ($\beta_{demand\ side\ search}=0.39$, $p<0.01$), there were no significant direct effects of supply and spatial side search on firm competitiveness. With respect to the moderated effect of market environmental turbulence (MET), we find that supply side search significantly and negatively interacted with market environmental turbulence to influence firm competitiveness ($\beta_{supply\ side\ search\ x\ MET}=-0.3$, $p<0.05$). This lends support to H2 that, at the higher (lower) level of environmental turbulence, supply side search was negatively (positively) associated with

firm competitiveness. However, no other moderating items were significant. Overall, Model 2 improved the model fit significantly compared with Model 1. Specifically, the improvement in R^2 was 0.15 and significant (F=4.65, $p<0.001$). The control variables exhibited similar significance levels and directions as in Model 1.

Model 3 incorporates the additional two regulatory search constructs and their respective moderating terms. In this full model, the direct effect of demand side search on firm competitiveness retained its magnitude, direction and significance level ($\beta_{\text{demand side search}}$=0.4, $p<0.01$). However, the direct effects of other search dimensions including the regulatory search constructs were not significant. In relation to the moderated effects of market environmental turbulence, the effect of supply side search was moderated as predicted and was consistent with Model 2 ($\beta_{\text{supply side search x MET}}$=-0.25, $p<0.05$). With regard to demand side search, it was found that market environmental turbulence showed a marginally significant moderating effect of 0.3 in the predicted direction at 10%, lending some support to H1 that, at the higher (lower) level of environmental turbulence, demand side search was positively (negatively) associated with firm competitiveness. As hypothesized in H3, the effect of spatial side search on firm competitiveness was not found to be significantly moderated by market environmental turbulence.

Turning to regulatory search, we found the moderated effect of reactive regulatory search on firm competitiveness was significant at 10% with a magnitude of -0.21, and in the predicted direction. This provides marginal support for H4a that, at the higher (lower) level of environmental turbulence, reactive regulatory search is negatively (positively) associated with firm competitiveness. Hypothesis 4b was also supported as it was found that proactive regulatory search significantly and positively interacted with market environmental turbulence in affecting firm competitiveness ($\beta_{\text{proactive regulatory search x MET}}$=0.18, $p<0.05$). Overall, by adding the regulatory search variable and its respective moderating terms, Model 3 showed a significant improvement in model fit, reflected by the improvement in

R^2 of 0.05, which was significant at 5%. Again, the control variables exhibited similar significance levels and directions as in models 1 and 2.

To assist the visualization of the moderating effect of market environmental turbulence, we plotted the interaction effects in Figures 1 and 2 by running simple regressions using unstandardized coefficients (Aiken and West, 1991). Figure 1 graphs the interaction effect using supply side search as the independent variable and firm competitiveness as the dependent variable. Similarly, Figure 2 depicts the interaction effect using proactive regulatory search as the independent variable and firm competitiveness as the dependent variable.

Figure 1 Moderating effects of market environmental turbulence (MET) on the relation between supply side search and firm competitiveness
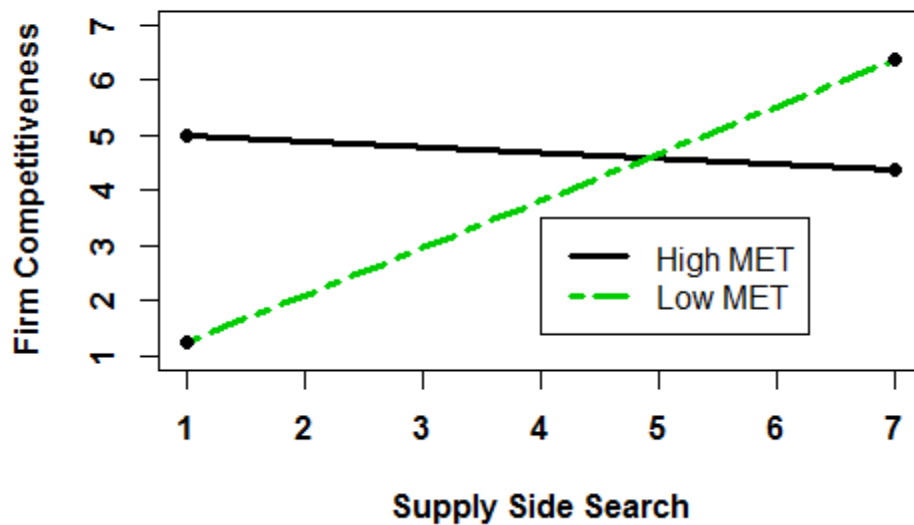
Figure 2 Moderating effects of market environmental turbulence (MET) on the relation between proactive regulatory search and firm competitiveness
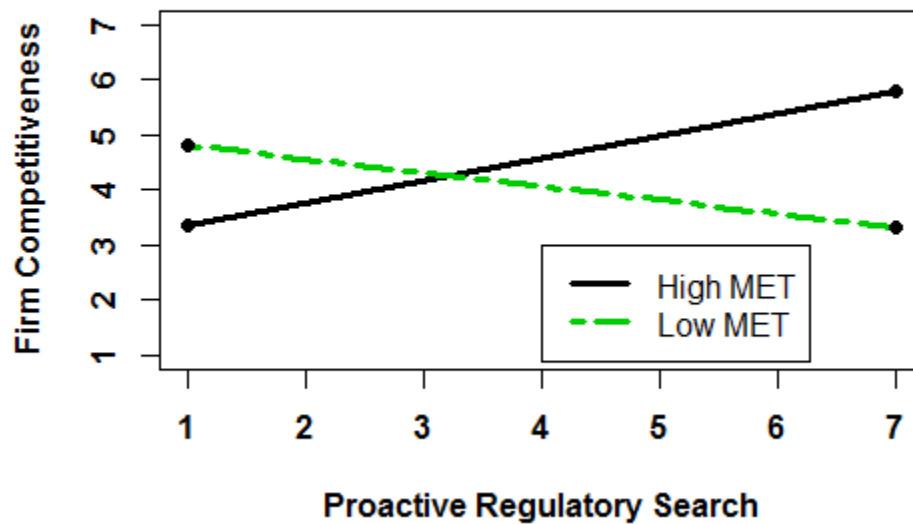
5. Discussion and implications

This paper investigated the differential effects of firms' search processes on firm competitiveness contingent on market environmental turbulence. Our empirical results highlighted the strategic relevance of considering customers' actions in both the market and regulatory environments (represented by market environmental turbulence) when conducting market and regulatory search.

In relation to market search, market environment turbulence is used to proxy for a changing market environment. Our finding of a positive relation between demand side search and competitiveness at a high level of market environmental turbulence is consistent with a market/demand pull strategy. The market/demand pull strategy requires the acquisition of market information/intelligence on customer preferences to create superior customer value for better firm performance (Brem and Voigt, 2009; Day, 1994; Zhou et al., 2005). We argue that the demand side search for a market/demand pull strategy is most effective at a high

level of market turbulence, indicating the existence of multiple and emerging demand side opportunities that can be explored.

In contrast, the positive relationship between supply side search and competitiveness at a low level of market environmental turbulence is consistent with a technology push strategy. A technology push strategy presumes that customers prefer technologically advanced products, and therefore, that supply side search for technological innovation is the key source of competitiveness (Brem and Voigt, 2009; Day, 1994; Zhou et al., 2005). We argue, however, that this presumption may only be valid at a low level of market turbulence, indicating searching for technological innovation is most likely to capture customers' imagination (i.e., customer preferences) when their preferences are not frequently changing.

In relation to regulatory search, our study firstly provides important empirical evidence that regulatory search is a distinctive search process, in addition to the market search processes studied in Sidhu et al. (2007). Secondly, our finding that reactive and proactive regulatory search are distinctive sub-regulatory search processes supports our theorization that search should reflect a firm's political strategic intents of anticipation and participation. Thirdly, our results demonstrate that adding regulatory search to the market search model significantly improves the explanatory and predictive power of the overall model, thereby supporting the additional contribution of regulatory search in explaining firm competitiveness. Fourthly, using market turbulence as a contingent variable indicating a changing regulatory environment, we found that reactive and proactive regulatory search affected firm competitiveness in a different manner under different levels of market turbulence.

We argue that the level of stability (instability) in customer preferences reflects the likelihood (or unlikelihood) of customers, as economic agents, forming a political coalition to pursue and advocate their interests in the public policy-making process (Baumann et al.,

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2015; Neilson, 2010; Newman and Bartels, 2011). This potential role switching of customers from economic actors to political actors corresponds to the theoretical explication of Holzer (2006) that political consumerism, combining aspects of both politics and economics, largely indicates whether individual consumers can wield political power when properly mobilized. We argue that this potential role switching and proper mobilization is only likely to occur at a lower level of market environmental turbulence. To this end, our results indicate that reactive regulatory search, pursued for a political strategy of anticipation/compliance, is most effective when market environmental turbulence is low as a firm's better and earlier compliance serve to place it ahead of its competition. However, when market turbulence is high, proactive regulatory search directed towards the political strategy of participating in, and influencing legislative outcomes, is likely to be most effective given the lesser ability of customers to form a collective political force and, hence, to have less influence on the policy-making process.

6. Limitations

This study is subject to limitations which provide opportunities for future research. First, all data were gathered through a single survey. Despite careful design of the survey questionnaire and Harman's (1967) single-factor test suggesting the potential for common method bias is low, we cannot completely rule out the influence of a single respondent survey on our results. Also, the cross-sectional nature of our research suggests associations between independent and dependent variables consistent with our theory. However, to further validate our findings and establish causality on how dimensional search affects competitiveness empirically, future research adopting a longitudinal approach will be important.

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CHAPTER 5

Paper 3 – Managerial intentionality and firm strategic renewal: The mediating role of higher order competences

Abstract

The literature suggests that top management's intentional actions play an important part in a firm's successful strategic renewal. However, there has been a lack of investigation of the processes intervening between intentionality and renewal outcomes. This paper examines the roles of higher order competences, specifically research and development (R&D) and marketing competences as both change and strategic routines, in linking managerial intentionality and renewal outcomes. We operationalize managerial intentionality using learning complexity, reflecting nonlocal/exploratory search in both the market and regulatory environments, and examine two renewal outcomes, innovativeness and competitiveness. Our empirical results suggest that managerial intentionality and renewal outcomes are mediated by higher order competences. In particular, our findings show that the learning complexity and innovativeness relation is mediated by R&D competence, representing the renewal channel of technological transformation, and the learning complexity and competitiveness relation is mediated by marketing competence, representing the renewal channel of marketing transformation.

