Conceptualising an Organisational Innovation Capability

A Thesis Submitted for the Degree of

Doctor of Business Administration

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Abstract

Innovation is regarded as the principal source of sustainable competitive advantage, yet many firms approach innovation haphazardly and without discipline. These firms appear poorly equipped to implement a comprehensive innovation strategy as they focus only on incremental innovation and are committed to preserving the status quo.

A dynamic capabilities approach was selected because of its focus on the development of management capabilities. This research has answered the call for fine-grained qualitative case studies to look at the detail of *how* dynamic capabilities are deployed to better understand how these capabilities work in practice and whether and how they might differ across firms. By the analysis of three embedded business units in the one case organisation this research has opened the innovation "black box" and provided a capability framework for strategic managers to build, systematise and replicate within their organisations. It is a higher order capability which provides managers with the capacity to manage the component capabilities of the Organisational Innovation Capability framework together with their linkages and interdependencies to impact the firm's existing resource base. It also identifies strategic entrepreneurship, organisational learning capability and alliance building capability as the essential preconditions for innovation capability renewal.

In summary, this research is part of the increasing momentum in understanding the "how" of dynamic capabilities. It provides learning for management practice on how dynamic capabilities originate, how firms built and deployed their Organisational Innovation Capability and how distinctive processes support the creation, modification, reconfiguration and augmentation of firm resources to achieve competitive advantage. Most importantly, it has provided a framework for an Organisational Innovation Capability which can be applied in practice.

Key words: organisational capability, organisational innovation capability, entrepreneurship, dynamic capabilities

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Statement of Authorship

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Abbreviations

The following abbreviations have been used in this thesis:

CHLSS	Commercial High Level Security Sector
CMMI	Capability Maturity Model Integration
CO	Case Organisation
COFBU	Case Organisation - First Business Unit
COSBU	Case Organisation - Second Business Unit
COTBU	Case Organisation - Third Business Unit
Cor_	Case organisation (Interviewee Number)
FBU_	First Business Unit (Interviewee Number)
GHLSS	Government High Level Security Sector
HFD	Human Factors Domain
OEM	Original Equipment Manufacturer
OIC	Organisational Innovation Capability
RA Theory	Resource Advantage Theory
RBV	Resource-based View
RO	Research Organisation
SBU_	Second Business Unit (Interviewee Number)
TBU_	Third Business Unit (Interviewee Number)
VARs	Value Added Reseller

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Chapter One

INTRODUCTION TO THE RESEARCH

1.1 Introduction

Innovation is regarded as an imperative for firms seeking to achieve sustainable competitive advantage with the expectation that it is endogenous to the firm (Hunt and Davis 2008, p. 12). In rapidly changing market conditions with shrinking market knowledge driven by compressed life cycles, fragmenting and disaggregating markets, and proliferating media and distribution channels, developing successful innovation is challenging (Day 1994a, p. 9; Han, Kim and Srivastava 1998, p. 30).

Yet, despite the universal acceptance of the need for innovation and the vast literature on the processes and approaches to support innovation success (Crossan and Apaydin 2010; Cooper 1996; 1999), the academic literature suggests that innovation is rare and episodic and that few firms achieve innovation success on a consistent basis (Hamel 2006; Cooper 1996; 1999; Connell, Edgar et al., 2001; Rothwell et al., 1974). The McKinsey Global Survey, Innovation and Commercialisation supports this persistent challenge as 50% of the 2,240 executives surveyed responded positively to these questions: "We have pockets of successful innovation, but innovation is rarely scaled throughout the organisation" and "We have lots of good ideas but do not get enough of them through to commercialisation" (McKinsey 2010). As 40% of respondents said that their companies made commercialisation decisions in an ad hoc manner, the inconsistency in innovation outcomes is not surprising.

"How do firms develop an innovation capability to achieve continued differential firm performance within an industry?" The dynamic capabilities framework provides an explanation of how firms might constantly renew their innovation capability in rapidly changing environments. It is an influential framework for investigating

strategic renewal of the firm as researchers seek to understand and investigate managerial capabilities, organisational resources and strategies that enable a firm to renew, augment and adapt its innovation capability over time (Teece 2007).

1.2 Background to the Research

With the changing dynamics of business, innovation is regarded as the principal source of sustainable competitive advantage (Teece 2007; Teece 1998, pp. 55-60; Leonard and Sensiper, 1998, p. 112). While the need for innovation is regarded as an organisational imperative, many firms approach innovation haphazardly and without discipline, expecting another serendipitous Newtonian apple to fall from the sky. Cooper argues that there has been little improvement in the innovation success rate as actors "seem to fall into the same traps that their predecessors did back in the 1970's" (Cooper 1999, p. 2) and that merely studying successful and unsuccessful new product projects, as he and his colleague have done in the past, misses many of the key factors in success (Cooper and Kleinschmidt 2007, p. 2). Most organisations appear poorly equipped to implement a radical innovation strategy as they focus on incremental innovation and are "genetically programmed to preserve the status quo" (Stringer 2000, p. 71).

Why is the success rate for new product development and innovation so low particularly when numerous success/failure criteria have been identified in the academic literature? (Rothwell et al., 1974; Cooper 1980, 1996, 1998, 1999, 2004; Wycoff 2003; Connell, Edgar et al., 2001). Crossan and Apaydin in their analysis of 525 reviews and meta-analyses, highly cited papers, and recent papers on innovation found no overarching framework of innovation determinants. In addition, their review found that while the organisational learning and knowledge-based views were quite prominent, innovation research was generally fragmented, lacked interconnectedness and was poorly grounded theoretically (2010, pp. 1164, 1165, 1174).

Hamel considered that the reason for the innovation hiatus is that "senior leaders do not have a clear, well-developed model of what innovation looks like as an

organisational capability" (2003). One of the reasons for the lack of management understanding is that "innovation as a process is under developed in the literature" (Crossan and Apaydin 2010, p. 1167). Hamel argued that firms need to "move from innovations as exceptions; move beyond innovation as a specific role or structure, beyond innovation as a once-in-a-while project, to thinking about innovation as a *deep capability*" (2003, emphasis added). This position is consistent with the dynamic capabilities approach because of its focus on the ongoing renewal of management capabilities (Teece 2007; Helfat et al., 2007, p. 4; Agarwal and Helfat 2009, p. 283).

While some consider that the situation simply requires "more commitment and a more innovative approach to the *process* of innovation" (Booz Allen 2005, p. 4, emphasis added), following the recommendation of Hamel, the importance of an Organisational Innovation Capability (OIC) cannot be denied. The objective of building such a capability is to create, distinctive and difficult-to-imitate value-creating resource advantages through the integration, adaptation and reconfiguration of the firm's endowed assets and resources (Hunt and Morgan 1995, p. 6; Teece et al., 1997, p. 528; Barney 1991, p. 102). OIC's represent the integration of systems, processes, skills and behaviours and it is within this architecture that an innovation capability will be investigated.

1.3 Research Question

The research question is *"How can an Organisational Innovation Capability be conceptualised in an information technology solutions context, and what is the role of learning in organisational innovation capability renewal"*. The intention of this research question is to address the paucity of academic research in the management literature by opening the innovation "black box" and providing an explanation of the how an organisational innovation capability is constructed, i.e. how are structures, systems, processes, skills, and behaviours inherent in this organisational capability, what is the process of renewal and what are the organisational preconditions required to support a well balanced, productive and successful OIC.

1.4 Research Approach

A postpositivist paradigm was selected because of its emphasis on critical multiplism as a means of falsifying, rather than verifying hypotheses and its increased reliance upon qualitative research techniques (Guba and Lincoln 2005, p. 193). Case study research was selected as the research approach because of its ability to answer "how" and "why" questions in the context of a complex world of lived experience. Another compelling reason is the formative stage of dynamic capabilities research as the boundaries between the phenomenon and the context are not necessarily apparent (Yin 2009, p. 18).

Based on the innovation capability literature this research conceptualised an OIC in the IT solutions context[1]. The OIC was conceptualised using the dynamic capabilities approach consisting of three constructs: organisational innovation intensity, market-focused learning capability and innovation infrastructure renewal capability and two organisational preconditions: organisational learning capability and entrepreneurial intensity. To analyse the validity of this framework a single case organisation (CO) was selected for research comprising three embedded units with substantially different paths, processes and positions. A within-case analysis of three business units within the CO was conducted and followed by a cross-case analysis between the three business units to identify similarities and differences in the process of building an OIC. While the researcher was employed by the CO, the CO was selected on the basis that it provided the highest "opportunity to learn" (Stake, 1994, p. 243) for the CO and the researcher, as at the time that the research was conducted, the CO was undergoing significant change as it endeavoured to capitalise on its acquisitions, expand into new markets and increase the success rate of innovation and the speed of commercialisation.

From the case analysis, an OIC was conceptualised and then compared to the framework conceptualised from the innovation capability literature.

[1] IT solutions context includes the integration of system sub-components into a single functioning system. The sub-components may include software either developed or acquired by the integrator. In this case study, IT solutions were often implemented to support major infrastructure projects.

1.5 Outline of the Thesis

An outline of the thesis is contained in Figure 1.1 below.

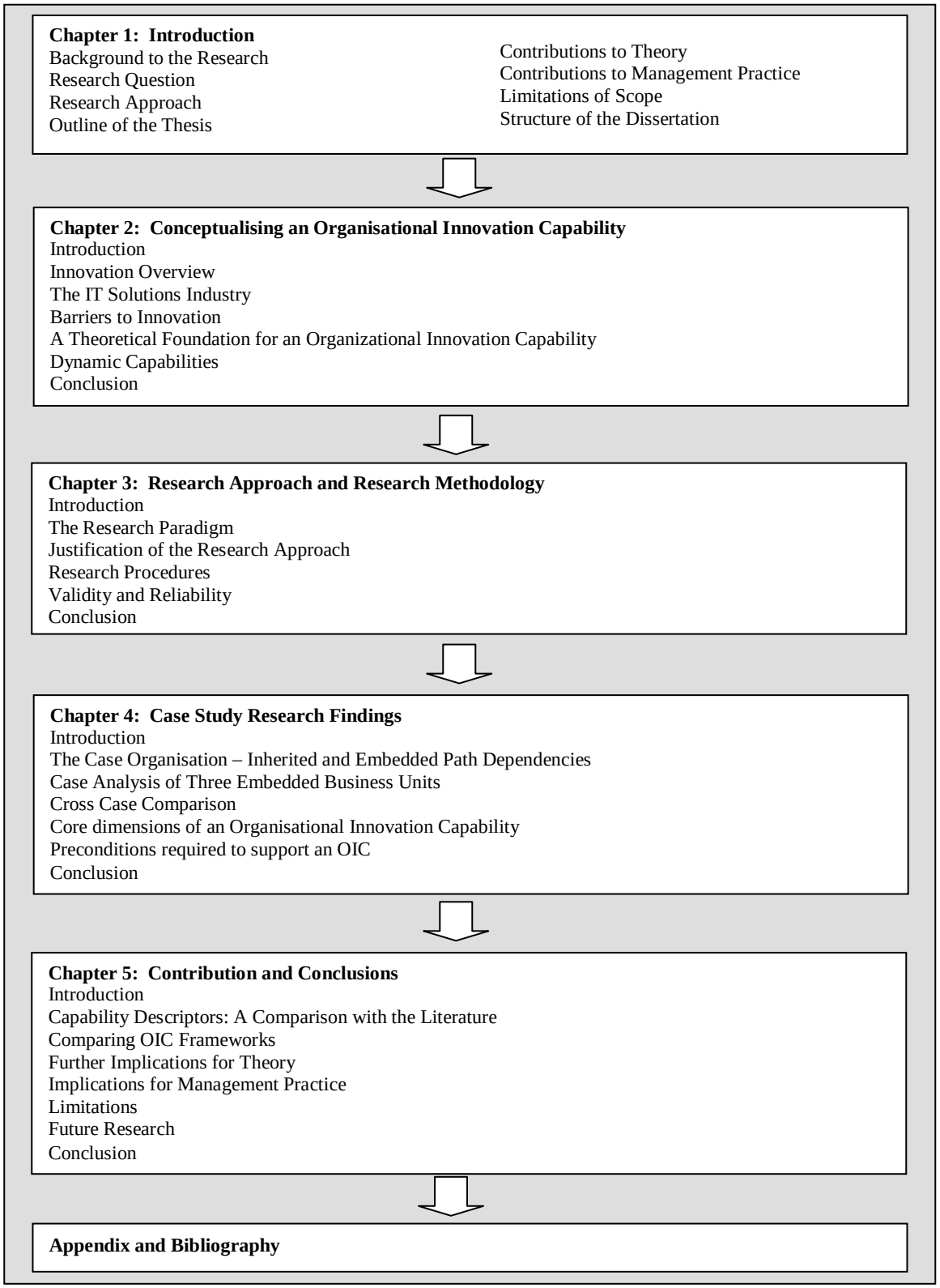


Figure 1.1 Outline of Thesis

1.6 Contributions to Theory

This research has opened the innovation "black box" and provided a capability framework which will provide guidance to strategic managers as they attempt to build, systematise and replicate an innovation capability within their organisations. The OIC framework which emerged from the case analysis answers the call to address the "abstract and intractable" nature of dynamic capabilities (Danneels 2008, p. 536) through detailed, micro mechanisms based on qualitative fieldwork to identify how a capability is deployed and how it works (Ambrosini and Bowman 2009, p. 37).

Through the analysis of the formation of an OIC in three embedded business units in the CO this research focused on understanding the complex world of contemporary experience from the point of view of its participants (Yin 2009, pp. 8, 11) and, in doing so, provided a closer, richer, thicker, more subjective view of idiosyncratic organisational innovation phenomena (McKelvey 2003, p. 6) beyond the common unit analysis of the firm. This higher order capability provides managers with the capacity to achieve competitive advantage by managing the component capabilities of the OIC framework, together with their linkages and interdependencies, to create new or augmented resources by transforming the firm's existing resource base.