Keywords

1. Introduction

Literature suggests that, when facing environmental selection pressure, managerial intentional actions play an important part in a firm's successful strategic renewal (Flier et al., 2003; Lewin et al., 1999; Van Den Bosch et al., 1999; Volberda et al., 2001). Intentional actions to explore opportunities from both the factor and product markets for renewal/adaptation purposes reflect the premise that an individual firm is able to proactively influence/manage its long term survival (Capron and Mitchell, 2009; Kim and Pennings, 2009); and stands in contrast to the deterministic views of population ecology (Carroll and Hannan, 2000) and institutional theory (DiMaggio and Powell, 1983) that an individual firm is passively selected in or out by the environmental or institutional forces. On this basis, past studies, especially studies using organizational learning theory, suggest that managerial intentionality, reflected through the actions of exploratory learning (Flier et al., 2003; Sidhu et al., 2004), increases a firm's knowledge diversity (March, 1991), uncovers environmental opportunities, and leads to the firm's eventual adaptation and survival through innovative products and sustained competitive advantage (He and Wong, 2004; Sidhu et al., 2007).

However, these studies do not explicitly examine the intermediate processes linking managerial intentionality and strategic renewal outcomes, and, therefore, do not consider one of the fundamental characteristics of strategic renewal defined by Agarwal and Helfat (2009), namely, the intermediate processes of strategic renewal to refresh or replace existing organizational attributes (e.g., routines and capabilities) for a firm's long term prosperity. Consequently, this paper addresses this gap in the prior literature by examining the mediating roles of two higher order competences, i.e., research and development (R&D) and marketing competences, in linking managerial intentionality (i.e., the intention to renew) and renewal outcomes.

Higher order competences, also known as dynamic capabilities, are considered as strategic change routines, representing firms' abilities to add, reconfigure and recombine resources

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and lower order competences for sustained competitive advantage (Danneels, 2002, 2008; Eisenhardt and Martin, 2000; Helfat and Martin, 2015; King and Tucci, 2002; Teece et al., 1997; Wang et al., 2015). Specifically, as change routines, R&D and marketing competences modify and change the lower order competences such as technological competences and customer competences respectively. As strategic routines, R&D and marketing competences are closely aligned with a firm's strategic posture of being technologically innovative and being market oriented.

Through examining the mediating processes of R&D and marketing competences, this paper contributes to both the literatures of firm capabilities and strategic renewal as follows. First, we explicitly establish the theoretical link between managerial intentionality and firms' capability development, and highlight the importance of top managers' proactive/intentional actions in effecting organizational changes through the use of higher order competences. Managerial intentionality is operationalized as a firm's exploratory search orientation (Sidhu et al., 2004). However, distinguishing from Sidhu et al.'s (2004) focus on exploratory search in the market environment (e.g., factor and/or product markets), this paper augments a firm's search orientation with exploratory search in the nonmarket environment, specifically, the firm's regulatory environment[15]. The inclusion of regulatory search highlights that the regulatory environment is another important environmental condition requiring managers' proactive consideration for strategic renewal purpose (Oliver and Holzinger, 2008). We name the resulting composite measure as learning complexity, reflecting the complex nature of a firm's exploratory search in both the market and regulatory environments.

Second, distinguishing from prior studies, we specify two strategic renewal outcomes, namely, innovativeness with a narrow view of strategic renewal and adaptation through new

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[15] Baron (1995) suggests that a firm's nonmarket environment consists of the social, legal and political environments. The regulatory environment, in this paper, captures both legal and political environments.

product performance, and competitiveness with a broad view of strategic renewal based on both strategic performance (a firm's market position or market share) and financial performance relative to a firm's competitors (He and Wong, 2004; Schilke, 2014). By considering two renewal outcomes and two higher order competences in the mediation analysis, we seek to demonstrate idealized strategic renewal channels, through which positive renewal outcomes can be achieved. These idealized strategic renewal channels may constitute technological transformation, using R&D competence to change a firm's technological competences to explore a new technological domain; or marketing transformation, using marketing competence to change customer competences to explore a new market.

In the following sections, we first review the relevant literature on strategic renewal focusing on managerial intentionality and exploratory learning, leading to the discussion of learning complexity and higher order competences. Second, we develop the theories and present the hypotheses for our mediated model. Third, data collection and the method are discussed, followed by the presentation of results. Finally, we provide the discussion of the results, implications and limitations.

2. Literature review and hypotheses development

2.1 Strategic renewal and managerial intentionality

Past studies offer various conceptualizations of strategic renewal. For instance, Floyd and Lane (2000, p. 155) suggest that "strategic renewal is an evolutionary process associated with promoting, accommodating, and utilizing new knowledge and innovative behaviour in order to bring about change in an organization's core competencies and/or change in its product market domain". Volberda et al. (2001) broadly define strategic renewal as a firm's activities to alter its path dependence, including important parameters of how managers behave towards each other and the way they invest for the future. Similarly, Flier et al.

(2003, p. 2168) define strategic renewal as "strategic actions to align organizational competencies with the environment to increase competitive advantage". More recently, Agarwal and Helfat (2009) explain strategic renewal by separately defining 'strategic' as "that which relates to the long term prospects of the company and has a critical influence on its success or failure" (p. 281); and 'renewal' as 'a type of change', which is synonymous to 'refreshment' and 'replacement' (p. 282).

The common undertone in these seemingly different conceptualizations is the belief that individual firms and their managers have both the innate capacity and the intention to transform their organizations for the purpose of adaptation. However, given intentions are not directly observable, Flier et al. (2003) argue that managerial intentionality can be, and is more likely to be, linked with firms' strategic actions of exploration.

The conception of exploration is pioneered in the seminal work of March (1991), and later operationalized as nonlocal search in Sidhu et al. (2004, 2007). According to Sidhu et al. (2004, 2007), nonlocal search is an information acquisition process conducted in the distant, rather than proximate, regions of a firm's knowledge competence. It reflects a firm's exploration orientation (Sidhu et al., 2004, 2007) and prevents competence traps (Leonard-Barton, 1992) and competitive myopia (Levinthal and March, 1993), while allowing for a firm's strategic renewal and adaptation (Floyd and Lane, 2000). To this end, we relate managerial intentionality to the firm's overall exploratory search orientation, and operationalize this intentionality as learning complexity, including nonlocal search in the market dimensions of supply, demand and geography examined in Sidhu et al. (2004), and nonlocal search in the regulatory environment.

2.2 Learning complexity

Learning complexity reflects a firm's nonlocal search in both the market and regulatory environments, and accords with the research on environmental scanning suggesting that

multiple sectors of the environment (e.g., customer, technology, and regulation) attract management attention due to the perceived uncertainty in, and importance of, the sectors (Bourgeois, 1980; Daft et al., 1988; Sawyerr, 1993), and highlighting the importance of understanding how these different and interconnected environmental sectors concurrently affect a firm (Anderson, 1999; Sharfman and Dean, 1991).

While past studies on exploratory/nonlocal search largely focus on the market environment (e.g., Sidhu et al., 2004, 2007), our addition of regulatory search highlights the importance of a changing regulatory environment for a successful strategic renewal. The knowledge acquired from the regulatory environment assists a firm to understand the effects of potential regulatory changes and serves as an important impetus for organizational change. For instance, Meyer et al. (2012) document that the Brazilian government's efforts to revive the ethanol industry in the country included the provision of incentives for the purchase of 'flex fuel' vehicles; i.e., vehicles which allow consumers to choose the desired mix of petroleum and ethanol as the fuel for their vehicles. Responding to this regulatory change, those car manufacturers that changed their technologies and production processes from the traditional petroleum engines to the 'flex fuel' engines enjoyed significant increases in sales.

We propose that learning complexity is a multi-dimensional construct consisting of dimensions of nonlocal search in the supply, demand, geography and regulatory sectors of the external environment. Specifically, nonlocal search from the supply side focuses a firm's search on new and innovative technologies; demand side search acquires knowledge on customers' emerging and latent needs; geographical side search provides information on the expansion opportunities into a new geographical region; and regulatory search acquires knowledge about changes in the regulatory environment (e.g., deregulation and government incentives) to effect organizational transformations ahead of competitors. On this basis, learning complexity (1) aggregates the dimensional nonlocal search in the respective individual domains of the factor (e.g., technology) and product (e.g., customer preferences

and diversification opportunities) markets, and the regulatory environment; and (2) represents a collective managerial intentionality and an overall firm level orientation to explore the environmental opportunities for purposeful organizational changes. Before further discussing how learning complexity reflects managerial intentionality and signals the need for firm level changes (which is conducted in the hypotheses development section), we first review the literature on higher order competences with specific focus on the roles of R&D and marketing competences as firm-level strategic change routines.

2.3 R&D and marketing competences as strategic change routines

The notion of competence originates from the resource based view of the firm (Barney, 1996). It is synonymous with the notion of capability (Danneels, 2002; Grant, 1991), and represents the activities in which a firm outperforms its competition (Hitt and Ireland, 1985). A firm's competences relate to the collective knowledge about how to coordinate production skills and technologies (Prahalad and Hamel, 1990), and require "a purposive combination of firm specific assets (or resources) which enables it to accomplish a given task" (McGrath et al., 1995, p. 254).

Research differentiates lower and higher order competences (e.g., Helfat and Martin, 2015; Winter, 2003). Lower order competences relate to knowledge capability specific to the current technologies and markets, and are akin to the static operating routines discussed in King and Tucci (2002). Danneels (2002) explains that lower order competences may be technological competence (i.e., the ability to make a given new product) and customer competence (i.e., the ability to sell to or serve certain customers). These lower order competences are static and inert in nature, and are prone to early and local returns, and trap the firms in their own competences in a changing external environment (Levinthal and March, 1993).

Higher order competences, in contrast, are known as dynamic capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997), 'the competence to build new competences' (Danneels, 2008, p. 519), meta-capabilities (Collis, 1994), or change routines (King and Tucci, 2002). Danneels (2002, 2008) suggests that the higher order competences may be R&D and marketing competences, which are not specific to a given new technological or customer domain. Rather, they are change routines, which add, reconfigure and recombine first order competences (Piening and Salge, 2015). For instance, Danneels (2008) suggests that R&D competence refers to a firm's ability to change lower order technological competences, reflecting the firm's ability to explore new technological domains. R&D competence may be a firm's ability to change engineering and manufacturing know-how or the ability to patent. On the other hand, marketing competence refers to a firm's ability to change lower order customer competences, reflecting the firm's ability to explore new market opportunities. Marketing competence may be the ability to build customer relationships or reconfigure sales force and distribution channels.

In addition, R&D and marketing competences, as higher order competences, are also strategic routines (Eisenhardt and Martin, 2000), corresponding to a firm's strategic posture of being technologically innovative and market oriented (Danneels, 2008; Wilden and Gudergan, 2015). For instance, the organizational transformations achieved through the use of R&D and marketing competences, such as developing patenting capability or reconfiguring the sales force, contribute to the value-adding strategies to be innovative (e.g., the patenting capability developed can be used to produce new products catering for an emerging environmental niche) and market driven (e.g., the reconfigured sales force can be used to better promote and market the new or existing products to customer needs).

In this paper, we argue that R&D and marketing competences are the key channels leading to organizational technological and marketing transformations, and are the processes/capabilities of refreshment and replacement of organizational attributes (e.g.,

routines) for strategic renewal as described in Agarwal and Helfat (2009). We propose that one of the key antecedents to the development and deployment of R&D and marketing competences for successful strategic renewal is managerial intentionality. In the following sections, we develop hypotheses for our proposed mediating relation by first establishing the link between managerial intentionality (represented by learning complexity) and higher order competences (in terms of R&D and marketing competences), and then the link between higher order competences and renewal outcomes (represented by firm innovativeness and competitiveness).

2.4 The association between learning complexity and R&D and marketing competences

The theoretical perspective of dynamic capability suggests that higher order competences as change routines are used to instigate organizational changes to respond to environmental changes (Eisenhardt and Martin, 2000; Teece et al., 1997). However, before instigating organizational changes, it is necessary for top managers to first proactively and intentionally learn about or notice the environmental changes. The consequence of not doing so is explicitly stated in Floyd and Lane (2000, p. 155) that "unless preceded by learning, domain shifts increase the organization's vulnerability to external selection and expose it to significant survival risk". Further, higher order competences such as R&D and marketing competences are similar to the strategic renewal processes of competence modification (i.e., changing existing competences) and competence definition (i.e., creating new competences), described in Floyd and Lane (2000). Floyd and Lane (2000) emphasize that modifying competences or creating new ones requires managers to recognise the need for change and to question the fitness of the existing competences with the changing environment.

We argue that learning complexity, consisting of a firm's nonlocal search in individual environmental sectors of supply, demand, geography and regulation, proactively acquires the knowledge of changes in these sectors and signals the need for organizational changes,

and, in turn therefore, the need to use R&D and marketing competences. With respect to the R&D competence, supply side search for technological advancements signals the need to convert external technologies into in-house capabilities. Demand side search, uncovering customers' latent needs, may lead a firm to deploy and integrate new technologies to produce new products meeting customer needs. Geographical side search, indicating expansion opportunities to a new location, requires the application of new technologies to the new location. Regulatory search for information to anticipate the effects of changes in regulations on a firm requires the adoption and integration of new technologies in-house. For example, regulatory search detecting an upcoming climate change regulation would encourage a firm to adopt or integrate an external carbon abatement technology to the firm's existing production processes.

With respect to marketing competence, supply side search for innovative new products may lead a firm to reconfigure its sales force to market these innovations. Demand side search, uncovering emerging customer needs, signals the need to devise promotion strategies that highlight how a firm's product offerings satisfy the customer requirements. Geographical side search aimed at gaining a foothold in a new location requires the development of customer relationships, and setting up sales forces and distribution channels in the new market. Regulatory search for information to anticipate the effects of changes in regulations may lead a firm to reconfigure its marketing practices to promote the firm's early compliance with the upcoming regulations.

In addition, we argue that learning complexity reflects a strong propensity to institute firm level changes through the use of R&D and/or marketing competences. That is, we suggest that consistent nonlocal (i.e., exploratory) search in the factor (i.e., supply side search) and product (i.e., demand and geographical side search) markets, and in the regulatory environment (i.e., regulatory search), reflects both (i) top managers' belief that their proactive actions (i.e., nonlocal search) can influence their firms' long term survival, and

(ii) their intention to purposefully transform their organizations for survival and adaptation purposes. On this basis, we argue that the higher the learning complexity, the higher the likelihood that managers will notice changes in their firms' environment and the higher their willingness to make organizational changes to adapt to the environmental changes. Consequently, the more likely is the firm to invoke R&D and marketing competences to achieve those organizational changes.

H1: Learning complexity will be positively associated with R&D and marketing competences.

2.5 The association between R&D and marketing competences and strategic renewal outcomes

R&D and marketing competences, as strategic routines, facilitate organizational transformations due to their functions to add, reconfigure and recombine lower order operating routines, and give rise to superior firm performance (reflected in renewal outcomes such as innovativeness and competitiveness) (Danneels, 2002, 2008; Day, 1994; Teece et al., 1997). With regard to the function of R&D competence to effect technological transformation, Prahalad and Hamel (1990) suggest that Honda's ability to leverage its engine related technologies from cars to other products such as lawn mowers, contributes significantly to the success of the firm's new product development and long-term performance. Danneels (2002, 2007) further demonstrates the effects of competence leveraging, which delivers the benefits of economies of scope (i.e., generating multiple outputs of, for example, cars and lawn mowers, from the same input of engine technology).

Additionally, Henderson and Cockburn's (1994) investigation of the pharmaceutical industry shows that a firm's architectural competence (i.e., another term for higher order competence) serves to facilitate and maintain information flows between various scientific disciplines and therapeutic classes within the firm, and positively induces productive drug discovery. The in-depth analysis of firms in the oil industry in Helfat (1997) is another

example. Over the period from 1976 to 1981, the supply side shocks caused by OPEC countries created significant shortages of oil supply and steep increases in oil prices. Firms in the oil industry responded to this major disruption from the supply side by investing, developing and commercializing new technologies to reduce their dependence on oil. One such technology was the technique of coal gasification and liquefaction. Helfat (1997) found that oil firms which were able to leverage, combine and reconfigure their refining technologies, and which had the ability to produce synthetic fuels along with accumulated coal assets, were more likely to successfully implement coal gasification and liquefaction.

With regard to the function of marketing competence to effect marketing transformation, the customer linking capability, as a higher order competence to create and manage customer relationships and channel bonding, is crucial for firm success (Danneels, 2002; Day, 1994). Similarly, Prahalad and Ramaswamy (2000) suggest that, to link with customers, firms need to be able to engage active dialogue, mobilize customer communities, manage customer diversity, and create personalized experiences. Also, Danneels (2002) argues that the marketing competence designed to delink pricing, promotion, and sales and distribution channels from a firm's current products/customers, and relink them to new products/customers, broadens the firm's strategic renewal options and enhances overall performance. Weerawardena's (2003) empirical evidence, based on a sample of manufacturing firms, shows that marketing capability integrating eight customer processes/competences (such as customer service, promotional activities, and the quality of sales personnel) positively relates to sustained competitive advantage. More recently, in the context of corporate social responsibility, Bai and Chang (2015) conceptualize marketing competence as incorporating a firm's ability to create customer value, improve customer satisfaction and build brand image. Their empirical results based on 800 firms in China show that marketing competence positively relates to firm performance.

H2: R&D and marketing competences are positively associated with firm strategic renewal outcomes (i.e., innovativeness and competitiveness).

2.6 The mediating role of R&D and marketing competences in the association between learning complexity and strategic renewal outcomes

As noted above, we propose that learning complexity, reflecting managerial intentionality, positively contributes to firms' superior performance (reflected in strategic renewal outcomes, such as innovativeness and competitiveness). However, we argue that the link between learning complexity and firm performance is indirect, not direct, requiring the consideration of intermediate processes of R&D and marketing competences. As change routines, R&D and marketing competences integrate, reconfigure and recombine a firm's operating routines, and are invoked by managerial intentionality to adapt to the environmental changes through complex learning/searching. As strategic routines, R&D and marketing competences bring about the organizational transformations and lead to positive strategic renewal outcomes (i.e., superior firm performance).

H3: R&D and marketing competences mediate the association between learning complexity and strategic renewal outcomes (i.e., innovativeness and competitiveness).

3. Method

3.1 Data

Data were collected from firms (both private and listed) in the healthcare, industrial machinery and financial service industries in Australia using a mail-based survey. The firms were selected from Capital IQ from their respective industries, with a population of 578 firms in healthcare, 790 in industrial machinery, and 761 in financial services, totalling 2129 firms across three industries. The contact details of the firms were further validated by phone and information available on companies' websites. During this purification process, 1172 firms were discarded due to the contact details not being corroborated. The final purified population contained 957 firms.

Consistent with Sidhu et al. (2007), the key informant approach was used to target CEOs of 930 companies using pre-tested questionnaires. CEOs are considered as the most appropriate source for organizational and strategic level information (Conant et al., 1990). Contact details were initially obtained from Capital IQ and further validated by phone and the information on company websites. We performed one follow-up mailing subsequent to the initial mailing. In total, 135 questionnaires were received. Four responses were deleted due to significant incompletion. The resulting final response rate was 14.1%. While this response rate is low, it is comparable to past studies where top management, especially the CEO, was used as a target audience (Sidhu et al., 2007). The 131 firms in the sample were characterised by an average of 33.7 years of operations, 349.5 full time equivalent employees, and $281 million of annual income. Respondents were all CEOs or equivalent with an average managerial experience of 21 years.

We conducted t-tests on the mean values of key variables between early and late respondents to test non-response bias (Armstrong and Overton, 1977) and noted no significant differences. This suggests that non-response bias is unlikely to be a problem. In addition, Harman's (1967) single-factor test was conducted, which showed that the highest variance explained by a single factor (20%) was well below the 50% threshold suggested by Podsakoff et al. (2003), indicating that common method bias is not likely to be a concern.