In addition, while most of the elements of the strategic entrepreneurship precondition had been identified previously in the literature this research has brought them together for the first time and provided a framework for strategic entrepreneurship. In doing so, while supporting the innovation literature and the inclusion of each construct, it extends the current understanding of entrepreneurship by combining it with the intentionality and discipline of strategic management to complement the risk orientation inherent in entrepreneurship. The research has also extended the definition of innovation intensity from the internal focus to include external factors such as the firm's business model, strategic alliances and its ecosystem.

1.7 Contributions to Management Practice

The key contributions of this dissertation to management practice include the imperative for management to understand the nature of the firm's path dependencies

and their impact upon organisational change, the criticality of generative learning to challenging the status quo and the firm's mental models, and the accuracy of management's perceptions of the firm's environment and their impact upon innovation capability development. One other primary contribution is the emphasis upon coherency of the way the components are integrated and linked together to form the OIC as this coherency, rather than the components of the capability, may itself be the source of competitive advantage.

1.8 Limitations

This research, like all research, suffers from some limitations. Firstly, it has investigated a single CO with its own peculiar characteristics. Secondly, as the analysis is based upon data from one firm the ability to make inter-firm comparisons is limited. A third limitation is that the primary industry focus of the research was on IT solutions firms operating in the government high level security sector (GHLSS) with a limited focus on the commercial high level security sector CHLSS. Further, as the qualitative research was conducted over several months it did not provide opportunity to gain an understanding of the development of the OIC and the competitive advantage created over time. A final limitation may be the employment of the researcher by the CO. While this employment assisted in the research and facilitated access to interviewees and sensitive information, there is the possibility that the researcher's experience within the CO may have influenced the selection of interviewees or led to a less objective analysis of the cases.

1.9 Structure of the Dissertation

This introductory Chapter 1 has outlined the practice and theoretical background to the problem that motivated this dissertation. Subsequently, the research problem and the research approach selected to pursue this objective were described. The key contributions to theory and management practice were also identified.

In Chapter 2 a conceptualisation of the organisational innovation capability is presented. The Chapter begins by providing a brief overview of innovation and the IT solutions environment. It then describes organisational barriers to innovation

identified in the literature and builds a theoretical and conceptual framework to test the research question. The Chapter includes an overview of the extant dynamic capabilities research and the theoretical foundations upon which this framework is based. A dynamic capabilities framework was developed to guide an examination of an innovation capability to better understand how these capabilities work in practice and whether and how they might differ across firms (Ambrosini and Bowman 2009, p. 46).

The third chapter justifies and describes the research methodology used to address the research question posed in section 1.3. The research paradigm selected was identified together with the justification for the selection of the case study methodology as the research approach. The Chapter then continues with a description of the research procedures implemented including the case study selection and design, the data collection and analysis processes before concluding with a discussion regarding validity and reliability.

Chapter 4 provides an understanding of the case study data collected, identifies key themes and patterns in the data and describes the innovation capability dimensions in each case study. The Chapter begins with an introduction to the case organisation. Inherited path dependencies of the three embedded business units were examined to reveal how current innovation approaches emerged. The process of analysis involved building concepts from the data and seeking evidence to support linkages between those concepts. The data was interrogated to identify evidence that confirmed the presence of dimensions evident in the literature as contributing to an OIC and clarified the constructs that defined them. Evidence was then sought to support or reject the propositions generated from the innovation literature as well as the interrelationships between the dimensions. The data was examined to identify the presence of additional dimensions, interrelationships and constructs that were not evident in the literature.

A cross-case analysis was then conducted to highlight similarities and differences in approaches in the formation of an innovation capability within the three business

units and to inform the innovation dynamic capability frameworks which emerged from the data. This analysis enabled a case derived OIC to be developed comprising three preconditions – an organisational learning capability, strategic entrepreneurship and an alliance building capability – and four components - innovation infrastructure and OIC renewal, an innovation absorptive capacity, an innovation culture and organisational innovation intensity.

The fifth and concluding chapter provides a description of the core dimensions of the OIC derived from the research. The capability descriptors of the OIC are compared to the literature and the linkages between the components identified. The Chapter continues with an outline of the contributions of the research to innovation theory and management practice.

In summary, this research is part of the increasing momentum focused on understanding the "how" of dynamic capabilities (Helfat and Maritan 2007, p. 37). It has revealed management practice insights on how dynamic capabilities originate, how firms build and deploy an OIC and how distinctive processes support the creation, modification, reconfiguration and augmentation of firm resources to achieve competitive advantage. Most importantly, it has provided a theoretical framework for an OIC which can be applied in practice.

Chapter Two

Conceptualising an Organisational Innovation Capability

2.1 Introduction

Irrespective of the success or failure metrics employed or the industry studied, the literature is united in the view that innovation success rates are unacceptable (de Waal, Maritz and Shieh 2010; Cooper 1996, 1999; Connell et al., 2001; Hamel 2003). The continued failure of organisations to achieve innovation-based sustainable competitive advantage can be partially attributed to the focus of innovation research on technological innovation (Weerawardena 2003, p. 409). Where attempts have been made to open the innovation capability "black box" they have focused primarily on new product development (Pavlou and El Sawy 2006; Blum 2004; Verona and Ravasi 2003), specifically, processes related to new product development such as research and development (Macher and Mowery 2009; Blum 2005), and entrepreneurial venturing (Katzy et al., 2003).

This chapter builds a theoretical foundation and a conceptual framework to address the research question *"How can an Organisational Innovation Capability be conceptualised in an information technology solutions context, and what is the role of learning in organisational innovation capability renewal"*. The research of the innovation capability will not be confined to incremental or radical innovation as to do so would impinge upon the exploratory nature of the inquiry. It begins in sections 2.2 and 2.3 with an overview of innovation and the IT solutions industry respectively and then continues in section 2.4 with an analysis of the organisational barriers to innovation identified in the literature as these barriers have significant implications for firms seeking to build an innovation capability. Section 2.5 provides a theoretical foundation for an OIC. Initially, theory supporting the concept of capability renewal is introduced and conclusions drawn on how the notion of renewal might be

evidenced in an OIC. Next, prior research on components of an OIC were organised, analysed, synthesised and arguments presented regarding the key dimensions of a well balanced, highly performing OIC. To provide initial answers to the research question, an OIC framework derived from the innovation capability literature is depicted in section 2.6.1. The preconditions of the OIC are described in detail in section 2.6.2 with the construct of the OIC described in section 2.6.3.

The theoretical foundation is based on the dynamic capabilities framework which may enable a firm to effectively adapt to its changing environment and achieve competitive advantage Teece (2007). An OIC provides an explanation of a firm's ability to sustain its competitive advantage in terms of its ability to "integrate, build, and reconfigure" its innovation resources in response to dynamic environmental changes (Teece et al., 1997, p. 516). The key to achieving comparative and competitive advantage is to identify the elements of firm-specific innovation capabilities that can be sources of advantage, and to explain how combinations of competences and resources can be deployed and developed (ibid., p. 510). This "dynamic capability" approach, builds on the resource-based view of the firm (RBV) and evolutionary economics (Barney 2001a pp. 646, 647, Ambrosini and Bowman 2009, p. 29; Helfat et al., 2007, pp. 13-15; Teece 2000, p. 1105, Collis and Montgomery 1995, p. 119).

The RBV provided the foundation for developing a capability framework for the constant struggle to achieve "superior financial performance" (Hunt 1999, p. 153) in a "Schumpeterian world of innovation-based competition, price/performance rivalry, increasing returns, and the 'creative destruction' of existing competencies" (Teece et al., 1997, p. 509). While the dynamic capabilities approach has been applied to many disciplines, little research has been directed to developing a holistic OIC, both technological and non-technological (Lawson and Samson 2001, p. 388), notwithstanding that "at its core, a theory of dynamic capabilities is a theory of innovation" (Rodan 2002, p.152).

2.2 Innovation Overview

2.2.1 Introduction

While innovation is widely considered as "the lifeblood of corporate survival and growth" (Zahra and Covin 1994, p. 183) and "represents the core renewal process in any organisation" (Bessant et al., 2005, p. 1366), there are at least "60 definitions from different disciplinary traditions and paradigms" (Baregheh et al., 2009, p. 1325) as "(i)nnovation is studied in many disciplines and has been defined from different perspectives" (Damanpour and Schneider 2006, p. 216).

Joseph Schumpeter, regarded as the godfather of innovation (Tidd et al., 2005, p. 7), stressed the importance of innovation as a basis for achieving competitive advantage defining innovation as "the competition from the new commodity, the new technology, the new source of supply, the new type of organisation… competition…which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives" (1975, p. 84).

Newness is an underlying theme of most definitions of innovation (Schumpeter 1975, p. 84; Damanpour 1996, p. 694; Thompson 1965, p. 2). Damanpour's expansive definition of innovation has been selected by way of example:

> Innovation is conceived as a means of changing an organization, either as a response to changes in the external environment or as a pre-emptive action to influence the environment. Hence, innovation is here broadly defined to encompass a range of types, including new product or service, new process technology, new organization structure or administrative systems, or new plans or program pertaining to organization members (1996, p. 694).

As innovation is the specific tool of entrepreneurs and the means by which they exploit change, entrepreneurs need to search purposefully and intentionally for the sources of innovation, the changes and their symptoms that indicate opportunities for successful innovation to endow its resources with a new capacity to create wealth (Drucker 1985, pp. 17, 27). Bessant and Tidd argue that the forms of innovation can be reduced to four dimensions of change (2011, p.19). *Product innovation* focuses on changes in the products or services which an organisation offers whereas *process*

innovation changes in the way in which those products or services are created and delivered. By contrast, *position innovation* brings changes in the context in which the products or services are introduced while *paradigm innovation* changes the underlying mental models which frame what the organisation does. Another dimension is the degree of novelty involved in the innovation with novelty extending along a continuum from incremental to radical change. Change is possible at component or sub-system level or across the whole system (ibid., p. 22).

2.2.2 The Innovation Process

Innovation is a core business process associated with survival and growth (Tidd et al., 2005, p. 67). Eveleens' research found 12 innovation process models in management literature, policy papers as well as scientific handbooks with the general tendency for the models becoming, over time, "more complex, more interdisciplinary, more integrated and more connected with their surroundings" (2010, pp. 5, 6). Three of the models developed during the period 1962 to 1994 remain in use, while the rest were published from 1999 onwards. This analysis concluded that most of the innovation process models were largely "based on (1) radical (2) products and processes in the (3) private sector (Cooper and Kleinschmidt 1986; Cormican and O Sullivan 2004; Verloop 2004; Andrew and Sirkin 2006)" but "other types of innovations (incremental and/or services) (were) considered as well (Tidd and Bessant 2005; Jacobs and Snijder 2008)" although with less attention (ibid., p. 6).

All of the models identified by Eveleens included "certain phases, stages, components, building blocks, or main activities" with an implied or explicit order in these phases, though not necessarily linear (ibid., p. 7). For instance, Hansen and Birkinshaw's model "presents innovation as a sequential, three-phase process that involves idea generation, idea development, and the diffusion of developed concepts" (2007, p. 122). Researchers continue to debate the linearity of the innovation process phases (Eveleens 2010, p. 7; Rosing 2011, p. 6). Those supporting linearity argue that later phases are built on the phases which logically precede them in the linear succession with a superior innovation outcome being achieved if the ideal sequence of events can be followed. By contrast, the opposing view argues that innovation

processes are complex, non-linear and interdependent with deviation from the "neat and linear succession of phases" as the "different activities underlying innovation processes such as idea generation and the implementation of ideas…(are) relevant throughout the whole innovation process and not only during certain time frames within the process" (Rosing 2011, p. 6).

The importance of these innovation process models is that they focus management's attention on the need "to take an end-to-end view of their innovation efforts" and on strengthening their weak links (Hansen and Birkinshaw 2007, p. 122, 125). However, the need to go beyond innovation as a process was stressed by Drucker where he argues that what most organisations have failed to recognise is that "the very foundation of entrepreneurship is the practice of systematic innovation" (Drucker 2002, p. 102).

2.2.3 Open Innovation

One major trend in regard to ideation has been the transition from closed to open innovation (Chesbrough 2003). In the old model of closed innovation firms believed that successful innovation required control so "companies must generate their own ideas that they would then develop, manufacture, market, distribute and service themselves" (ibid., p. 36).

With the growing availability of private venture capital, the increased number and mobility of knowledge workers and the consequent difficulty for companies to control their proprietary ideas and expertise, came a move toward the end of the 20th century to open innovation and the breaking down or increasing permeability of traditional corporate boundaries. With the increased openness came the recognition that "a single organisation cannot innovate in isolation" (Dahlandera and Gann 2010, p. 699).

Open innovation facilitates the flow of intellectual property, ideas and people into and out of a firm. While much of the focus has been on outside-in open innovation attention also needs to be directed to inside-out open innovation where a firm places

some of its assets or projects outside its firm boundaries (Chesbrough and Garman 2009, p. 70). With this new model of open innovation, firms commercialise ideas from both internal and external sources with the knowledge from one source complemented by that of the other, thereby increasing the robustness of the idea screening process. Through open innovation firms can commercialise internal ideas through licensing agreements or channels outside of their current businesses, such as companies (which might be financed and staffed with some of the company's own personnel), in order to generate value for the organisation. This approach means that "the boundary between a firm and its surrounding environment is more porous, enabling innovation to move easily between the two" (ibid., pp. 36, 37).

2.3 The IT Solutions Industry

Information technology (IT) solutions and information systems (IS) disciplines have been transformed from the traditional "back office" orientation of administrative support towards a more strategic role within a firm where it cannot only support the business strategies but also define new strategies (Henderson and Venkatraman 1993, p. 4). The continued evolution has led to the convergence of information and communication technology design, execution, storage, transmission and reusable knowledge has created new opportunities (Demirkan et al., 2008, p. 356).

With the increasing focus on service orientation (ibid.), the IT solutions industry is characterised by the "fast pace of technological change, which leads to the rapid introduction of new products, presents unique challenges to incumbent firms in the IT industry" where "the cost of entry is usually low and startups with intellectual capital can emerge as industry leaders in a short time (for example, Cisco and Google)" (Banker et al., date unknown, p. 2). These start ups target the "flaws or blind spots result from a company's mistaken or incomplete view of its industry and competition, the poor design of the competitive analysis system, inaccurate managerial perceptions, or ineffective organizational processes" (Zahra and Chaples 1993, p. 9).

In addition to the rapid changes taking place in technology "the complex and imposing challenges associated with IT management, development, and use demand interdisciplinary approaches to their resolution" (Benbasat and Zmud 2003, p. 185).

2.4 Barriers to Innovation

2.4.1 Introduction

Cooper argued that there has been little improvement in the success rate as innovation actors "seem to fall into the same traps that their predecessors did back in the 1970's" (Cooper 1999, p. 2). These views are supported by a recent Accenture Survey (2008) of 601 senior executives from companies with annual turnover in excess of US$750m per annum which were pursuing business strategies that depend on a stream of innovation. The Survey indicated that only 41% were fully satisfied with how their firms pursued innovation; only 15% were very satisfied with the conversion rate of ideas to new service offerings and 13% considered that the innovations were repeatable. Most organisations appear poorly equipped to implement a radical innovation strategy as they are "genetically programmed to preserve the status quo" (Stringer 2000, p. 71) or are constrained by experience or their myopic management (Braganza et al., 2009, pp. 49, 51). While organisations sense the changing nature of the world, they focus on incremental innovation as they have too much invested in the status quo to embrace radical innovation. Even when innovation occurs, there is generally a focus on acquiring a new product, than acquiring a new capability (Stringer 2000, pp. 72, 80).

The question that must be raised is "Why is the success rate for new product development and innovation so low particularly when numerous success/failure criteria have been identified in the academic literature?" The lack of improvement in the innovation success rate is puzzling since a myriad of critical success factor lists and innovation killers have been published (Crossan and Apaydin 2010; Rothwell et al., 1974; Cooper 1980, 1996, 1998, 1999, 2004; Cooper and Kleinschmidt 2007; Wycoff 2003; Connell, Edgar et al., 2001).

Organisational barriers to innovation have been identified by many authors (Braganza et al., 2009, p. 46; Sapsed et al., 2007; Petersen 2010; Christensen et al., 2008; Baker and Sinkula 2002; Leonard 1998; Senge 1990) with Leonard concluding that an organisation's strengths or capabilities are simultaneously also its weaknesses which manifest themselves in organisational rigidities (1998, p. 30). In the same way that an organisation's culture is difficult to articulate, the impediments to innovation may be equally as subtle particularly as core capabilities and rigidities are built through the same activities (Fastabend and Simpson 2004, p. 5; Leonard 1998, p. 30). While a classification of innovation barriers has been developed (Sapsed et al., 2007), the key innovation barriers are institutional and relate to belief systems, information and behaviour as well as path dependency barriers and organisational inertial tendencies.

2.4.2 Belief System Barriers

Belief system barriers are based on the gap between an organisation's real (theories in use) and perceived (espoused) reality with radical innovation potential decreasing with a widening gap (Baker and Sinkula 2002, p. 15; Argyris and Schon 1996, p. 13). Typically, organisations with high belief system barriers have flawed mental models and limit their behaviours and actions to the options and alternatives which are consistent with their existing mental models and theories-in-use.

Belief system barriers frequently manifest themselves by omitting key activities in the new product process such as the nature and scope of market research (Cooper 1999, p. 16). A highly technical cognitive belief system may lead to "a bias towards placing disproportionate weight on hard evidence (i.e. tangible and visible factors)" leading to an undue emphasis on a product's technical features (Han, Kim and Srivastava 1998, p. 30).

Orlikowski and Gash provide an alternative and supportive view of belief system barriers. They call the organisational "biases and limitations" frames and argue that they can have "both facilitating and constraining effects" (Orlikowski and Gash 1994, p. 176). In commenting on the risks in promoting emerging technologies, Day and

Schoemaker warn about “the biases and limitations of people’s thinking frameworks” as limiting organisational vision and effective implementation (2000, p. 6).

Frames are valuable when they “structure organisational experience, allow interpretation of ambiguous situations” and so “reduce uncertainty in conditions of complexity and change, and provide a basis for taking action” (Orlikowski and Gash 1994, p. 176). But, in an echo of the Day and Schoemaker warning, Orlikowski and Gash contend that “frames are constraining when they reinforce unreflective reliance on established assumptions and knowledge, distort information to make it fit existing cognitive structures, and inhibit creative problem solving” by creating “psychic prisons” that inhibit learning because people are unable to see old problems in a new light (Orlikowski and Gash 1994, p. 177; Bolman and Deal 1997, p. 5).

Belief system barriers are also evident in the fundamental assumptions made by management in relation to the implementation of the managerial functional disciplines (Argyris 1999, p. 55). Embedded in these managerial disciplines is the micro-causal theory of implementation; a theory based on the assumption that intended consequences follow from prescriptive roles and enablers. With effective coaching, employees can achieve the required skill levels. Ineffective performance can be eliminated as it can be traced to errors and mismatches with the result that actions become automatic, routine, and therefore, manageable (Argyris 1999, pp. 55, 56). These beliefs are deeply entrenched within organisation as they are largely tacit (Senge 1990, p. 12).

2.4.3 Information Barriers

Information barriers manifest themselves in “the propensity for managers to dismiss information and knowledge inconsistent with their current view of the world, their trusted mental models and theories-in-use believing that these are the outcome of rational analyses and successful experiences” (Baker and Sinkula 2002, p. 17). External knowledge is subject to a screening process biased towards familiar and existing knowledge types (Leonard 1998, p. 40; Braganza 2009, p. 49) or limited to established and local search locations (Sapsed 2007, p. 5).

Another information barrier is the "liability of success" which invests individual with "special interests in the status quo" and a propensity for risk averseness (playing the game "not to lose" rather than to win) (Sinkula 2002, p. 256; Lawler and Galbraith 1994, p. 7; Braganza 2009, p. 49). The repeated success leads the organisation to "the presumed correctness of past actions and interpretations" resulting in complacency and the rejection of information that conflicts with conventional wisdom (Day, 1994, p. 24). Similarly, the success of an established business model can limit the information that gets fed into or filtered out of the corporate decision making process so that firms may forgo valuable business opportunities (Chesbrough 2010, p. 358).

2.4.4 Behavioural Barriers

Organisational behavioural barriers include the failure to change behaviour even though disconfirming evidence or insight into the inadequacy of managerial mental models or theories-in-use is received (Baker and Sinkula 2002, p. 17; Pontiskoski and Asakawa 2010, p. 28; Braganza 2009, p. 51), as well as behaviours imposed by or entrenched in organisational routines (Van der Panne, van Beers and Kleinknecht 2003, p. 314).

Organisational defensive routines, while intended for individual and organisational survival, promote behaviour that is counterproductive to innovation and to learning (Argyris 1999, p. 56). Defensive routines are individual or organisational threat or embarrassment minimisation or prevention strategies. They have the effect of inhibiting the identification of or reducing the cause of the embarrassment or threat (Argyris 1999, p. 56). These counterproductive routines promote behaviours that cover up errors and a culture of inflexibility, which in turn inhibits effective organisational performance. They also promote a culture where failure is unacceptable and errors cannot be discussed without blame or criticism as "defensive reasoning prohibits questioning the defensive reasoning" (Argyris 1999, pp. 56, 57). Behaviours which are inconsistent with an innovation orientation such as failure to take responsibility, and suppressing negative emotions and feelings, especially those associated with embarrassment or threat, become the predominant organisational

logic (Argyris 1999, p. 57). The result is that belief system and information barriers are maintained and entrenched with the self-fuelling process maintaining the status quo and inhibiting genuine learning (Argyris 1999, p. 57).

Behavioural barriers are relevant to the IT solutions context. The nature of software development is such that, in the absence of firm-wide disciplined and institutionalised practices, software teams and developers often turn to ad hoc and a multiplicity of individual and non standard practices in the software development process (Ethiraj et al., 2005, p. 34).

2.4.5 Path Dependency Barriers

The organisation's historic legacy can intrude on the present and shape its future as the future is implicitly assumed to look much like the present, so that experimentation addresses doing what the organisation does now, better – not differently (Leonard 1995, p. 35). A firm's historical legacy is associated with deep seated and embedded values which impact the accumulation of capabilities so that "to perhaps a surprising degree, many companies that appear to have evolved over time still have deep roots in their technological origins" (Leonard 1998, p. 26).

An organisation's resources also can also be a path dependency barrier. As Penrose noted "the services that resources will yield depend on the capacities of the men using them, but the development of the capacities of men is partly shaped by the resources men deal with. The two create the special productive opportunity of a particular firm" (2009, p. 70).

The firm's congenital knowledge, knowledge held at its birth (Sinkula 1994, p. 38), determines "what it searches for, what it experiences and how it interprets what it encounters" (Huber 1991, p. 91) with a heavy bias toward the types of knowledge already known to feed core capabilities (Leonard 1998, p. 40). This results in limited experimentation as newly acquired knowledge flow along well-worn paths. If allowed to continue "unchecked and unexamined…predilections towards core capabilities can choke off enriching knowledge from unexpected sources" (Leonard

1998, pp. 39, 40). These limitations are often reinforced by the associated cognitive preference. An organisation's cognitive orientation will frequently lead to the implementation of the comfortable clone syndrome in which employees are hired based on their conformance to organisational cognitive thinking styles and the similarity of their interests and training (Leonard and Straus 1997, p. 112). These preferences work as cognitive filters to the information sought and received so that unfamiliar information is rejected (ibid.) with the consequence that information barriers are formed and entrenched.

Another critical consequence of path dependency is its impact on learning with Sinkula warning emphatically that "past learning inhibits new learning" (2002, p. 256). Prior knowledge determines an organisation's ability to recognise the value of new information, to learn from that new knowledge and to exploit it (Cohen and Levinthal 1990, p. 128) as well as its ability to learn and the quantum of such learning (Zack 1999, p. 28).

Path dependency also manifests itself in thought precluding innovative problem solving activities where "functional fixedness" – i.e. the tendency for people to be quite fixed in their perception of how objects could be used once that use was suggested - limits search patterns to prior experience and successes (Leonard 1998, p. 61). As organisations develop excellence in one knowledge domain, it becomes relatively unreceptive to ideas from others (Leonard 1998, p. 59). Functional fixedness mind-sets arise from "the brain's tendency to store, process, and retrieve information in related blocks" with these blocks constituting the mental models, or schema, against which information is calibrated and that used to solve problems. While mind-sets are highly useful in routine activities, the limited range of problem-solving responses developed can transform capabilities into dysfunctional and core rigidities (Leonard 1998, pp. 61, 62).

2.4.6 Organisational Inertial Tendencies

Mature organisations have a tendency to maintain the status quo rather than challenge it or the assumptions upon which it is based as "many pressures conspire to keep

managers internally focused and comfortable with the status quo long after disquieting signs should have made them edgy" (Braganza et al., 2009, p. 46; Leonard 1998, p. 31). Organisational learning from history is seen as "a faulty mechanism" (Edmonson and Moingeon 1998, p. 8) as it involves "encoding inferences from history into routines that guide behaviour" (Levitt and March, 1988, p. 320). The mechanism is faulty as the encapsulated routines make the lessons, but not the history, accessible to individuals and organisations that have not experienced the history (Levitt and March, 1988, p. 320). In this way organisational routines, in which "action stems from a logic of appropriateness or legitimacy, more than from a logic of consequentiality or intention" (Levitt and March, 1988, p. 320), are "thus over-learned, such that actors are more habit driven and imitative than rational" (Edmonson and Moingeon 1998, p. 8; see also Pontiskoski and Asakawa 2010, p. 28).

Organisational routines thus create organisations that have self-perpetuating processes that maintain the status quo by limiting genuine learning, and reinforcing the deception (Argyris 1999, p. 57). Organisational inertia becomes institutionalised through the often unintended, implementation of belief, information and behavioural barriers. For instance, Levitt and March assert that organisational routines and beliefs are changed through direct experience in regard to trial and error experimentation and organisational search (1988, p. 321). In relation to the latter, an organisation may limit the range of its alternatives to resolving a problem or issue due to the experiences that they have accumulated with known routines (belief or information barrier) or fall into a competency trap where routines are regarded as rigid notwithstanding that organisational learning may have taken place in the application of a routine (Levitt and March 1988, pp. 321, 322).

Prior investment choices are also a barrier to organisational innovation. Where high technology products are involved, such as hardware and software, the investment is often in systems with strong functional interdependence among components of the system. Accordingly, from both the point of view of the innovative firm and the prospective customer, there are path dependency barriers as well as a high tendency

for inertia because of investments made previously (Teece 2007, p. 1332; Duncan 1995, p. 38).

2.4.7 Conclusion

The barriers to innovation referred to in this section have significant implications for organisations seeking to develop an innovation capability. In particular, an organisation needs to be aware that its strengths and capabilities can simultaneously be its weaknesses, and accordingly, that core capabilities can become core rigidities in the absence of dynamism in the maintenance, development and continuous enhancement of that capability. It is critical for any firm which wishes to develop an innovation capability to be aware of the innovation barriers within its organisation and to takes steps to ensure that strategies are implemented to minimise or eliminate the negative impacts of the identified barriers and path dependencies upon innovation.