3.2 Measurement

3.2.1 Learning complexity

Learning complexity is a composite construct consisting of dimensions of market search, including supply, demand and geographical side search, measured using Sidhu et al.'s (2007) exploration scale, and regulatory search, measured using a self-developed eight-item scale. In relation to the market search scale, one item was added to the demand and geographical side search scales respectively, reflecting the knowledge gathered on the marketability of the existing products to new customers and new geographic regions, which

are not reflected in the original scales. The market search scales were purified based on the items' individual loadings and Cronbach's alpha. As a result, one item was dropped from each of the scales of supply, demand, and geographical side search. The construct reliabilities of the market search scales were all above the recommended threshold of 0.7.

Regulatory search was measured using an eight-item self-developed scale. In line with Sidhu et al. (2007), items were produced to capture nonlocal search behaviour in a firm's regulatory environment. We argue that regulatory search is considered as nonlocal or exploratory in nature if the search behaviour emphasizes 'change' and 'others'. The focus on change indicates that regulatory search is forward looking (i.e., future oriented) (Danneels and Sethi, 2011). The focus on others indicates a boundary spanning behaviour (Carlile, 2002), reflecting how changes in regulations affect others, which then indirectly affect the firm[16]. We used the word 'developments' to capture changes in laws and regulations, and, therefore, to reflect the 'future' orientation of regulatory search. The word 'others' was used to capture other parties who are outside a firm's boundary and are affected by and/or affect the regulatory changes, such as resource providers, complementary product providers, legislators, and other interest groups.

In addition, we suggest that regulatory search conducted in a nonlocal manner should be strategic in nature. We differentiate regulatory search conducted for the strategy of anticipating the effects of regulatory changes on the firm from that of influencing the public policy-making processes for favourable regulatory outcomes (Oliver and Holzinger, 2008). On this basis, statements were produced to capture whether the search reflects the strategic intention to anticipate legislative and regulatory changes or to influence the public policy-making process.

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[16] For instance, potential regulatory changes to a firm's supplier, increasing its cost structure (e.g., the introduction of a carbon tax), may have an adverse effect on the firm's input cost.

Table 1 Measures of market and regulatory search

Search Scale Items	Cronbach's alpha
Supply Side Search	
1. We are well aware of technological and technical developments within our industry.	0.8
2. Our information gathering efforts cover all industries that employ the sort of technology that we use.	
3. A careful watch is kept on industries that are technologically related to ours.	
4. We acquire little information on opportunities to leverage off our existing production/technical capabilities in new product domains.[*]	
5. We closely monitor companies not active in our product area but that have skills and know-how comparable to ours.	
6. In our organization, there is close surveillance of technological advancements in supplier industries.	
Demand Side Search	
1. Marketing strategies of companies targeting our customers are closely followed by us.	0.78
2. We have a finger on the pulse as far as changes in the preferences of our customers are concerned.	
3. Developments in industries that fulfil the same customer needs as we do, albeit with a completely different product, are well known to us.	
4. Little information is gathered on preferences of customer groups that we do not currently serve.[*]	
5. We keep close track of the activities of companies that offer products complementary to ours (e.g. cameras and memory cards are complementary products because they are used together by customers).[*]	
6. We know the product and process innovation efforts of our customers well.	
7. We closely monitor the marketability of our existing products to new customers.[**]	
Geographical Side Search	
1. We are knowledgeable about all important opportunities in the geographic regions in which we operate.[*]	0.73
2. We hardly acquire any intelligence about potential opportunities in new geographic markets.	
3. We are well informed about the price and quality aspects of products in neighbouring geographic regions.	
4. We closely follow the activities of companies in our industrial sector but operating outside our geographic area.	
5. We actively seek information on the marketability of our existing products in new geographic regions.[**]	
Reactive Regulatory Search[***]	
1. We are well aware of current regulatory developments uniquely affecting our organization.	0.79
2. We are well aware of regulatory developments affecting our resource providers.	
3. A close watch is kept on regulatory developments affecting organizations providing complementary products to ours (e.g. computer hardware and software).	
4. We acquire little information on regulatory developments affecting our competitors.	
Proactive Regulatory Search[***]	
1. We are in close contact with legislators to gain an understanding of new legislative trends affecting us.	0.81
2. We actively seek information through the collective lobbying efforts of trade/professional/political associations.	
3. We strategically monitor other interest groups in their efforts to change regulations affecting our organization.	

[*] Items were deleted due to low individual loadings and/or for the purpose of improving Cronbach's alpha.

[**] Additional items added.

[***] The unpurified regulatory search items consist of eight items. The eighth item, "We are on a constant watch for regulatory developments in foreign jurisdictions where we may operate or are operating", exhibited low individual loadings for both the reactive and proactive regulatory search constructs.

For example, the statement "We are well aware of regulatory developments affecting our resource providers" reflects the anticipation strategy; while "We actively seek information through the collective lobbying efforts of trade/professional/political associations" reflects the strategic intent to influence the public policy-making process.

Factor analysis of the regulatory search measure indicated two factors, with four items loading onto one factor, which is termed reactive regulatory search, aligning with the anticipation strategy, and three items loading onto the other factor, which is termed proactive regulatory search, aligning with the influence strategy. One item was deleted due to low individual loadings on both factors. Construct reliabilities based on Cronbach's alpha were above the recommended threshold of 0.7. Items for the market and regulatory search scales are shown in Table 1. Seven-point Likert-type scales were used for all items, anchored at "1 = Strongly disagree" and "7 = Strongly agree".

3.2.2 Learning complexity as a multi-dimensional construct

As noted earlier, we theorize that learning complexity is a multi-dimensional measure, consisting of sub-dimensions of market search (i.e., supply, demand, and geographical side search) and regulatory search (i.e., reactive and proactive regulatory search). To examine if the dimensional search factors are discriminatory to each other, but convergent to an overall managerial intentionality to explore at the firm level, we employed alternative factor models, shown in Table 2. In our initial attempt of factor modelling, we included all five dimensions of firm search. The fit indices for the initial model with five factors were not satisfactory, with a high χ^2_{df} at 304.5$_{(179)}$, CFI (Comparative Fit Index) and TLI (Tucker Lewis Index) values below the recommended thresholds of 0.9, and RMSEA (Root Mean Square Error of Approximation) and SRMR (Standardized Root Mean Square Residual) values significantly higher than the acceptable threshold of 0.05. To improve the model fit,

we conducted further analysis by deleting items within the search dimensions. It was found that by deleting the items of reactive search, the fit indices were significantly improved.

Table 2 Comparisons of alternative factor models

Model	Description	χ^2_{df}	CFI	TLI	RMSEA	SRMR
Initial model	Five related factors	$304.5_{(179)}$	0.87	0.85	0.073	0.074
Alternative models excluding four items of reactive regulatory search						
1	One general factor, four unrelated factors	$175.6_{(115)}$	0.92	0.90	0.063	0.067
2	One general factor	$435.2_{(119)}$	0.57	0.51	0.142	0.112
3	Four related factors	$175.6_{(113)}$	0.91	0.90	0.065	0.067
4	Four unrelated factors	$252.7_{(119)}$	0.82	0.79	0.093	0.189
5	One general factor, four related factors	Non-convergent solution				

Based on the remaining four factors (i.e., supply, demand, geographical and proactive regulatory search), we ran five factor models to explore the relations between the search factors, with Model 1 specifying a factor structure consisting of one general search factor and four unrelated dimensional search factors; Model 2 specifying one general search factor only, without the consideration of dimensional search factors; Model 3 specifying four related yet distinctive sub-search factors[17]; Model 4 specifying four unrelated sub-search factors; and Model 5 specifying one general search factor and four related sub-search processes.

The results show that, based on the criteria of χ^2_{df}, CFI, TLI, RMSEA, and SRMR, Models 1 and 3 were superior to Models 2, 4 and 5. The comparison between Model 1 (one general factor and four unrelated factors) and Model 3 (four related factors) indicates no discernible difference. However, it is reasonable to expect some correlations among the sub-search processes due to the expected consistency with which the search processes are conducted within a firm (i.e., nonlocal and exploratory search conducted in all individual environmental sectors). Therefore, we suggest that Model 3 is preferable as the existence of individual dimensional search factors indicated discriminant validity, yet the correlations

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[17] The four related yet distinctive sub-search factors model (Model 3) anticipates that the convergence (i.e., the relatedness) among the dimensional search factors reflects an overall managerial intentionality to explore, yet the existence of individual dimensional search factors indicates that the dimensional search factors are discriminant to each other due to differing search content.

between dimensional search factors indicated the convergence of the factors at the construct level, reflecting an overall managerial intentionality to explore.

3.2.3 R&D and marketing competences

R&D and marketing competences were measured using Danneels' (2008) six-item and eight-item scales respectively. Due to low individual loadings, three items were dropped from the marketing competence scale. The remaining five items are as follows and preceded by a statement "Different companies are good at different things. The following questions ask you to assess your company's skills in various areas, relative to your competitors. Relative to our competitors, my company is good at… (1) "assessing potential new markets"; (2) "building relationships in new markets"; (3) "setting up new distribution channels"; (4) "leveraging our brand reputation or image to new markets"; and (5) "assessing new competitors and new customers". Cronbach's alpha for marketing competence based on the five items was 0.87.

No items were dropped for R&D competence. The six items used are as follows and preceded by the same statement as marketing competence: (1) "setting up new types of production facilities, operations or work/task processes"; (2) "applying technology we have not used before"; (3) "assessing the feasibility of new technologies"; (4) "recruiting talents in technical areas we are not familiar with"; (5) "developing promising new technologies"; and (6) "implementing new types of production or work/task processes". Cronbach's alpha for R&D competence was 0.89. Seven-point Likert-type scales were used for all measures, anchored at '1=Strongly disagree' and '7=Strongly agree'.

3.2.4 Innovativeness and competitiveness

Following past studies such as He and Wong (2004) and Sidhu et al. (2007), we measure firm innovativeness in terms of the performance of its new product development program. We collected perceptual data as the financial performance of new products is not publicly

reported, especially for private firms. Lichtenthaler's (2009) three-item scale was used to measure perceived performance. The three items are: (1) "the overall performance of our new product development program has met our objectives"; (2) "from an overall profitability standpoint, our new product development program has been successful"; and (3) "compared with our major competitors, our overall new product development program is far more successful". The construct reliability coefficient was 0.84 and well above the recommended threshold of 0.7.

Firm competitiveness was measured using Schilke's (2014) six-item competitive advantage scale, which includes consideration of a firm's strategic and financial performance and also an additional item in relation to financial performance. The six items from Schilke (2014) are: (1) "we have gained strategic advantages over our competitors"; (2) "we have a large market share"; (3) "overall, we are more successful than our major competitors"; (4) "our EBIT (earnings before interest and taxes) is continuously above industry average"; (5) "our ROI (return on investment) is continuously above industry average"; and (6) "our ROS (return on sales) is continuously above industry average". An additional item is "our sales growth rate is continuously above industry average". In line with He and Wong (2004), sales growth rate is used as an additional item to measure financial performance as research (e.g., Henderson, 1999) suggests that sales growth rate is a reliable indicator of superior firm performance. Cronbach's alpha construct reliability coefficient for competitiveness was 0.91. Seven-point Likert-type scales were used for all measures, anchored at '1=Strongly disagree' and '7=Strongly agree'.

4. Results

Table 3 reports the means, standard deviations and the correlation matrix for the key variables of our analysis. There were no significant correlations among the independent variables, indicating that multicollinearity is unlikely to be a concern. This was further

confirmed by the variance inflation factors being well below the recommended threshold of 10.

Table 3 Means, standard deviations (SD), and correlation matrix[a]

	Mean	SD	1	2	3	4	5
1. Learning Complexity	4.51	0.76					
2. R&D Competence	4.89	0.90	0.349				
3. Marketing Competence	4.65	1.03	0.530	0.51			
4. Innovativeness	4.65	1.30	0.351	0.54	0.35		
5. Competitiveness	4.33	1.30	0.381	0.33	0.43	0.63	

[a] All correlations are significant at $p<0.001$.

Structural equation modelling (SEM) using the Partial Least Squares (PLS) method is used to examine the hypothesized mediating relations. Considered as a robust statistical method, PLS-SEM does not require the stringent assumptions of variable distribution (Henseler et al., 2009), and is suitable for use with the relatively small sample size of this study. The measurement model and structural model were estimated concurrently using Smart PLS 3.0. The standard errors and p-values for the path coefficients were obtained from 5,000 bootstrapping runs (Preacher and Hayes, 2008). The section below specifies the models used to investigate the hypothesized mediating relations.

The variables of interest for the measurement models included learning complexity, incorporating the items of the four search factors (i.e. supply, demand, geographical and proactive regulatory search specified in Model 3 in Table 2), two mediating variables (including items of R&D and marketing competences) and two dependent variables (including items of innovativeness and competitiveness). Six structural models were formulated, including two direct effect and four mediated effect models (refer to Figure 1). Figures 1A and 1B show the direct effects of learning complexity on innovativeness and competitiveness respectively. Figures 1C and 1D represent R&D competence mediating the relations between learning complexity and innovativeness, and between learning complexity and competitiveness respectively. Figures 1E and 1F represent marketing

competence mediating the relations between learning complexity and innovativeness, and between learning complexity and competitiveness respectively.

Supporting H1 that learning complexity positively relates to R&D and marketing competences, the path coefficients in Figures 1C to 1F ranged from 0.39 to 0.59, and are significant at 0.1%. Supporting H2 that R&D and marketing competences positively relate to firm performance in terms of innovativeness and competitiveness, our results showed that R&D competence was positively related to innovativeness (β=0.47, p<0.001 in Figure 1C) and competitiveness (β=0.2, p<0.05 in Figure 1D). Marketing competence was also positively related to innovativeness (β=0.2, p<0.05 in Figure 1E) and competitiveness (β=0.27, p<0.01 in Figure 1F).

We examined the mediating effects hypothesized in H3 by first using the indirect effect test, which suggests that a significant indirect effect indicates the existence of the mediators (Preacher and Hayes, 2004, 2008). Table 4 reports the direct and indirect effects. R&D competence mediated the relation between learning complexity and innovativeness as the indirect effect was significant (β=0.19, p<0.001). However, there was no conclusive evidence that marketing competence mediated the same relation as the indirect effect was only marginally significant (β=0.11, p<0.1). Similarly, marketing competence mediated the relation between learning complexity and competitiveness as the indirect effect was significant (β=0.15, p<0.05), but R&D competence did not mediate the same relation as the indirect effect was not significant.

Figure 1 Structural models, path coefficients and variances explained[a]

A: Direct effect of learning complexity (LC) on innovativeness	B: Direct effect of LC on competitiveness

LC 0.42^{***} Innovativeness $R^2=0.167$

LC 0.45^{***} Competitiveness $R^2=0.192$

C: Mediated effect of R&D competence on the relation between LC and innovativeness

D: Mediated effects of R&D competence on the relation between LC and competitiveness

LC 0.21^{**} Innovativeness $R^2=0.335$
0.41^{***} R&D Competence 0.47^{***}

LC 0.35^{***} Competitiveness $R^2=0.20$
0.39^{***} R&D Competence 0.2^{*}

E: Mediated effect of marketing competence on the relation between LC and innovativeness

F: Mediated effect of marketing competence on the relation between LC and competitiveness

LC 0.26^{**} Innovativeness $R^2=0.153$
0.58^{***} Marketing Competence 0.2^{*}

LC 0.27^{**} Competitiveness $R^2=0.213$
0.59^{***} Marketing Competence 0.27^{**}

[a] Significance levels (two-tailed): $^{+}p<0.10$, $^{*}p<0.05$, $^{**}p<0.01$, $^{***}p<0.000$

Table 4 Direct and indirect effects[a]

Effects on dependent variables	Direct effects	Indirect effects	Total effects
Innovativeness			
R&D Competence	0.47***	-	0.47***
Marketing Competence	0.2*	-	0.2*
Learning Complexity (mediated by R&D)	0.21**	0.19***	0.40***
Learning Complexity (mediated by marketing)	0.26**	0.11+	0.37***
Competitiveness			
R&D Competence	0.2*	-	0.2*
Marketing Competence	0.27**	-	0.27**
Learning Complexity (mediated by R&D)	0.35**	0.08	0.43***
Learning Complexity (mediated by marketing)	0.27**	0.15*	0.42***

[a] Significance levels (two-tailed): $^+p<0.10$, $^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$

Further, we validated the results of the indirect effect tests using the four-step approach in Tippins and Sohi (2003), which requires that the following be satisfied for the mediators to exist. Step one requires that the direct effects be significant. The significant path coefficients of the direct effect models supported step one, with learning complexity significantly affecting innovativeness (β=0.42, $p<0.001$ in Figure 1A) and competitiveness (β=0.45, $p<0.001$ in Figure 1B). Step two requires that the mediators, in our case, R&D and marketing competences, are significantly associated with the dependent variables of innovativeness and competitiveness. Step two was supported by the results supporting H2. Step three requires that the magnitudes of the path coefficients of the direct effects are reduced when the mediators are included. Step three was supported as the path coefficients of the learning complexity and firm performance (both innovativeness and competitiveness) decreased from above 0.4 without the mediators being included (refer to Figures 1A and 1B) to below 0.4 (ranging from 0.21 to 0.35) with the mediators being included (refer to Figures 1C to 1F).

Given that the previous three steps were all supported, the existence of the mediators is then determined by step four, which requires that the mediated models account for more variance in the dependent variable than the direct effect models. The results showed that R&D

competence mediated the learning complexity-innovativeness relation as the R^2 of the mediated model (0.335) in Figure 1C was larger than the R^2 of the direct effect model (0.167) in Figure 1A. However, marketing competence did not mediate the same relation as the R^2 of the mediated model (0.153) in Figure 1E was smaller than the R^2 of the direct effect model (0.167) in Figure 1A. Marketing competence mediated the learning complexity-competitiveness relation as the R^2 of the mediated model (0.213) in Figure 1F was larger than the R^2 of the direct effect model (0.192) in Figure 1B. But, there is no conclusive evidence that R&D competence mediated the same relation as the R^2 of the mediated model (0.20) in Figure 1D was similar to the R^2 of the direct effect model (0.192) in Figure 1B.

Therefore, in summary, comparing the four step-approach and the indirect effect tests, our findings suggest that R&D competence mediated the learning complexity-innovativeness relation, and marketing competence mediated the learning complexity-competitiveness relation. However, there was no conclusive evidence that marketing competence mediated the learning complexity-innovativeness relation, nor was there conclusive evidence that R&D competence mediated the learning complexity-competitiveness relation.

Finally, we performed effect size calculations according to Chin (1998) to understand the effect sizes of the mediators on the respective structural models. The results (Table 5) showed that R&D competence had a medium effect (0.253) on the relation between learning complexity and innovativeness, whereas marketing competence had a weak effect (0.027) on the relation between learning complexity and competitiveness. Consistent with the mediation tests above, R&D competence had a negligible or less than weak effect (0.01) on the relation between learning complexity and competitiveness. The effect size of marketing competence was not calculated for the relation between learning complexity and innovativeness as adding the mediator to the structural model did not increase the variance explained.

Table 5 Effect sizes of R&D and marketing competences

Dependent variable explained	Variance explained			
	Direct model	Mediated model	Δ variance explained	Strength of the mediation effect (f^2)[a]
Innovativeness, mediated by				
R&D Competence	0.167	0.335	0.168	0.253 (medium)
Marketing competence[b]	0.167	0.153	n/a	n/a
Competitiveness, mediated by				
R&D Competence	0.192	0.200	0.008	0.01 (less than weak)
Marketing competence	0.192	0.213	0.021	0.027 (weak)

[a] Weak effect is between 0.02 and 0.15 and moderate effect is between 0.15 and 0.35 (Chin, 1998).
[b] Given there is a decrease in R^2 from the direct model to the mediated model, effect size was not calculated as adding the mediator did not increase the variance explained.

5. Discussion, implications and limitations

While our findings showed that managerial intentionality (represented by learning complexity) positively relates to strategic renewal outcomes (in terms of firm innovativeness and competitiveness), the results of our mediation analysis support our theoretical premises, and provide important empirical evidence, that this relation is not direct. That is, for strategic renewal to occur, managerial intentionality first induces organizational changes by invoking change routines, such as R&D and marketing competences. These change routines, acting as strategic routines, then orchestrate either technological or marketing transformation to achieve positive renewal outcomes. To this end, our results showed that R&D competence mediated the learning complexity-innovativeness relation, and marketing competence mediated the learning complexity-competitiveness relation. These results are identified with two idealized strategic renewal channels, which are (1) technological renewal to achieve superior new product performance, through intentionally changing firms' technological capabilities/know-how (i.e. technological transformation) using R&D competence; and (2) marketing renewal to

achieve superior market position and financial performance, through intentionally changing firms' marketing practices (i.e., marketing transformation) using marketing competence.