In order to overcome the persistent and often entrenched barriers to innovation firms need to intervene to overcome these innovation inhibitors (Petersen 2010; Braganza et al., 2009, p. 52; Sapsed et al., 2007). The importance of preconditions to the innovation capability will be addressed in section 2.6.2.1.

2.5 A Theoretical Foundation for an Organisational Innovation Capability

2.5.1 The Resource–based View of the Firm

The invisibility of critical success factors and the low innovation success rate (Cooper 1999, pp. 2, 8, 9) requires the development of an organisational competency to bring about innovation as a result of intended action such that "the outcome bears a definite resemblance to what was intended" (Dosi et al., 2000, p. 2). Some argue that the market for valuable strategic resources and competencies is efficient and that over time no real profits exist except in rare circumstances where information asymmetry occurs (Rodan 2002, p.152; Lockett et al., 2009, p. 11). An alternative, and more compelling argument, is that as valuable organisational resources can rarely be acquired, they must be *built* inside the firm with the process sometimes taking years

or even decades (Rodan 2002, p.152; Teece 2007, p. 1338; Teece et al., 1997, p. 528; Spender 1996, p. 46). For instance, Teece et al. are emphatic in their view that the "soft" constituent elements of competencies and capabilities such as "values, culture and organisational experience" cannot be traded or acquired.

The RBV of the firm is an influential theoretical framework for planning and achieving firm-level sustainable competitive advantage (Teece 2000, p. 1105; Collis and Montgomery 1995, p. 119) and understanding the evolution of firm resource stock over time and the impact of the evolution of competitive advantage (Ambrosini and Bowman 2009, p. 29). Accordingly, it provides the foundation for development of a capability framework for achieving "superior financial performance" (Hunt 1999, p. 153) in a "Schumpeterian world of innovation-based competition, price/performance rivalry, increasing returns, and the 'creative destruction' of existing competencies" (Teece et al., 1997, p. 509).

Barney was first to challenge the two Porterian assumptions - firm homogeneity in terms of resources and strategy, and temporal resource advantage – and substituted firm resource heterogeneity (i.e. asymmetric distribution of resources among competing firms) and immobility (i.e. not readily available in the factor markets), and the sustainability of the heterogeneity of its resources (1991, p. 101; Hunt 1999, p. 149) in their stead. Under the RBV, firms now focused on their own internal resources and competencies to supplement the Porter-led external focus on industry structure and the search for a favourable competitive position within that structure (Porter 1985, p. 1).

Barney defined a firm's resources to include "all assets, capabilities, organisational processes, firm attributes, information (and) knowledge controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (1991, p. 101). These "resources are firm-specific assets that are difficult, if not impossible, to imitate" (Teece et al., 1997, p. 516). Therefore, if resources are valuable, rare, inimitable, durable, and difficult to substitute (Barney 1995, Collis and Montgomery 1995, pp. 120-123) then sustainable competitive

advantage can be achieved through value-creating strategies (Barney 1991, p. 102). Teece et al. extended the RBV generally and also specifically to "rapidly changing environments" (1997, p. 516; see also Ambrosini and Bowman 2009, p. 31) and explained the firm's ability to sustain its competitive advantage in terms of its dynamic capabilities – its ability to "integrate, build, and reconfigure" its resources in response to dynamic environmental changes (1997, p. 516; see also Ambrosini et al., 2009, p. S9).

Based on Bharadwaj, typical key resources within the IT solutions context include (1) tangible resources such as the hardware and software IT infrastructure components, (2) the human IT resources comprising the technical (programming, systems analysis and design in emerging technologies), managerial and project management IT solutions skills (including abilities such as the effective management of IS functions, coordination and interaction with the user community, and project management and leadership skills), and (3) the intangible idiosyncratic IT-enabled resources such as intellectual capital or knowledge assets, customer orientation, and synergy (2000, pp. 171173[2]; see also Benbasat 2003, p. 186) The tangible resources provide the delivery platform to enable information to be seamlessly and automatically shared across systems and services.

Strong human IT resources (technical and managerial IT skills, employees culture of change and adaptability, empowering human resource structures) are critical for the effective integration and alignment of the IT and business planning functions as the absence of an integrated IT infrastructure severely restricts an organisation's business choices. These human IT resources, when viewed from a resource-based perspective, are difficult to acquire and complex to imitate, thereby serving as sources of competitive advantage (ibid., pp. 172-174).

[2] While this comment was made in relation to the development of an IT capability within a firm rather than the supply of IT solutions to another firm, it is submitted that a services firm must have those IT resources before it supply those services to another firm.

2.5.2 The Resource-based View and Evolutionary Economics

With economic reward being transitory due to the propensity for competitors to imitate successful innovation, Schumpeter bypassed static economic theories and postulated that an evolutionary economic system would have within it the seeds for positive adjustment and change otherwise it could not evolve (Matthews 2003, p. 4). To Schumpeter, the fundamental source of organisational variation was in the entrepreneurial recombination of factors, resulting in new applications of existing processes or business models to new areas of application, rather than their innovation at first instance (ibid., p. 8).

Barney's positioning of RBV in evolutionary economics facilitates the development of arguments in respect of the way organisational routines and capabilities change over time (Barney 2001a, pp. 646, 647). He observed that routines are part of the firm's resources and capabilities and it is the "most efficient and effective routines, which generate competitive advantage" (Barney 2001, p. 646). Routines contribute to sustainable competitive advantage by the creation of new resource sets through reconfiguring, transforming and recombining assets and resources, leveraging existing resources such as business models, processes or systems in other parts of the business, learning through experimentation to improve efficiency and effectiveness of the operations and processes, and the creative integration of resources (Ambrosini and Bowman 2009, p. 35).

2.5.3 The Resource Advantage Theory of Competition

The RBV has provided a foundation for the Resource-Advantage Theory (RA Theory) postulated by Hunt and Morgan (1995, 1997, 1999). Under this evolving theory which describes the evolutionary, disequilibrium-provoking process of competition (Hunt 2011, p. 11), the firm's objective is to attain superior financial performance by combining and exploiting its resources to achieve a position of comparative advantage in a market or a segment of a market (1995, p. 6). In so doing, the firm's internal capabilities ("what it does well') are linked with the environment in which it competes ("what the market demands and what competitor's offer") (Collis and Montgomery 1995, p. 120). While many other competition

theories are rooted in one discipline, the RA Theory is an interdisciplinary dynamic, process theory of competition that has been developed in various disciplines including marketing, management, economics, general business and ethics (Hunt and Arnett 2003, p. 1). In addition, it has affinities with other theories including evolutionary economics, 'Austrian' economics, industrial-organisation theory, and the resource- and competence-based traditions (Hunt and David 2008, p. 12; Hunt 2011, p. 9).

The key to achieving comparative and, therefore, competitive advantage is to "identify the dimensions of firm-specific capabilities that can be sources of advantage, and to explain how combinations of competences and resources can be deployed and developed" (Teece et al., 1997, p. 510). This dynamic capability approach, builds on the RBV of the firm and evolutionary economics by *linking* the *dynamic* (the ability to renew competencies in response to rapidly changing business environments) with *capabilities* (the strategic management role bringing congruence to the dynamic environment) (ibid., p. 515). It is this linking which provides the context for resources and the active integration, construction and reconfiguration of those resources within a dynamic environment which enables firms to achieve market positions of comparative and/or competitive advantage through increases in efficiency and effectiveness.

The RA Theory provides the theoretical framework for the firm's constant struggle for comparative advantages in resources that will yield marketplace positions of competitive advantage and, thereby, superior financial performance (Hunt 2011, p. 11). The competition is among firms within a market segment to achieve comparative advantage from their unique resource mix (Hunt 1997, p. 60). Accordingly, the competitive process yields "numerous, vigorous, ongoing, disequilibrating struggles among firms for comparative advantages in resources" (Hunt 1999, p. 153), and it is this disequilibria which is the driver for reactive and proactive innovation and thus increased efficiency/effectiveness (Hunt and Morgan 1999, p. 149). The firm achieves its competitive advantage objective if it creates comparative value, i.e. more customer value than its competitors at either the same or

a lower cost, or it creates the same value as its competitors at a lower cost (Hunt 1999, pp.149, 154).

While reactive innovation arises from a rival firm's realisation that it is producing inefficiently/ineffectively, *proactive innovation* is "not prompted by specific competitive pressures as is genuinely entrepreneurial in the classic sense of *entrepreneur*" (Hunt 2011, p. 11). While the advantaged firm already has a competitive advantage, the entrepreneurship is driven by the firm's desire to increase the efficiency-effectiveness gap between it and its rivals, and so, increase its competitive advantage. Accordingly, proactive innovation is the product of "renewal competencies" which move the firm to new levels of competitive advantage (Hunt 1999, p. 154). These competencies enable the firm to "(1) anticipate potential market segments (unmet, changing, and/or new needs, wants, and desires); (2) envision market offerings that might be attractive to such segments; and (3) foresee the need to acquire, to develop, or to create the required resources, including particular competences, to produce the envisioned market offerings" (Hunt 1999, p. 154). Thus, learning and innovation are endogenous to the RA Theory as they arise directly out of the process of competition (Hunt 1997, p. 60, 1999, p. 153; Hunt and Davis 2008, p. 12).

One of the key achievements of the RA Theory is the consolidation of the expanded view of what constitutes a resource and the relevance of that definition for a market-based economy (Hunt and Morgan 1995, p. 8). The view now encompasses both tangible and intangible resources which are available to the firm and which enable it to "produce efficiently and/or effectively a market offering that has some value for some market segment(s)" (Hunt 2011, p. 14).

While the tangible resources are well understood and documented, the intangible, "higher order resources" (Hunt and Morgan 1995, p. 12) require consideration as it is often these which are most difficult to imitate (Barney 1995, p. 53), to neutralise or create causal ambiguity to either the resource owner or its competitors (Hunt and Davis 2008, p. 18). For instance, in regard to a superior product offering, there could

be significant ambiguity as to which of the firm's resources are being used to produce the desired attribute (Hunt and Morgan 1995, p. 12) or the mix of those resources.

Each firm has a unique mix of resources due to the heterogeneity of resources and their imperfect mobility (Hunt and Morgan 1995, p. 7). If a resource or the resource mix is sufficiently rare then it may produce competitive advantage for the firm (Hunt and Morgan 1995, p. 7). The key is for the firm to create idiosyncratic resources – those which are "relatively immobile (difficult to buy in the factor markets), inimitable (difficult to copy or duplicate), nonsubstitutable (difficult to find or create functional equivalents for), and nonsurpassable (difficult to find or create functional superiors for)" (Hunt 1999, p. 152). The key attributes which facilitate the identification and production of idiosyncratic resources are tacitness, causal ambiguity, social or technological complexity, interconnectedness, mass efficiencies, and time compression diseconomies so that they are less likely to be quickly and effectively neutralised and more likely to produce a sustainable competitive advantage (Hunt 1999, p. 152; Hunt and Davis 2008, p. 16).

2.5.4 Corporate Entrepreneurship

Corporate entrepreneurship has been growing in increasing importance as "entrepreneurial strategies suggest ways to revitalise existing organisations and make them more innovative" (Cooper, Markman, and Niss 2000, p. 116). Research in entrepreneurship endeavours to find answers to questions such as, "(1) why, when, and how opportunities for the creation of goods and services come into existence; (2) why, when, and how some people and not others discover and exploit these opportunities; and (3) why, when, and how different modes of action are used to exploit entrepreneurial opportunities" (Shane and Venkataraman 2000, p. 218).

To possess a corporate entrepreneurship strategy, firms must, through "consistency in approach and regularity in behaviour" (Ireland et al., 2009, p. 37), "*significantly* display the three foundational elements of an entrepreneurial strategic vision, a pro-entrepreneurship organizational architecture, and entrepreneurial processes and behavior as exhibited throughout the organization. The absence or weakness of any

of these elements would indicate that a corporate entrepreneurship strategy does not exist in a firm" as to operate effectively as a strategy it must "run deep" within the organisation (ibid., p. 38). Corporate entrepreneurship has been described by Morris et al., (2008, p. 81) as being comprised of corporate venturing and strategic entrepreneurship and their characterisation is depicted in Figure 2.1 below.

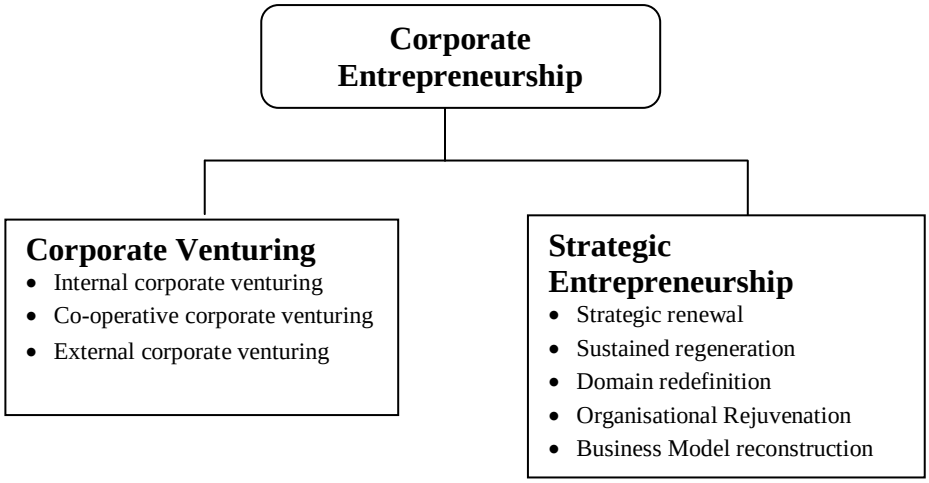


Figure 2.1 Corporate Entrepreneurship Framework

The focus of corporate venturing is the addition of new businesses either internal or external to the firm or in partnership with one or more other entities. By contrast, strategic entrepreneurship exhibits "large-scale or highly consequential innovations that are adopted in the firm's pursuit of competitive advantage" (Kurato 2007, pp. 6, 7). Ireland et al. described entrepreneurship is terms of opportunity seeking so that strategic entrepreneurship, the integration of the mutually supportive disciplines of strategic management and entrepreneurship, is the combination and synthesis of opportunity-seeking and advantage-seeking behaviour (2003, pp. 964, 966).