With regard to technological renewal, our findings showed a medium effect of R&D competence on the main relation between learning complexity and innovativeness, indicating that, while R&D competence did not fully mediate the main relation, a firm level technological transformation had an important effect on new product performance. However, with regard to marketing renewal, our finding showed a weak effect of marketing competence on the main relation between learning complexity and firm competitiveness, indicating that transforming the marketing practices may have limited impact on the firms' market position and financial performance. We reason that a stronger effect of R&D competence on innovativeness compared to the effect of marketing competence on competitiveness might be due to the following. Marketing transformations, such as reconfiguring the sales force, distribution channels, and/or advertising and promotional strategies, are relatively observable, imitable and diffusible once the new marketing initiatives are implemented and known to competitors. As a result, the economic rents generated (e.g., initial increase in market share) from marketing transformation may be eroded by competition rather quickly. In contrast, technological transformation, such as developing patenting capability or applying new work/task processes, are largely conducted 'in-house', and embedded in the organizational routines and practices. Hence, they are not easily observable and imitated, nor can they be easily transferred to competitors. As a result, the economic rents generated from new products or new product features can be better protected.

In addition, our results suggested the lack of conclusive evidence that marketing competence mediated the relation between learning complexity and innovativeness. We argue that this indicates that marketing transformation may not be able to lead to the changes in the underlying value of the products/services that can be offered by the technological

transformation. Contrary to our expectation, the results also suggested the lack of conclusive evidence that R&D competence mediated the relation between learning complexity and competitiveness, indicating that the technological transformation may not lead to a significant change in firm competitiveness.

We suspect that this phenomenon may be specific to the industries examined. Our research is conducted in the healthcare, industrial machinery and financial services industries. While technological transformation is expected to generate a positive renewal outcome through superior new product performance in these industries, the contributions from the new products may not immediately overtake the contributions from the existing products to the firm's competitive position and overall financial performance. We illustrate this by comparing firms in the high-tech industry and those in the traditional banking industry (investigated in this study) as follows. Sales of new products in the high-tech industry (e.g., new versions of a smartphone) are expected to overtake or cannibalize the sales of the existing products (e.g., existing versions of the smartphone) in a relatively short period of time. However, sales of new products in the traditional banking industries (e.g., online brokerage services) may take a long time to cannibalize the sales from the traditional product offerings (e.g., depositing or lending services).

Our research also has important implications for practice. Managerial intentionality, measured using learning complexity, incorporates supply, demand and geographical side search, and regulatory search. Our results suggest that the dimensional search processes, despite being distinct to each other, are related nonlocal search processes, and can be considered at the firm level (when aggregated) to (1) represent an overall exploration orientation, (2) reflect managerial intention and willingness to renew and adapt, and (3) set the tone for organizational changes for strategic renewal purposes.

This top-down approach of strategic renewal accords with Volberda et al.'s (2001, p. 165) directed renewal journey model, in which top management is assumed to be a 'rational actor', who "sets goals, scans the environment, searches for alternatives, chooses one, and monitors the processes", therefore following the sequence that "strategy formulation precedes strategy implementation". In this respect, our research suggests that rational decision making relating to strategic renewal requires a coordinated effort to pursue complex and nonlocal search for opportunities in the factor market (i.e., supply side), product market (i.e., demand and geographical sides) and the regulatory environment. In addition, knowledge acquired should be aggregated and analysed at the firm level in order to (1) understand the overall impact of environmental changes originating from the individual sectors of the external environment, and (2) determine the alternatives, which may be our idealized strategic renewal channels; i.e., technological transformation using R&D competence or marketing transformation using marketing competence.

This study is subject to limitations which provide opportunities for future research. First, all data were gathered through a single survey. Despite careful design of the survey questionnaire, and Harman's (1967) single-factor test suggesting the potential for common method bias is low, we cannot completely rule out the influence of single respondent survey on our results. Second, the construct of learning complexity, reflecting managerial intentionality to explore, excludes items of reactive regulatory search, but includes proactive regulatory search for a better model fit. Compared with proactive regulatory search to intentionally participate in the public policy-making process, reactive regulatory search might not be 'exploratory' enough to reflect the managerial intentionality to explore. Nevertheless, we suggest that future research may further examine the reactive regulatory search scale with different datasets to determine if it can be included in firms' overall exploratory search orientation. Thirdly, future research may consider the mediating effects of other higher order competences, such as acquisitions, alliance formation and product

innovation (Eisenhardt and Martin, 2000); process research and development, restructuring and post-acquisition integration (Zollo and Winter, 2002); and/or market orientation (Menguc and Auh, 2006).

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CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Introduction

This thesis investigated the overarching research question of how firm performance is affected by exploratory search, internal and external environmental conditions, and firms' strategic change processes. Specifically, through three separate yet related research papers, and using multiple theoretical lenses, the thesis examined how exploratory search in both the market and regulatory environments affects firm performance in terms of innovativeness and competitiveness; and how those effects are (i) moderated by the internal environmental condition of slack and the external environmental condition of market environmental turbulence, and (ii) mediated by the higher order competences of research and development (R&D) and marketing competences, as strategic change processes. The key relations investigated in the thesis were depicted in Figure 1.1, reproduced here as Figure 6.1.

6.2 Overview of the findings

The overarching research question, stated above, was addressed through four individual and related research questions. In the sections below, the individual research questions are discussed in terms of how the questions were motivated, and how they are answered by the empirical findings of the thesis.

### 6.2.1 Regulatory search and firm innovativeness

The first research question related to the importance of regulatory search as an additional and new construct in the search literature, and its effect on firm innovativeness. Research question 1 was stated as:

> *How does a firm conduct exploratory search in the regulatory environment to acquire knowledge on future changes in regulations, and how does regulatory search contribute to a firm's nonmarket strategies and firm innovativeness?*

The motivation for research question 1 was that, although the environmental scanning literature has emphasized the importance of environmental search for a firm's strategic decision making, prior research (particularly, Sidhu et al., 2007 and also Benner and

Tushman, 2002, and He and Wong, 2004) had primarily focused on search in the market sectors of the environment (e.g., technology and customer) and had not examined the importance of search in the nonmarket, regulatory, environment.

Figure 6.1 Overview of the thesis
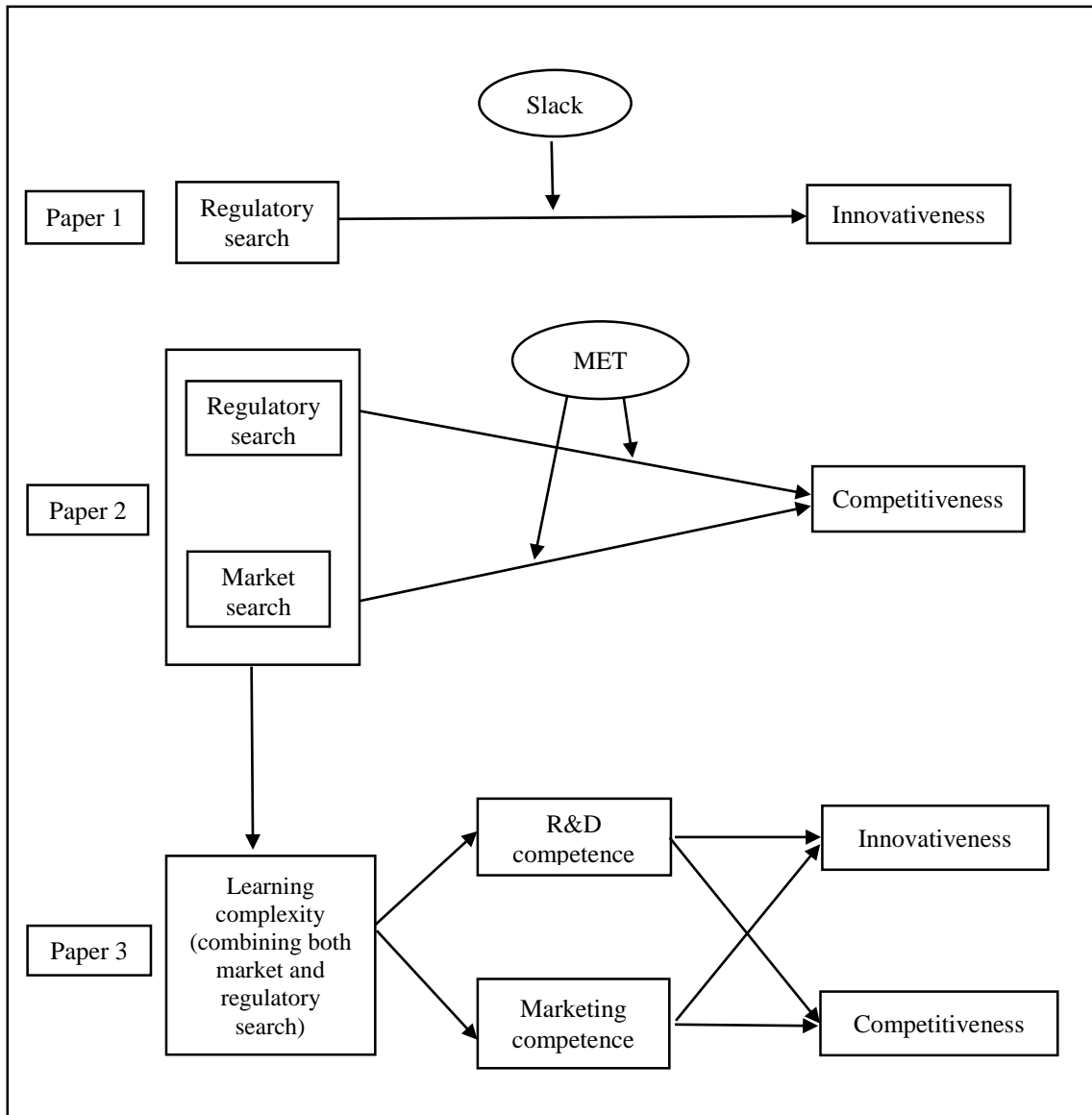
However, as discussed in Chapter 1 (Introduction) and Chapter 3 (Paper 1) of the thesis, search in the regulatory environment is important because regulations, especially changes in regulations, have important impacts on a firm's resource allocation and its performance (Capron and Chatain, 2008). Previous studies suggest that firms that are equipped with pertinent knowledge on regulations, and associated changes in regulations, are more likely

to succeed in terms of bringing new products to market and in terms of new product performance (Baron, 1995; De Carolis, 2003; Meyer et al., 2012).