2.6 Dynamic Capabilities

The concept of dynamic capabilities, while still in its infancy and focused on foundational level issues (Helfat and Peteraf 2009, p. 92), is an influential framework which has enabled strategic managers competing in a Schumpeterian world of innovation-based competition to analyse and operationalise the organisational resources and methods of effective wealth creation (Teece et al., 1997, p. 509; Teece

2007; Ambrosini and Bowman 2009). This paper argues for the development of an organisational innovation capability. The dynamic capabilities approach provides a theoretical framework for examining how a firm can integrate, adapt and reconfigure its endowed assets and resources to create "renewal capabilities" which lead to comparative and/or competitive advantage and "superior financial performance" in a market or a segment of a market (Teece 2007; Hunt and Morgan 1995, p. 6). Utilising this theoretical framework, this research provides a definitional context for evaluating key organisational capabilities that directly impact an organisation's drive towards consistent and effective innovation in a rapidly changing environment.

With the continuing development of the dynamic capabilities concept, the definition of dynamic capabilities has itself evolved through incremental improvements. Teece et al. defined dynamic capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (1997, p. 516). While Eisenhardt and Martin's definition of dynamic capabilities is largely consistent with this definition, they extend the dynamism concept of Teece et al. (1997) beyond achieving environmental congruence to capabilities which produce value-creating market and ecosystem change as markets emerge, collide, split, evolve and die (2000, p. 1107; see also Teece 2007, p. 1341). In addition, Eisenhardt and Martin do not limit dynamic capabilities to a firm's functional environment as they extend their definition to include "alliance and acquisition routines that bring new resources into the firm from *external* sources" (2000, p. 1108, emphasis added).

Helfat et al. define dynamic capability as "the capacity of an organisation to purposefully create, extend, and modify its resource base" which includes its "tangible, intangible, and human assets (or resources) as well as capabilities which the organisation owns, controls or has access to on a preferential basis" (2007, p. 4). Following Ambrosini et al. (2009, pp. S10, S11), the Helfat definition has been adopted as it provides a synthesis of prior definitions and makes explicit the need for a minimal degree of intentionality (Helfat and Peteraf, 2009, pp. 94, 95).

In identifying organisational dynamic capabilities it is first necessary to identify "the foundations upon which distinctive and difficult-to-replicate advantages can be built, maintained and enhanced" (Teece et al., 1997, p. 516). Three classes of factors that help determine the way *in* which the firm's distinctive competencies and dynamic capabilities evolve were identified (ibid., pp. 518-524; Ambrosini and Bowman 2009, pp. 39, 40).

Processes

Processes include organisational and managerial firm-specific routines relating *firstly*, to co-ordination and integration of organisational activity such as recognising the congruencies and complementarities among processes, and between processes and incentives; *secondly*, to learning as a process by which repetition and experimentation enable tasks to be performed better and quicker both on an individual and organisational level which in turn result in newer and improved routines; and *thirdly*, to the reconfiguration of the organisation's assets and structures in response to or anticipation of changing markets and technologies.

Positions

The organisation's legacy of assets includes its technology and complementary assets, its difficult-to-trade knowledge assets and assets complementary to them, its organisational structure, internal linkages and its financial assets. These factors also include the firm's management, their ability to sense changes in their competitive environment and to reconfigure assets to meet the changing environment. Another related internal factor is the management's perception of the environmental change and the accuracy of those perceptions.

In addition to the internal position, its external position "refers to the firm *vis-à-vis* its institutional environment and its markets" (Ambrosini and Bowman 2009, p. 39). Together with the paths a firm has travelled, positions enable or constrain dynamic capabilities (ibid.).

Path Dependencies

An organisation's strategic direction is a function of both its current position and the paths available to it, with the former being shaped by the path it has traveled and its previous investments. The firm's history and its strategic choices constrain its future behaviour and reinforce the propensity of learning to be close to previous activities (Teece et al., 1997, p. 522). Similarly, according to Eisenhardt and Martin, path dependencies are more accurately described in terms of learning mechanisms which guide the evolution of dynamic capabilities (2000, p. 1114). Consequently, path dependency "not only defines what choices are open to the firm…but puts bounds around what its internal repertoire is likely to be in the future (Teece et al., 1997, p. 515). However, while path dependencies constrain strategic options "the business enterprise is not necessarily trapped by its paths" (Teece 2007, p. 1341).

Fundamental to capability development is the concept of organisational routines. Routines are "the building blocks of capabilities" and represent successful solutions to particular problems (Dosi et al., 2000, p. 4; Teece et al., 1997, p. 520). The managerial and organisational processes are embedded within the firm in its routines, patterns of current practice and learning, such as the way information is gathered and processed and encompass both individual and collective interaction, learning and knowledge generation (Teece 1997, pp. 518-520). These routines, "whether deliberately organised or spontaneously evolved, structure activities, processes and information" (Van der Panne, van Beers and Kleinknecht 2003, p. 313). Routines contribute to sustainable competitive advantage in "distinct ways of co-ordinating and combining" to facilitate the embedding of competence and capability with the firm (Teece et al., 1997, p. 519). Other resource creation mechanisms include reconfiguration, leverage, learning and integration being applied at either the core process or support activity level (Bowman and Ambrosini 2003, p. 293).

Ambrosini et al. (2009) also identified three levels of dynamic capabilities which are related to managers' understanding of the need for change based on their perceptions of internal and external environmental dynamism. In an environment which is perceived to be stable, incremental dynamic capabilities are applied to achieve

continuous improvement (incremental adjustment or adaptation) of the firm's resource base. In dynamic environments, core capabilities can become core rigidities and so renewing capabilities - those that refresh, adapt and augment the resource base – are required to create or introduce new resources or to combine existing resources in new ways. Without this renewal of the way in which the firm performed it would not be able to "survive and prosper under conditions of change" (Helfat et al., 2007, p. 1). These first two levels are usually what the literature refers to as dynamic capabilities. However, dynamic capabilities are also part of the resource base of an organisation and since they act to create, modify or extend an organisation's resources it implies that dynamic capabilities can modify or extend dynamic capabilities (Helfat et al., 2007, p. 4). Therefore, where managers perceive the environment to be turbulent or where external changes are non-linear or discontinuous, regenerative capabilities are required to create, extend or modify the existing embedded dynamic capabilities, i.e. these change the way the firm changes its resource base (Ambrosini 2009).

While the dynamic capability framework has been associated with the quest for sustainable competitive advantage, Helfat et al. (2007) and Ambrosini et al. (2009) have decoupled the notion that dynamic capabilities *automatically* lead to competitive advantage. Capability life cycles were also identified as a source of heterogeneity in organisational capabilities (Helfat and Peteraf 2003) as dynamic capabilities follow a similar evolutionary life cycle to products with recognisable stages such as growth, maturity and decline. In addition, there is opportunity for the capability to branch into retirement, retrenchment, renewal, replication, redeployment or recombination at any point in its life cycle (ibid., p. 1000).

2.6.1 Organisational Innovation Capability Research

Hamel considers that the reason for the innovation hiatus is that management needs to "move from innovations as exceptions; move beyond innovation as a specific role or structure, beyond innovation as a once-in-a-while project, to thinking about innovation as a *deep* capability" (2003, emphasis added). This position is consistent with the dynamic capabilities approach because of its focus on the development of

management capabilities (Teece et al., 1997, p. 510). Accordingly, innovation has been identified as a capability critical for competing in a dynamic and turbulent environment.

Based on their knowledge content, Verona classifies rent-generating routines in terms of their functional or integrative capabilities. Technical knowledge is enhanced by the firm's functional capabilities. Integrative capabilities, on the other hand, facilitate the integration of knowledge from outside the firm as well as blend technical competencies across departmental boundaries (Verona 1999, p. 134; Lawson and Samson 2001, p. 379).

Innovation capability has been defined as "the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders" with this higher order capability enabling the moulding and management of multiple capabilities to successfully stimulate innovation (Lawson and Samson 2001, pp. 380, 384). In highly competitive and high-velocity markets, dynamic capabilities take on a different character being simple (not complicated), experiential (not analytic), and iterative (not linear) processes with situation-specific knowledge created and applied in the context of simple boundary and priority-setting rules (Eisenhardt 2000, p. 1113).

Multiple views of the elements of a successful innovation enterprise are present in the literature (Waal, Maritz and Shieh 2010, p. 43; Lawson and Samson 2001; Tushman and O'Reilly 1997; Cooper 2004; Grant 1996; Verona and Ravasi 2003; Pavlou and El Sawy 2006; Blum 2004). These range from an approach where the author includes a list of all tangentially relevant factors such as learning orientation, market orientation, culture, innovation metrics and subsequent and continued measurement, organisational structure (Waal, Maritz and Shieh 2010, p. 43; Lawson and Samson 2001; Cooper 2004, 2005) to the approach where most factors are considered to be preconditions with the principal drivers for the dynamic capability being entrepreneurship and learning how to be better at innovation (Weerawardena 2003).

Another approach is where a single resource such as knowledge is said to capture the essence of the organisational innovation capability (Grant 1996, p. 375; also Verona and Ravasi 2003). The theoretical framework defining the boundaries for this current research recognises that some of the dimensions identified in research investigating a firm's OIC are components of the capability itself, while others are dimensions of the organisational environment which bound the skills and behaviour inherent in the capability.

The debate about which dimensions to include in any OIC must take place in a broader context than new product development. Teece et al. define dynamic capabilities as "the subset of competence/capabilities which allow the firm to create new products *and* processes" (1994, p. 541, emphasis added). Therefore, the conceptualisation of an OIC that focuses only on technological innovation or new product development cannot, by definition, be a holistic model of innovation. As Blum concluded, it provides "a disaggregated view of dynamic capabilities" (2005, p. 11).

Key organisational innovation dimensions synthesised from the literature are included in the Table 2.1 below. While there is still no dominant organisational innovation theory, key dimensions are beginning to emerge with consistency. Two factors have emerged as innovation preconditions – learning and entrepreneurial intensity. Learning is prevalent as a key innovation dimension either explicitly (Bessant and Buckingham 1993; Lawson and Samson 2001; Pavlou and El Sawy 2006; Blum 2004; Weerawardena 2003; Van der Panne et al., 2003) or implicitly in the type of organisational culture required for effective and consistent innovation (Cooper 2005; Tushman and O'Reilly 1997; Verona and Ravasi 2003). Entrepreneurial capability or intensity is displayed in types of organisational behaviour such as proactive risk taking, experimentation, promotion of cross-functional teams (Miller 1983; Weerawardena 2003).

Table 2.1 Organisational Innovation Dimensions

Author	Innovation Dimensions
Lawson and Samson 2001	• Vision and strategy • Harnessing the competence base • Organisational intelligence (learning about customers and competitors) • Creativity and idea management • Organisational structure and systems • Culture and climate • Management of technology (p. 388)
Tushman and O'Reilly 1997	Ambidextrous organisation characterised by • Senior management "articulating a clear, emotionally engaging, and consistent vision; building a senior team with diverse competencies, developing a healthy team process (p.171). • Innovation infrastructures (comprehensive rewards and recognition that promote creativity and facilitate implementation, p. 172),
Cooper 2005	• Innovation diamond • Existence of a product innovation and technology strategy • Effective and efficient idea-to-launch process • Resource commitment and focus on the right projects (portfolio management) • People, positive culture for innovation and entrepreneurship (e.g. foster effective cross-functional teams and provide strong support and empowerment to those teams) and leadership
Cooper and Kleinschmidt 2007	• High-quality new product process • Defined new product strategy • Resources of people and money • R&D spending for new product development • High-quality new product project teams • Senior management committed to, and involved in, new products • Innovative climate and culture • Use of cross-functional project teams • Senior management accountability for new product results.
Verona and Ravasi 2003	• Systems and structure: Innovation infrastructure ("loosely coupled based on the absence of permanent formal structures", p. 598) with continuous collection and evaluation of proposals, free allocation of time and skills and centralised allocation of financial resources • Culture: Open and informal culture characterised by openness to individual proposals and creativity • Actors: Contributive and motivated employees • Physical resources: Flexible workplace design
Pavlou and El Sawy 2006	• Sensing the environment - identifying consumer needs and new market opportunities - captured by market orientation • learning which builds new thinking, generates new knowledge and enhances existing resources – captured by absorptive capacity • co-ordinating activities - resource allocation, task assignment and activity synchronisation – captured by co-ordination capability and • integrating resources captured by collective mind (p. 8)
Blum 2004	• Effective cross functional teams • Experimentation and Exploit and explore orientation • Integration, learning and reconfiguring routines • Streams of new products (p.159)

Author	Innovation Dimensions
Weerawardena 2003	• Market-focused learning capability • Organisational Innovation Intensity • Entrepreneurial capability
Van der Panne et al., 2003	• Culture oriented towards innovation and an awareness of the collective nature of innovation • Prior experience with innovation projects (learning-by-doing) • Multi-disciplinary R and D team • Clearly articulated innovation strategy and aligned management style • Project compatibility with firm competencies • Innovation product has relative quality and price advantage and good market timing (page 327)
de Waal, Maritz and Shieh 2010	• Formulation of an innovation strategy • Having an innovation supportive organisation • Collaborating with innovation partners (external linkages) • The identification of appropriate innovation metrics and subsequent and continued measurement • Developing and implementing suitable innovation processes • Making use of appropriate innovation tools • Providing innovative leadership (page 43)

An organisation's market-focused learning capability is a measure of its ability to learn from market changes (both customer preferences and competitor actions) and has been consistently included in previous conceptualisations of an OIC. Organisational innovation intensity reflects the extent of the firm's innovations across its products, processes, management and marketing focus, and the ability to learn about what customer's value, how competitors are adjusting their value propositions, how competitor's success in innovation is changing and what are the drivers of those changes in innovation success.

Recent research developed and refined comprehensive measures of market-focused learning capability and organisational innovation intensity (Weerawardeena 2003) and also identified the importance of innovation infrastructure renewal (Gold et al., 2001). Weerawardena found that market-focused learning capability and organisational innovation intensity are interrelated as the learning enables firms to "pursue both technological (product and process) and non-technological (marketing and organisational systems) innovations" (Weerawardeena 2003, p. 419). In addition, market-focused learning will influence innovation infrastructure renewal as new ideas and approaches to innovation management are learned from the environment.

Infrastructure renewal may in turn influence the extent and nature of market-focused activity and the intensity of innovation pursued.

The OIC is depicted in Figure 2.2. The framework comprises two preconditions - organisational learning and entrepreneurial intensity - and the three interdependent components - organisational innovation intensity, innovation infrastructure capability renewal, market-focused learning capability.

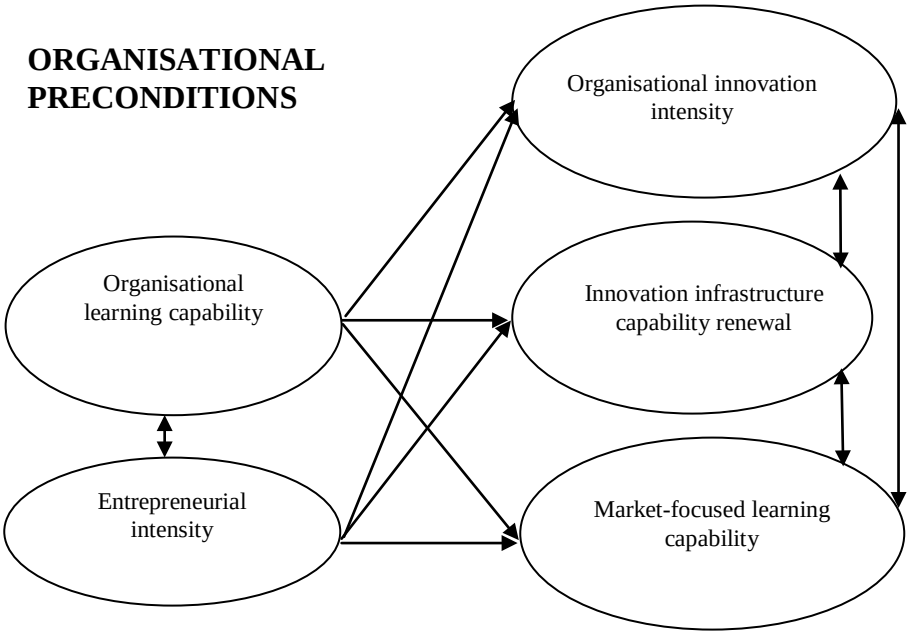


Figure 2.2 Organisational Innovation Framework

2.6.2 Organisational Preconditions supporting an OIC

2.6.2.1 Importance of Preconditions

The structure of the OIC is consistent with management literature which identifies capabilities or leadership behaviours which facilitate capability development. Gold et al. support the existence and importance of preconditions and their characterisation as capabilities in the following quotation:

> Importantly, organizations may not be equally predisposed for successful launch and maintenance of knowledge management initiatives. Therefore, a key to understanding the success and failure of knowledge management within organizations is the *identification and assessment of preconditions* that are necessary for the effort to flourish. *These preconditions are described broadly*

> *as "capabilities" or "resources"* within the organizational behavior literature…(2001, p. 186, emphasis added).

The hierarchical nature of capabilities and the relevance of preconditions to innovation is also encapsulated by Baker and Sinkula when they identify five levels of organisational learning (2002, p. 10). Based on this hierarchy they define three types of marketing firms. These firms are defined "by the strength of their market orientation and learning orientation and are characterised by different learning approaches, which *determine* their innovation capabilities" (ibid., emphasis added). Jarratt and O'Neill (2002) support the hierarchical nature of capabilities when they state "that cultural dimensions such as flexibility and consultation are organisational preconditions or values that support relational behaviour. Similarly, Jarratt argues that "it has also been established that a firm's learning is facilitated by structures that encourage interaction between all organizational members irrespective of their status or expertise (Hedlund, 1994)" (Jarratt 2009, p. 367). Ireland et al. provide further support for the hierarchical approach by their identification of the antecedents to corporate entrepreneurship strategy (2009, p. 26). As a consequence of the hierarchical nature of capabilities, if an organisation has, for instance, limited learning capabilities, it follows that its innovation capability, as well as its ability to renew that capability, will be constrained.

The RA Theory as an evolutionary, process theory of competition provided the compulsion for the need for preconditions to facilitate innovation capability renewal as it placed significant emphasis on proactive and reactive innovation (Hunt and Davis 2008, p. 14). Proactive innovation arises, not from competitive pressures, but from the initiative of the firm's entrepreneurial management in expectation of superior financial performance. The absence of entrepreneurial management action results in disadvantage in efficiency and effectiveness (ibid., p. 13). Reactive innovation is dependent upon organisational learning. Through the ongoing process of disequilibrating competition, organisations learn as the result of the continued feedback from relative financial performance which provided signals of the firm's

relative market position and resource advantage or disadvantage (ibid., p. 14), and this learning prompted an innovation response.

As organisational learning and entrepreneurial management are endogenous to the RA Theory it is imperative that these attributes be included as preconditions for an innovation capability framework. Without these preconditions, a firm will lack the will and innovation capacity (O'Connor et al., 2007, p. 551) to engage in proactive innovation and the antecedents for success.

2.6.2.2 Entrepreneurial Intensity

The firm's entrepreneurial intensity is a key factor in determining its capability building activity (Weerawardena 2003, p. 410) as "the managerial competence of a firm is to a large extent a function of the quality of the entrepreneurial services available to it" (Penrose 1995, p. 32). Teece states that "enterprises with good dynamic capabilities will have entrepreneurial management that is strategic in nature and achieves the value-enhancing orchestration of assets inside, between, and amongst enterprises and other institutions within the business ecosystem" (2007, p. 1344).

This capability is demonstrated by the innovative, proactive and risk seeking propensity of its strategic leaders and infuses through the organisational environment (Deshpande and Webster 1992). Penrose characterised a growing enterprise as having "a psychological predisposition on the part of individuals to take a chance in the hope of gain, and, in particular, to commit effort and resources to speculative activity with the success of the firm being a function of the entrepreneurial services available to it" (1995, pp. 30, 32). Other supporting elements include the firm's acceptance of risk as an inherent part of innovation (Rothwell 1992, p. 227), a no blame culture with no punishment for failure (Cooper, Edgett and Kleinschmidt 2004, p. 37), good internal and external communication with an open communication culture (Rothwell 1992, p. 223; Cooper, Edgett and Kleinschmidt 2004, p. 37) and the capacity for innovation as a corporate-wide task (Rothwell 1992, p. 223, 224).

Associated with innovation behavioural orientation is recognition by senior management of the "people-centeredness" of the innovation process (ibid., p. 224), the requirement of senior management commitment to and visible support for innovation (Cooper 2004; Connell, Edgar et al., 2001, p. 36; Van der Panne, van Beers and Kleinknecht 2003, p. 321; Rothwell 1992, p. 227), as well as the organisation's commitment to the development of human capital and its ability to attract and retain dynamic, open-minded managers (ibid., p. 224). Thus, organisational entrepreneurial intensity appears in Figure 2.2 as an organisational precondition that will define the extent and nature of the organisational innovation intensity and innovation infrastructure renewal dimensions of an OIC.

2.6.2.3 Organisational Learning Capability

Dynamic capabilities which provide superior financial performance are inimitable and rare (Teece et al., 1997, p. 516). The RA Theory recognises organisational learning as one of a number of competitive advantage driving resources (Hunt and Morgan 1996, p. 108). Dickson goes so far as to say that higher-order learning is the *fundamental* construct surpassing comparative advantage in product value as it gives a firm a comparative advantage in learning, and, consequently, in innovation (1996, p. 104, emphasis added).

Organisational learning is widely regarded as imperative to achieving competitive advantage, superior financial performance (Hult et al., 2000; Hunt and Morgan 1996, p. 108; Dickson 1996, p. 104; Baker and Sinkula 1999a) and capability renewal, particularly as it cannot be copied (ibid., p. 411). Learning is considered to be the principal process by which management innovation occurs with Stata arguing that "the rate at which individuals and organisations learn may be the only sustainable competitive advantage, especially in knowledge-intensive industries" (1989, p. 64).

As capabilities are complex bundles of skills, collective learning and accumulated knowledge, the learning dimension of the OIC is of paramount importance (Day 1994, p. 38). Learning enables organisations to link organisational memory to knowledge, products, processes and technologies as well as mainstream capabilities

(Lawson and Samson 2001, p. 382). The organisational learning capability, i.e. the learning culture of an organisation, has been confirmed as a dimension of an organisation's environment supporting a market orientation (Baker and Sinkula 1999a) and, therefore, is positioned in Figure 2.2 as an organisational precondition supporting an OIC. Consistent with the findings of Baker and Sinkula, it is argued that the ability of an organisation to glean ideas for innovation from its market, identify new processes that will advance the innovation potential of the organisation and understand how new technology might re-shape value creation for the market will be bounded by the learning culture of the organisation.

Edmonson and Moingeon's definition encapsulates organisational learning's iterative nature:

> Organisation learning is a process in which organisation's members actively use data to guide behaviour in such a way as to promote the ongoing adaptation of the organisation…It is a process of acting, assessing, and acting again – an ongoing cycle of reflection and action that cannot be taken for granted in organisations noted for their adherence to routine (1998, p. 12).

Companies that wish to compete on the basis of their knowledge need to follow the Japanese holistic approach to knowledge creation which recognises that the company is a living organism, not a machine (Nonaka 1991, p.97). The critical factor that stimulates continuous innovation and self-renewal is the recognition that "the knowledge-creating company is as much about ideals as it is about ideas" (ibid.). "To create new knowledge means quite literally to re-create the company and everyone in it in a non-stop process of personal and organisational self-renewal. In a firm with these knowledge-creating capabilities inventing new knowledge is not a specialised activity…It is a way of behaving, indeed a way of being, in which everyone is a knowledge worker – that is to say, even an entrepreneur" (ibid.). The focus on ideals rather than ideas is consistent with academic literature on organisational learning levels as the challenge to ideals parallels the challenge to governing variables in generative learning as with generative learning "managers must challenge employees to re-examine what they take for granted" (ibid., p. 102).

Organisational learning takes place with distinct systemic styles (levels) ranging from zero (not learning), to single (called adaptive learning by Senge 1990 and error correction by Wijnhoven 2001), double ("generative learning" by Senge 1990 and "innovation" by Wijnhoven 2001, p. 183) and triple loop learning (also called deutero learning) (Argyris 1999, p. 67ff; Senge 1990, p. 8; Snell and Chak 1998, pp. 339ff; Wijnhoven 2001, p. 182; Ortenblad, 2004, p. 133). For Wijnhoven, the action-outcome approach is affected by the environmental complexity (increasing complexity leads to the addition of *more* factors to understand what is occurring) as well as the level of dynamism in the environment (increasing dynamism is demonstrated by the frequency of changes in the factors) (2001, p. 183).

As it reflects the degree to which values influence the propensity of the organisation to "proactively question whether their existing beliefs and practices actually maximise organisational performance (Argyris and Schon 1978)" (Baker and Sinkula 2002, p. 8), learning orientation occurs along a continuum with adaptive learning (single loop learning) towards the beginning and generative learning (double loop learning) and triple loop learning towards the other end of the continuum (Osterberg, 2004, pp. 145, 146). Organisations have the capacity to increase or decrease the level of their orientation (Sinkula, Baker and Noordewier 1997, p. 309) and, in doing so, can select from the above range of learning orientations with their choice influencing both learning and the effectiveness of the organisation's performance (Osterberg, 2004, p. 145). While this continuum is adopted it is not suggest that adaptive, generative and triple loop learning are mutually exclusive but that additional learning capabilities are added in moving from left to right along the continuum (DiBella, Nevis and Gould 1996, p. 374; see also Loverde 2005).

The IT solutions context has implications for the entrepreneurial, organisational learning and market focused leaning capabilities. Typically, highly technologically turbulent environments are characterised by a short cycle of technological innovation and obsolescence (Song et al., 2005, p. 263) and so it is imperative that the entrepreneurial management of these firms take proactive action to put in place organisational processes to capture new technical information, tap developments in

exogenous science, monitor customer needs and competitor activity, and shape new products and processes (Teece 2007, p. 1323). Teece argues that the new knowledge acquired must be filtered and must flow, guided by appropriate innovation infrastructure, to those capable of making sense of it (ibid.).

Proactive technology search activities include research and development but the search needs to include the core as well as to the periphery of a firm's business ecosystem with knowledge sought from potential collaborators such as customers and suppliers that are active in complementary innovation activities (ibid., p. 1324).