Addressing research question 1, Paper 1 conceptualized regulatory search as an exploratory search process and developed a scale for its measurement. The empirical analysis suggested that the items in the scale formed two distinctive factors with satisfactory psychometric properties. The two search factors aligned with the nonmarket strategies of anticipation (i.e., anticipating changes in the regulatory environment) and participation (i.e., directly participating in the public policy-making process). The anticipative search factor was named as reactive regulatory search, whereas the participative search factor was named as proactive regulatory search. Accordingly, two regulatory search factors were regressed on firm innovativeness, with the results suggesting that only reactive regulatory search was positively related to innovativeness.

6.2.2 The moderating effect of firm slack

Research question 2 related to the moderating effect of slack on the regulatory search and firm innovativeness relation. It was stated as:

> *How does unabsorbed slack moderate the relation between regulatory search and firm innovativeness?*

The motivation for the second research question was that, although there has been extensive investigation of how external environmental conditions (particularly, technological and competitive dynamism) affect the exploratory search and performance relation (e.g., Jansen et al., 2006; Lichtenthaler, 2009; Sidhu et al., 2007), there has been limited investigation of how a firm's internal environmental conditions influence this relation.

Based on this motivation, Paper 1 used unabsorbed slack to proxy for a firm's internal environmental condition of resource munificence (Jansen et al., 2012), representing the availability of excess internal resources needed to support an effective regulatory search.

The findings of the moderated regression analysis showed that slack negatively moderated the reactive regulatory search and innovativeness relation, but positively moderated the proactive regulatory search and innovativeness relation. Model comparisons were conducted with a control only model, a direct effect model and a moderated effect model. The results showed that the moderated effect model explained significantly more variance in firm innovativeness than the other two models, suggesting superiority of the moderated effect model and the importance of considering slack as the internal environmental condition affecting firms' regulatory search effectiveness.

6.2.3 The moderating effect of market environmental turbulence on the relation between market and regulatory search with firm competitiveness

Research question 3 was stated as:

> *How does market environmental turbulence (MET) moderate the relation between market search and firm competitiveness, and the relation between regulatory search and firm competitiveness?*

Research question 3 was motivated to fill the gap in the existing literature that there was a lack of understanding of the effect of the customer sector of the external environment on the relation between exploratory search and firm performance. Specifically, there was a lack of understanding of how customer preferences and associated actions induce changes in both the market and regulatory environments, and how the resulting changes then affect the effectiveness of market and regulatory search. Based on this motivation, Paper 2 theorized that customers' changing preferences (representing market environmental turbulence) lead to changes in customers' purchasing behaviour, reflecting or constituting changes in the market, and economic environment. However, it was further theorized in Paper 2 that customers' changing preferences also have the potential to lead to changes in the regulatory environment. That is, it was theorized that greater stability of customer preferences provides greater potential for customers to form coalitions and initiate collective actions, which then lead to potential changes in public policy-making in the regulatory environment. Both

market and regulatory changes were then hypothesized to moderate the effectiveness of a firm's market and regulatory search.

Using the market search scales of Sidhu et al. (2007) and the regulatory search scales developed in Paper 1, moderated regression analysis was conducted. The results showed that the direct effects of market and regulatory search in the moderated models did not significantly explain firm performance, with the exception of the demand side search. However, the moderating effects of market environmental turbulence demonstrated significant influence on the effectiveness of both market search and regulatory search. Specifically, market environmental turbulence was found to: (1) negatively and significantly moderate the relation between supply side search and firm competitiveness; (2) positively moderate the relation between demand side search and firm competitiveness; (3) negatively moderate the relation between reactive regulatory search and firm competitiveness; and (4) positively moderate the relation between proactive regulatory search and firm competitiveness.

In addition, model comparisons showed that the model including both market and regulatory search explained significantly more variance than the model with the market search factors only, indicating that exploratory search in the regulatory environment yields superior firm performance, in addition to the effect of market search alone.

6.2.4 The mediating effects of R&D and marketing competences on the search and performance relation

Research question 4 was stated as:

> *How do managerial intentional actions (proxied by learning complexity) invoke the use of higher order competences (i.e., R&D and marketing competences), and in turn, subsequently lead to superior strategic renewal outcomes?*

Research question 4 was conceptualized in the theoretical framework of strategic renewal, with firms' exploratory search representing managerial intentionality to renew and adapt,

and firm innovativeness and competitiveness representing firm strategic renewal outcomes. The motivation for research question 4 was to address the gap in the prior literature that there was a lack of research aimed at understanding the processes linking managerial renewal intention and renewal outcomes. Understanding the intermediate linking processes is important because it is unlikely that a firm will enhance its performance outcomes if the knowledge acquired from the external environment about opportunities arising in that environment is not translated into appropriate organizational actions and changes to capitalize on these opportunities.

Based on this motivation, Paper 3 investigated the mediating effects of research and development (R&D) and marketing competences as strategic change processes linking firms' exploratory search and performance. Using both the market and regulatory search scales, the results of factor modellings with supply, demand, geographical and proactive regulatory search factors showed that these search factors were individually discriminant at the sub-construct level, yet converge to a firm level of exploration orientation, therefore, reflecting an overall managerial intentionality to adapt and renewal. The composite measure including the items of the four search factors was named as learning complexity, reflecting the complex nature of a firm's multi-dimensional search.

The linking effects of R&D and marketing competences were examined by structural equation modelling using the partial least squares method. The results of the path models showed that learning complexity was positively associated with R&D and marketing competences, which were then positively associated with firm innovativeness and competitiveness.

The mediating effects of the higher order competences were formally tested by using both the indirect-effect method and the four-step approach. The results from both methods consistently suggested that R&D competence mediated the learning complexity-

innovativeness relation with a medium mediating effect, and marketing competence mediated the learning complexity-competitiveness relation with a weak mediating effect. However, there was no evidence that marketing competence mediated the learning complexity-innovativeness relation, nor was there evidence that R&D competence mediated the learning complexity-competitiveness relation.

6.2.5 Summary of findings

In summary, the findings from the three papers allow the conclusions that: (1) firm performance in terms of innovativeness is affected by regulatory search, and this relation is differentially affected by firm slack as the internal moderating variable; (2) firm performance in terms of competitiveness (i.e., strategic and financial performance) is affected by both market and regulatory search, and the relations are differentially affected by market environmental turbulence as the external moderating variable; and (3) the exploratory search and firm performance relation is mediated by higher order competences (specifically, R&D and marketing competences).

6.3 Contributions and implications

In this section, the overall contributions and implications of the thesis are discussed, building on the summaries of the results of the individual papers. Theoretical contributions and implications for the literature and future research are discussed first, followed by contributions and implications for managerial and organizational practice.

6.3.1 Theoretical contributions and implications

The thesis contributes to the search literature by extending exploratory search in the market environment to exploratory search in the nonmarket, regulatory environment, and developing a scale to measure regulatory search. Taking the latter of these contributions first, prior to this thesis there was no established scale for regulatory search. The scale developed in this thesis was tested for, and demonstrated, good psychometric properties. If

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validated and/or refined further with different samples and in different contexts, the scale may well provide a useful operational definition and measure of regulatory search to underpin future research in this area.

With respect to extending the search literature, the finding of two factors comprising regulatory search (i.e., reactive and proactive regulatory search) suggests that exploratory search in the regulatory environment (i.e., knowledge/information acquisition) for the nonmarket strategy of participation to influence public policy-making is different and distinct from that of the nonmarket strategy of anticipation for active compliance.

This finding for regulatory search contrasts with, and extends, prior research into the supply, demand and spatial/geographical dimensions of the market environment, where each dimension has been theorized and found to comprise a single factor. The results from both Papers 1 and 2 demonstrated the importance of the two dimensional structure of regulatory search. Paper 1 showed that reactive (anticipative) search is positively and directly associated with firm innovativeness, highlighting the important effect of anticipating regulatory changes for new product performance, and contrasting with proactive regulatory search for which no direct association was found. Papers 1 and 2 further demonstrated the importance of the two dimensional structure by finding different moderating effects of the internal environmental condition of slack and the external environmental condition of market environmental turbulence for each of the reactive and proactive regulatory search dimensions. The thesis, therefore, has implications for the search literature by providing empirical evidence on the potency of regulatory search, thereby highlighting the importance of including regulatory search in future research, as well as demonstrating the importance of recognizing the two dimensional factor structure of regulatory search in that research.

A further contribution of the thesis arises from the finding in Paper 3 that, although regulatory search (specifically, proactive regulatory search) is an independent, nonmarket,

search dimension, distinct from the market search dimensions (of supply, demand and spatial/geographical), it nonetheless forms part of a firm's exploratory search orientation. This is demonstrated by the results of the factor modelling in Paper 3 that showed that proactive regulatory search, together with supply, demand and spatial/geographical side search, converges into a firm level composite search construct, namely, learning complexity.

As a multi-dimensional construct, learning complexity reflects the complex nature of a firm's search process covering a number of key areas of the external environment (i.e., technology, customer, geography and regulatory). Consistent exploratory search in various external environmental sectors reflects an overall managerial intentionality to adapt to environmental changes for organizational renewal purposes. The results of the path analysis in Paper 3 showed the significant direct effect of learning complexity on firms' strategic renewal outcomes (i.e., firm innovativeness and competitiveness). The thesis, therefore, has implications for the search literature by not only demonstrating the importance of regulatory search as an additional, nonmarket search dimension in its own right, but also by providing the construct of learning complexity and demonstrating its potential utility in guiding future research into managerial intentionality and actions for organizational renewal.