2.6.3 Construct of an OIC

In this research, explanation will be sought of how an OIC can be conceptualised in an information technology solutions context, and the role of learning in OIC renewal. It will identify and capture the synergy between the key dynamic elements of Hunt and Arnett's conceptualisation of the RA Theory (2003), proactive and reactive innovation, and Weerawardena's comprehensive innovation measures (2003).

The OIC framework that has been developed to ensure a comprehensive set of dimensions, has primarily been adapted from constructs contained in research undertaken by Weerawardena 2003 and Gold et al. (2001), i.e *innovation infrastructure renewal, organisational innovation intensity, and market-focused learning capability*. The inclusion of organisational environmental dimensions of *entrepreneurial capability or intensity* (Weerawardena 2003) and *organisational learning capability* (described by Slater and Narver 1995 and Stata 1989) will provide important insight as to why an OIC is successful in achieving sustainable competitive advantage in some businesses and unsuccessful in others.

These constructs have been selected as sustaining continuous innovation requires an organisation to "create a *context* that spurs creativity from all parts of the organisation at any time" (Verona and Ravasi 2003, p. 599, emphasis added). The research focus is on the key role of strategic management in the integration, adaptation and reconfiguration of organisational innovation resources (Teece et al., 1997, p. 515) and

the need to create an ambidextrous organisation (O'Reilly and Tushman 2004, p. 74). The ambidextrous organisation must be able to host "multiple, internally inconsistent architectures, competencies and cultures, with built-in capabilities for efficiency, consistency and reliability on the one hand (*for reactive innovation prompted by the market focused learning capability*) and experimentation, improvisation and luck on the other (*for proactive innovation prompted by the entrepreneurial capability*)" (Tushman and O'Reilly 1999, p. 20; italicised words in parentheses added). It must exhibit both the flawless execution of sustaining innovations while the organisation rigorously pursues the foundations of its next growth business through disruptive innovation (Anthony and Christensen 2005, p. 3).

The importance of innovation infrastructure capability renewal also flows from the requirement for organisational ambidexterity. "Different kinds of innovation require different organisational hardware – structures, systems and rewards - and different kinds of software – human resources, networks and culture" (Tushman and O'Reilly 1999, p. 20) so that the innovation infrastructure arises not from a predetermined plan or design but from innovation imperatives as they emerge from time to time (Verona and Ravasi 2003, p. 601). These "semistructures" balance order and disorder and enable the organisation to "rest on a loosely coupled arrangement as the distribution of tasks and resources is not strictly regulated by the designed structure" (Verona and Ravasi 2003, p. 600; Brown and Eisenhardt 1997, p. 3). People at all levels have extensive interactions and are empowered to identify key innovation resources and integrate and reconfigure them in new ways, and redesign organisational roles, tasks and responsibilities depending on the current needs and needs that emerge through the innovation process (Verona and Ravasi 2003, p. 600; Brown and Eisenhardt 1997, p. 3). They have freedom to improvise existing products, explore the future with extensive low cost probes and "link products together over time through rhythmic transition processes from present projects to future ones, creating a relentless pace of change" (ibid.).

Organisational innovation intensity provides an understanding of the organisation's commitment through the orientation of its resources towards innovation concentration

and/or diversity. A firm with a high intensity indicates that the organisation has introduced radical innovations in each of the four value-creating categories - products, processes, management and marketing (Weerawardena 2003, p. 415). The importance of this construct is in deciphering the contradiction of operating both for today and tomorrow, balancing conflict and dissent among organisational business units and implementing management strategies to develop streams of innovation (Tushman and O'Reilly 1999, p. 21).

Innovation infrastructure is crucial in an IT solutions environment as its set of resources, and the flexibility of those resources, make feasible both innovation and the continuous renewal of IT systems (used within the firm for knowledge capture, memory storage and knowledge dissemination) and this, in turn, may lead to sustainable competitive advantage (Bharadwa 2000, p. 173). The nature of the infrastructure affects the innovator's costs and development time and so flexible infrastructure reduces the time for imitation (reactive innovation), and may reduce the cost of innovation and enhance a firm's strategic options (Duncan 1995, p. 44). Implicitly, the breadth and degree of integration of the use of IT within a firm should be an additional factor which facilities product, process and managerial innovation within the firm.

As capabilities are developed gradually through human exchange the dedicated investment in continuous learning is an organisational imperative (Fuchs, Mifflin, Miller and Whitney 2000, p. 119) as a "superior learning environment will leverage the use of all resources…" (Baker and Sinkula 1999a, p. 411). Learning enables organisations to link organisational memory to knowledge, products, processes and technologies as well as mainstream capabilities (Lawson and Samson 2001, p. 382). Only those organisations with the best learning capability and the greatest capacity for absorbing external knowledge will survive (Zack 1999, p. 141). Failure to acknowledge and practice the importance of continuous organisational learning will result in core capabilities becoming core rigidities (Leonard Barton 1998, p. 30), specifically dampening the ability of a firm's OIC to deliver appropriate and timely innovation outcomes.

As learning is endogenous to capability renewal a construct depicting the dynamic components of an OIC must include mechanisms that support both proactive and reactive learning (Jarratt 2004). Organisational ambidexterity is demonstrated in two second order factors which facilitate both the exploration of new opportunities while diligently exploiting existing capabilities (O'Reilly and Tushman 2004, p. 74). The central dimension of innovation infrastructure capability renewal incorporates the notion of a dynamic capability in that it places both the elements of innovation infrastructure and the process of renewing that infrastructure at the core of an OIC. Market-focused learning capability will capture the firm's propensity to learn from customer, market and environmental changes (Weerawardena 2003, p. 415). A firm's entrepreneurial capability will identify the extent to which the organisation's leaders are "genuinely entrepreneurial" by being innovative, proactive and risk seeking unprompted by competitive pressures (Hunt and Arnetts 2003, p. 7; Weerawardena 2003, p. 414).

As the dynamic capabilities approach was developed to explain firm-level success and failure (Teece et al., 1997, p. 509), the common unit of analysis is the firm (Jarratt 2004, 2005; Gold, et al., 2001; Protorerou, Caloghirou and Lioukas 2005; Lawson and Samson 2001; Rosenbloom 2000; Hilliard 2004 and Matcher and Mowery 2004). While there is focus on firm-level analysis the "firm" has not been defined with the term appearing to encompass organisations with a single product to multi-divisional corporations with a wide variety of business foci. The breath of the term, "the firm", creates a dilemma as dynamic capabilities research should be situational as business opportunities flow from a firm's unique paths, processes and positions (Teece et al., 1997, p. 509). This research contributes to the concept of dynamic capabilities by examining for the first time, the conceptualisation of an OIC within multiple business units of the same firm[3]. The research will examine whether an OIC exists for the entire organisation or whether the dynamics of the OIC differ depending on the entrepreneurial capability and organisational learning capability

[3] Brown and Eisenhardt 1997 examined 9 business units but these were in 9 firms

that are evident within the business unit. The impact of the OIC will be examined to ascertain its contribution to sustainable competitive advantage and how it can be understood and achieved.

2.6.4 Linkages between OIC Preconditions and Components

As capabilities are built and nurtured by the entrepreneurial key decision makers of the firm (Teece 1997; 2007, p. 1344), Weerawardena argued that entrepreneurship is the "key factor determining the capability building activity of the firm" (2003, p. 410). The importance of entrepreneurship is reinforced by the RA Theory as proactive innovation is "genuinely entrepreneurial" (Hunt and Davis 2008, p. 14). In the RA Theory organisational learning and innovation are endogenous to the firm with reactive learning highly dependent upon the effectiveness of the firm's ability to learn from its financial performance and its relative competitive effectiveness and efficiency. The importance and relationship of the entrepreneurial intensity and organisational leaning capability has been established in section 2.6.2.1.

The linkage between market-focused learning capability and entrepreneurial and organisational leaning capability arises from the reactive innovation which is an inherent part of the process of competition. Learning can originate from formal market research, competitive intelligence, dissecting competitor's products or benchmarking and test marketing, and generally this learning is activated by the competitive process (Hunt and Davis 2008, p. 14). This linkage is also supported by Weerawardena's findings that entrepreneurial firms pursuing organisational innovation-based competitive strategy build and nurture distinctive market-focused learning capabilities (2003, p. 419).

While entrepreneurial intensity is demonstrated by the innovative, proactive and risk taking propensity of a firm's strategic managers, organisational innovation intensity captures the breadth of its commitment to innovation. The entrepreneurial firm's market-focused learning capability influences its organisational innovation intensity as those firms which "have excellent market sensing skills are more likely to develop radical changes to products, processes, marketing methods and managerial systems"

(ibid., pp. 417, 418). The linkage to organisational learning is explicit is respect of market-focused learning but implicit in respect to the other elements of innovation intensity.

The firm's capacity to reconfigure and transform itself, i.e. renewal, is a learned organisational skill (Teece et al., 1997, p. 521). Through generative and double loop learning the firm is able to "challenge old assumptions" and "change its view of the world" in order to continually renew its systems and procedures to meet changing market and environmental conditions (Baker and Sinkula 1999a, p. 412; Dickson 1996, p. 104). Accordingly, innovation infrastructure capability renewal is dependent on organisational learning with the firm that develops and sustains superior, higher order learning processes being able to achieve a long-term sustainable competitive advantage (Dickson 1996, p. 104). The proactive component of the entrepreneurial capability initiates pre-emptive changes to its innovation infrastructure to support its proactive innovation.

2.7 Summary and Conclusion

This chapter began with the identification of organisational innovation barriers identified in the literature. After a review of the extant dynamic capabilities research and the theoretical foundations upon which this framework is based, prior research on components of an OIC were organised, analysed, synthesised and arguments presented regarding the key dimensions of a well balanced, highly performing OIC. The literature derived OIC comprised two preconditions – *organisational learning capability and entrepreneurial intensity* – and three components - *innovation infrastructure renewal, organisational innovation intensity, and market-focused learning capability*. The conceptual model of the OIC is depicted diagrammatically in Figure 2.2 in section 2.6.1. It demonstrates the hierarchical nature of capabilities and the importance of preconditions as determinants of the capabilities as well as the relationships between the preconditions and components of the OIC. The purpose of the literature derived OIC was to provide a framework for comparison with the OIC derived from the case analysis in Chapter 4.

Chapter 3 outlines the research methodology (case study research) used to address the research question - *"How can an Organisational Innovation Capability be conceptualised in an information technology solutions context, and what is the role of learning in organisational innovation capability renewal"*. It begins with the identification of the research paradigm (postpositivism) and follows with the justification of the research approach. The procedure for the selection of the case is then described followed by the interactive data management strategy applied.

Chapter Three

RESEARCH APPROACH AND RESEARCH METHODOLOGY

3.1 Introduction

The research question posed in section 1.3 is *"How can an Organisational Innovation Capability be conceptualised in an information technology solutions context, and what is the role of learning in organisational innovation capability renewal"*. The objective of this research question is to build on the academic research in innovation management dynamic capabilities by opening the "black box" and providing evidence supporting the conceptualisation of an organisational innovation capability.

While some consider that the failure of organisations to achieve consistent innovation simply requires "more commitment and more innovative approaches to the *process* of innovation" (Booz Allen 2005, p. 4, emphasis added), here the importance of developing an organisational innovation capability is emphasised. The research question will be considered in the theoretical framework of dynamic capabilities linked to an IT solutions context and developed for this research. This approach provides a framework for examining how the firm can integrate, adapt and reconfigure its endowed assets and resources to create "renewal capabilities" which lead to comparative and/or competitive advantage, sustainable competitive advantage and "superior financial performance" in a market or a segment of a market (Hunt and Morgan 1995, p. 6). Utilising this theoretical framework, the substantive research provides a definitional context for evaluating key organisational capabilities that directly impact an organisation's drive towards efficient, effective and sustainable innovation.

Dynamic capabilities are particular relevant in this "Schumpeterian world of innovation-based competition, price/performance rivalry, increasing returns, and the 'creative destruction' of existing competencies", the uncertainty of the nature of future competition and markets and the consequent focus on time-to-market responses for new products and services (Teece et al., 1997, pp. 509, 515; Teece 2007, p. 1341).

Chapter 2 provided a theoretical foundation for the development of an OIC which has the capability to sustain and adapt organisational resources and competencies in fulfillment of long term strategies notwithstanding volatile competitive conditions, altered strategies and the loss of key employees, typical of the research context (Nadler and Tushman, 1997, p. 5). This chapter describes the research paradigm and justification for the selection of the case study methodology as the research approach. It then continues with a description of the research procedures, including the case study selection and design, the data collection and analysis processes, before concluding with a discussion regarding validity and reliability.

3.2 The Research Paradigm

The identification of the research paradigm makes explicit the fundamental assumptions of the research perspective and provides a rationale for the positioning of the scholarly work (Yin 2009, p. 26; Guba and Lincoln 1994, p. 112; Maxwell 1996, p. 4;). The postpositivist paradigm has been selected as from an ontological perspective, the postpositivist acknowledges the existence of an objective or "real reality" which can only be "imperfectly apprehendable because of basically flawed human intellectual mechanisms and the fundamentally intractable nature of the phenomena" (Guba and Lincoln 1994, pp. 109, 110).

The postpositivist epistemological view largely abandons the positivist's assumption that the researcher and the investigated object are independent entities as it is impossible for the former to be purely objective (Toma 1997, p. 683). However, research objectivity is considered to be a "regulatory ideal" with considerable emphasis placed on ensuring that "external guardians of objectivity" such as critical

traditions applied and the critical community engaged (Guba and Lincoln 1994, p. 110). According to Crotty, postpositivism is concerned with "probability rather than certainty", a level of objectivity rather than absolute objectivity, and the desire to "approximate the truth rather than aspiring to grasp it in its totality or essence" (1998, p. 29).