Finally, and drawing from the previous contribution, the research contributes to contingency-based research generally, i.e., studies in which the effects of environmental conditions are considered as critical factors moderating the relations between firms' actions and performance outcomes. In particular, while the findings indicate that reactive regulatory search and demand side search directly affected firm innovativeness and competitiveness (in Papers 1 and 2, respectively), the absence of direct effects of other search factors on firm performance, and the presence of significant moderating effects of slack and market

environmental turbulence, emphasize the powerful influence of internal and external environmental factors in shaping the effectiveness of firms' exploratory search.

6.3.2 Practical contributions and implications

The thesis also makes contributions to, and has implications for, practice. First, the thesis provides evidence that exploratory regulatory search is associated with superior firm performance in respect to innovativeness and competitiveness. That is, regulatory search contributes to firm performance over and above the contribution provided by market search in a firm's supply, demand and spatial/geographical environments. The findings, therefore, support the implication that managers should actively pursue exploratory search in their nonmarket regulatory environment as both a complement to and to enhance search in their market environment.

Second, given the findings of significant moderating effects of environmental factors on the search to firm performance relation, the thesis reinforces that it is critical for managers to be aware of both internal and external environmental conditions when conducting search in both the regulatory and market environments. This is because the effectiveness of search depends on those environmental conditions. For example, Paper 1 demonstrated that, when searching the regulatory environment, the effectiveness of reactive and proactive regulatory search depends on the internal environmental condition of slack, representing a firm's resource munificence.

In a high slack environment, the findings of Paper 1 suggest that it is more effective for managers to conduct proactive regulatory search to produce superior performance outcomes. Expressed another way, the finding suggests that high slack, proxying for internal resource munificence, is a potentially necessary condition to support proactive regulatory search. This is because a high level of slack supports the resource-consuming exploratory search initiatives conducted through a firm's corporate political activities, and increases a

firm's chance of success through one or more of the initiatives. As indicated in Paper 1, this is even more important in a pluralistic political environment, in which no political parties or interest groups dominate the public policy-making process. In contrast, the research found that the effectiveness of reactive regulatory search is associated with low to medium levels of slack, and not with a high level of slack. This finding was attributed to the limited potential payoff from reactive search; i.e., that higher levels of slack are only likely to support the search effectiveness to a given extent before a firm begins to experience diminishing and/or negative returns. The implication for managers is that the allocation of scarce resources to exploratory regulatory search is likely to be productive in the conduct of proactive regulatory search but counter-productive in the conduct of reactive regulatory search.

In addition to the moderating effects of slack, the results of the thesis (specifically Paper 2) suggest that the effectiveness of reactive and proactive regulatory search on firm performance is also affected by external environmental conditions, specifically, customers' preferences and actions, which may induce changes in the regulatory environment. The findings of Paper 2 indicate that customers are more likely to turn into political players to influence the public policy-making process, and to introduce changes to a firm's regulatory environment, when their preferences are not frequently changing (as measured by low market environmental turbulence). Therefore, when facing a higher probability of regulatory changes due to customer actions in a low turbulent market environment, it is more effective for managers to conduct reactive (i.e., anticipatory) regulatory search in producing competitive advantage. In contrast, when customers' preferences are frequently changing in a highly turbulent environment, managers will find it more effective to pursue proactive regulatory search to achieve superior competitiveness. This is because the resistance from customers to a firm's political activities and its influence on the political process is likely to be low in a highly turbulent market environment, meaning that firm

managers have greater opportunity to influence the public policy-making process to their firms' advantage.

When searching in the market environment, the findings of the thesis (also Paper 2) suggest that the effectiveness of demand and supply side search is also affected by external environmental conditions, specifically, changing customers' preferences and their purchasing behaviour. Paper 2 suggests that, to generate market intelligence to uncover latent customer needs and unique market niches, managers should engage in demand side search as this search was found to lead to superior firm competitiveness (and is consistent with a 'demand-pull' market strategy). However, the results of the moderation analysis demonstrate that demand side search is more likely to be effective when market environmental turbulence is high, indicating an environment with an abundance of emerging market opportunities from the demand side. In contrast, the results of Paper 2 suggest that, when market environmental turbulence is low, managers should engage in supply side search for new technological initiatives as it was supply side search that was found to lead to superior firm competitiveness (aligning with the 'technological push' strategy). That is, when market turbulence is low, managers can take advantage of a supportive market environment in which a firm's technological innovation can better target a market niche when the niche (based on customer preferences) is not frequently changing.

A final contribution and implication of the thesis is that, while the research reinforced the importance of environmental conditions as affecting the search to performance relation, it also demonstrated that firms', and their managers', deliberate and proactive actions to explore and adapt to environmental changes, and to effect associated organizational level changes, also play an important part in enhancing firm performance. Using the theoretical lens of strategic renewal in Paper 3, the results of the mediating models integrating managerial intention to renew (proxied by learning complexity), strategic change routines

as renewal processes, and firm innovativeness and competitiveness as renewal outcomes, showed that (1) R&D competence mediated the learning complexity-innovativeness relation, and (2) marketing competence mediated the learning complexity-competitiveness relation. These results have practical importance because they are identified with two idealized strategic renewal channels, specifically (1) technological renewal to achieve superior new product performance through intentionally changing firms' technological capabilities and know-how (i.e., technological transformation); and (2) marketing renewal to achieve superior market position and financial performance through intentionally changing firms' marketing practices (i.e., marketing transformation).

Comparing the two strategic renewal channels, the findings of Paper 3 suggest that the mediating effect of R&D competence on innovativeness is stronger than that of marketing competence on competitiveness. It is argued (in Paper 3) that marketing transformation is relatively observable, imitable and diffusible, whereas the technological transformations are largely developed 'in-house', and embedded in the organizational routines and practices. As a result, economic rents generated from technological transformation can be better protected. This finding, therefore, supports the implication that managers' intentional actions to renew their firms' generate larger competitive advantage when the resulting firm level changes are not easily imitated by competitors. On this basis, technological transformation effected in-house is the recommended renewal channel for superior firm performance.

6.4 Limitations and future research

This thesis is subject to limitations which provide opportunities for future research. First, the cross-sectional nature of the research means that the associations between the independent and dependent variables, and the directions of association, are reliant on theory. The results support these associations and their directions because of their consistency with the theory. Nevertheless, to further validate the findings, and to establish causality

empirically, future research may collect data for the dependent variable with a time lag, or use longitudinal data to cover a longer time period.

Second, regulatory search is a new construct and its relation with firm performance warrants further investigation. Although the findings of this thesis suggest that regulatory search can take the form of reactive and proactive search, future research may explore the antecedent factors determining the extent of firms' use of these two regulatory search options. For instance, Sidhu et al. (2004) propose that antecedent factors may include the organization's mission, its strategic orientation, and whether organizational actors are formally responsible for and committed to the search activities. In addition to these factors, future research may also examine contextual factors at the national and institutional level. Specifically, and for example, it can be argued that various legal and regulatory systems across different countries and institutions may have differential impacts on how regulatory search may be conducted.

Third, we focus on respondents' perceptions of new product development to conceptualize innovativeness. Future studies may seek to confirm our findings using alternative measures of innovativeness. Specifically, future research may investigate how firm exploratory search processes affect process, marketing and organizational innovations, or examine how these search processes differentially affect radical and incremental innovations.

Third, the research in this thesis suggests that the effects of search on firm performance are moderated by slack and the preferences and actions of customers. Future research may investigate how other contingency variables may affect the search-performance relation. For instance, in relation to the effects of regulatory search on competitiveness, while our study focuses on the actions of customers inducing regulatory changes, future research may examine how the actions of other stakeholder or interest groups (e.g., competitors or media organizations) may change and shape the landscape of a firm's regulatory environment, and

how the resulting regulatory change influences the effectiveness of a firm's regulatory search. In addition, variables, such as perceived environmental uncertainty, governance and board structure, industry, types of firms, and business strategic forms, can be considered as other important contextual variables for future research on the relation between search and performance.

Finally, the findings of the thesis suggest that an overall firm level exploratory search orientation affects firm performance, and that the search and performance relation is mediated by firms' higher order competences as change processes. While the thesis emphasizes the mediating effects of two specific higher order competences (i.e., R&D and marketing competences), future research may explore other change processes (e.g., restructuring or post-acquisition integration) to facilitating organizational changes.

In summary, there are many fruitful avenues for future research into exploratory search generally, and exploratory regulatory search specifically, that will inform and extend the research literature in this important area and will guide managers in both their search activity and strategy.

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Appendix A – Approval Letter from the Macquarie University Human Research Ethics Committee

From: **Mrs Yanru Ouyang** <fbe-ethics@mq.edu.au>
Date: Mon, Dec 15, 2014 at 3:15 PM
Subject: Approved - 5201401098
To: Mr Kevin Baird <kevin.baird@mq.edu.au>
Cc: Professor Graeme Harrison <graeme.harrison@mq.edu.au>, Mr Lu Jiao <lu.jiao@students.mq.edu.au>

Dear Mr Baird,

Re: 'Learning complexity: A study of multi-dimensional and ambidextrous organisational search.'

Reference No.: 5201401098

Thank you for your recent correspondence. Your response has addressed the issues raised by the Faculty of Business & Economics Human Research Ethics Sub Committee. Approval of the above application is granted, effective "15/12/2014". This email constitutes ethical approval only.

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

 http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/e72.pdf.

The following personnel are authorised to conduct this research:

Mr Kevin Baird
Mr Lu Jiao
Professor Graeme Harrison

NB. STUDENTS: IT IS YOUR RESPONSIBILITY TO KEEP A COPY OF THIS APPROVAL EMAIL TO SUBMIT WITH YOUR THESIS.

Please note the following standard requirements of approval:

1.   The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).

2.   Approval will be for a period of five (5) years subject to the provision of annual reports.

Progress Report 1 Due: 15th Dec 2015
Progress Report 2 Due: 15th Dec 2016
Progress Report 3 Due: 15th Dec 2017
Progress Report 4 Due: 15th Dec 2018
Final Report Due: 15th Dec 2019

NB. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at the following websites:

http://www.mq.edu.au/policy/
http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/policy

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of approval to an external organisation as evidence that you have approval, please do not hesitate to contact the FBE Ethics Committee Secretariat, via fbe-ethics@mq.edu.au or 9850 4826.

Please retain a copy of this email as this is your official notification of ethics approval.

Yours sincerely,

Parmod Chand
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