Epistemologically, the postpositivist acknowledges that the researcher cannot be purely objective (Toma 1997, p. 683). This perspective has been labelled critical realism as the apprehended reality must be subject to the widest possible scrutiny to ensure that it is a close as possible to, although it never achieves, perfect reality (Guba and Lincoln 2005, p. 193).

Methodologically, postpositivism emphasises "critical multiplism" as a means of falsifying rather than verifying hypotheses (Guba and Lincoln 2005, p. 193). Postpositivist research is conducted in more natural settings, with greater reliance on the collection of more contextual information, the reinforcement of discovery as an element in inquiry, and the solicitation of emic perspectives to provide an understanding of the meanings and purposes that individuals ascribe to their actions (Guba and Lincoln 1994, p. 110). This perspective focuses on "people as data collection instruments, qualitative methods, use of tacit knowledge, grounded theory inductive analysis, purposeful rather than random sampling, idiographic interpretation, and the case study reporting mode" (McKelvey 2003, p. 7), and, therefore has a "closer, richer, thicker, more subjective view of organisational phenomena coming to appreciate its fundamentally complex, idiosyncratic, and, multi and mutually causal nature" (McKelvey 2003, p. 6).

Empirical research on the organisational innovation dynamic capability is a relatively new area of management research. While the dynamic capabilities approach has been applied to many capabilities, little research has been directed to developing a holistic organisational innovation capability (Lawson and Samson 2001, p. 388).

Organisational capabilities are built over time and are "the result of complex processes comprising the accumulation of small decisions and actions undertaken over many years in a situation of great uncertainty" (Katzy et al., 2003, p. 4). Accordingly, as quantitative research is unlikely to be able to identify and explore the nature of the dynamic capabilities, qualitative research is the preferred, although not necessarily exclusive, research approach. Another reason is that while the key informant technique, used in data collection by many dynamic capabilities researchers, is an efficient method for data collection, when used for collecting survey and questionnaire data it generally suffers from an inability to capture tacit knowledge or assumptions, as these may not have been articulated.

3.3 Justification of Research Approach

Five major research strategies are identified for conducting social science research. The question of when to use each strategy – case study method, experiments, surveys, histories and the analysis of archival information - depends on the answers to three questions: firstly, the type of research question posed, secondly, the extent of control an investigator has over actual behavioural events, and finally, the degree of focus on contemporary as opposed to historical events (Yin 2009, p. 8).

Yin defines case study research as an empirical inquiry that investigates a contemporary phenomenon within its real-life context and when the boundaries between phenomenon and context are not clearly evident (ibid., p.18). The remainder of this section will apply Yin's three questions as a basis for justifying the selection of the case study method.

After an examination of 14 academic papers and dissertations with a focus on dynamic capabilities (Lawson and Samson 2001; Hilliard 2004; Ethiraj et al., 2000; Gold et al., 2001; Protorerou et al., 2005; Pavlou and El Sawy 2005, 2006; Katzy 2003; Jarratt 2004, 2005; Macher and Mowery 2009; Rosenbloom 2000; Choudrie and Dwivedi 2005; Ambrosini and Bowman 2009), and the book, Dynamic Capabilities: Understanding Strategic Change in Organisations (Helfat et al., 2007), it was concluded that the case study is the preferred primary strategy to investigate a

phenomenon “in its natural context” (Benbasat et al., 1987; Yin, 1994, p. 13) and to answer the “‘how’ or ‘why’ questions being posed”, whilst retaining “the holistic and meaningful characteristics of real-life events”, such as dynamic capability life cycles and managerial processes and routines (Yin 2009, p. 4). With these phenomenon-driven research questions, case studies give the researcher the flexibility to define the research question broadly (Eisenhardt and Graebner 2007, p. 26).

The nature of the research question in relation to an OIC requires an explanatory response as this “how question” deals with present-day operational links with sticky, practice based routines which need to be traced over time, rather than a single occurrence or incidence (Yin 2009, p. 9). Case study research is also the most appropriate research methodology as it emphasises research in dynamic naturalistic settings and the importance of contexts to generate explanations for observed attitudes and behaviours (Clegg, Kemp and Legge, 1986, p. 8; Benbaset et al., 1987, p. 371). Consistent with this view, Eisenhardt and Graebner argue that case studies are relevant for theory building and are one of the best, if not the best, of the bridges from rich qualitative evidence to mainstream deductive research (2007, p. 25).

By using a qualitative/postpositist perspective for the case study inquiry, the researcher attempts to interpret how an OIC is operationalised in search for explanation and theory. Ambrosini and Bowman argue that “qualitative smaller sample studies are likely to be more appropriate for understanding the subtlety of resource creation and regeneration processes” and call for “fine-grained case studies” to provide a strategy-as-practice perspective (2009, p. 37, 46).

Case study research is “a search for explanation and theory rather than just a report on an empirical research” (Kanter, 1977, p. 291) and is considered to be the most appropriate research methodology as the “research and theory are at their early, formative stages” (Benbasat et al., 1987; p.369; Darke et al., 1998, p. 279). As the broad approach to the research question is to gain a better understanding of the interplay between people, organisational strategy as well as the organisation itself, the selection of case study research as a new methodology is appropriate.

Darke et al. (1998, p. 279) specifically point to case study research as applicable where a phenomenon is dynamic and not yet matured or settled. While their observation relates to information systems research, they extend its scope to "business strategy concerned with use of the Internet, or where terminology and a common business language and a set of definitions are not yet clearly widely accepted". An investigation into innovation management capability would fall within the reach of their comments.

The use of the case study methodology for information technology and systems research is well established (Dube and Pare 2003; Benbasat et al., 1987; Darke et al., 1998). Reasons for its validity as a viable research strategy are firstly, it allows the researcher to conduct research in its "natural setting, learn about the state of the art, and generate theories from practice", particularly as the focus has shifted from technical to organisational issues; secondly, it allows the researcher to answer "how" and "why" questions by understanding the nature and complexity of its IT solution development processes; thirdly, the approach is highly relevant to areas where there is rapid change of pace in the information systems area and where few case studies have previously been carried out (Benbasat et al., 1987, p. 370) as it opens "the way to new ideas and new lines of reasoning and pinpoints the opportunities, challenges and issues facing IT specialists and managers" (Dube and Pare 2003, p. 598); and finally, the holistic investigation inherent in case study research suits the "need to understand the complex and ubiquitous interactions among organisations, technologies and people" (ibid.).

3.4 Research Procedures

3.4.1 Case Study Selection

In conducting case study research for developing constructs and theory "nothing is more important than making a proper selection of cases" (Stake, 1994, p. 243). Eisenhardt also emphasised the importance of case selection arguing that the concept of population is also applicable in this context (1989, p. 537). This concept is crucial for two reasons: firstly, because it defines the set of cases from which the research

sample is selected, and, secondly, because it controls extraneous variation and helps to define limits for generalisation of the findings (Eisenhardt 1989, p. 537). However, Yin calls it a misconception to believe that case studies are to represent a formal "sample" from some larger universe as generalising from case study research does not depend on statistical inference (*statistical generalisation*) but on the making of logical inferences (*analytic generalisation)* (Yin 2004, p. 7).

A critical issue in case study research is the selection of the number of case studies undertaken by a researcher. It is widely acknowledged that there is no ideal number of cases and that single-case or multi-case design can lead to successful research outcomes (Darke 1998 et al., p. 281; Yin 2009, p. 58). A single case may be appropriate where it represents a critical case in testing a well-formulated theory or where exploratory research is undertaken, a single case may provide the foundation for developing explanations of why a phenomenon occurs with the opportunity for these explanations to be subject to discussion and application in other contexts (Darke et al., 1998, pp. 277, 281; Yin 2004, p. 7). Other rationales for a single case include an extreme or unique case, a representative or typical case, or a revelatory case (Yin 2009, pp. 60-62).

Multi-case designs allow both literal and theoretical replication and cross-case comparison with this approach also capable of adoption for exploratory research (Darke et al., 1998, p. 281). Multiple-case designs have important advantages. Firstly, they provides a platform to respond to a common criticism of single-case studies that they are unique and idiosyncratic and, therefore, have limited value beyond the circumstances of the single case. Secondly, the researcher will collect an amount of comparative data which will assist in analysing the findings (Yin 2004, p. 8). Another key consideration in the selection of the number of cases to be studied is that there is a trade-off between a "deep understanding of a particular social setting and the benefits of comparative insights" with the greater the number of contexts a researcher investigates, the less contextual insights he can communicate (Dyer and Wilkins 1991, p. 614). Negative cases can also provide a rich source of analytic thinking (Bazeley 2009, p. 6).

Four basic types of case designs are identified by Yin (depicted in Figure 3.1) depending upon whether the case is single or multiple and whether or not multiple units of analysis are involved (2009, p. 46). The application of this matrix results in single-case (holistic) designs (Type 1), single-case (embedded) designs (Type 2), multiple-case (holistic) designs (Type 3), and multiple-case (embedded) designs (Type 4) (ibid.).

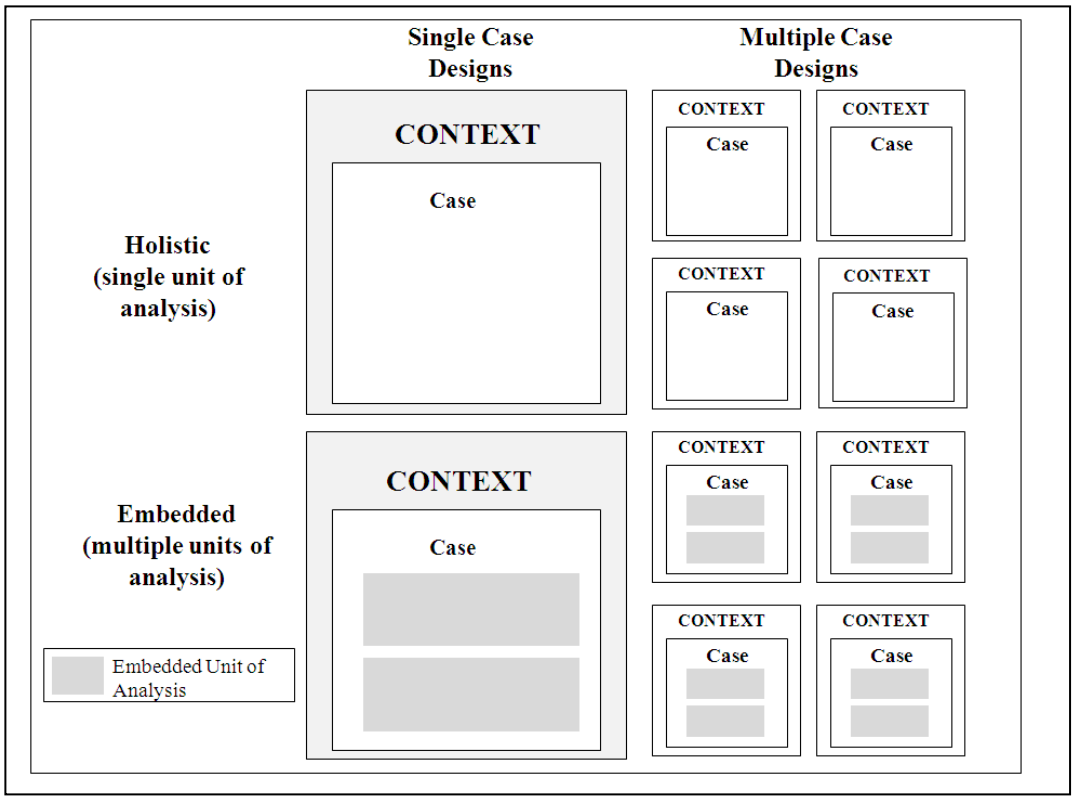


Figure 3.1 Case Study Design

The design format used in this research is Yin's Type 2 single embedded case with multiple units of analysis. While the researcher was employed by the CO, the CO was selected on the basis that it provided the highest "opportunity to learn" (Stake, 1994, p. 243) for the CO and the researcher, as at the time that the research was conducted, the CO was undergoing significant change as it endeavoured to capitalise on its acquisitions, expand into new markets and increase the success rate of its innovation and the speed of commercialisation. It was also adapting from a single project GHLSS technology contractor to a broader supplier of products and services to both the high level security sector and the commercial sector. These transitions

emphasised the CO's inherited and embedded path dependencies and provided opportunities to examine how various business units addressed these challenges in their quest for organisational innovation.

As the CO had operated in the GHLSS and was also a private company there was, apart from public speeches and an interview with a national business magazine, limited public information available about its innovation processes, particularly at the business unit level. While publically there was a strong management commitment to innovation as an organisation-wide practice there appeared to be a gap between the espoused innovation approach and actual practice. The employment of the researcher by the CO provided the opportunity for interviewees who were passionate about innovation, but frustrated by the CO's approach, the opportunity to speak opening and frankly about their innovation experience. It also provided access to sensitive strategic and operational documents which would not have been made available to an outsider. The CO was also selected as it met one research challenges of Ireland et al. - the difficulty in "identifying firms exhibiting highly entrepreneurial (corporate entrepreneurship) strategies" as these firms "may be few in number" (2009, p. 40).

While this case study focuses on a single case organisation in a single corporate setting, it does not constitute a single case as it is involves the study of multiple business units of the CO, each with different processes, paths and positions (Eisenhardt 1991, p. 623; Teece et al., 1997, pp. 518-524). Therefore, the CO comprises multiple subunits within the one organisation and this availability provides significant opportunity for multiple and extensive levels of analysis within the CO, thus enhancing the insights into the single case (Yin 2009, p. 46). While a study of this nature has compelling benefits, Yin warns against the possibility of the researcher becoming so absorbed with the subunits that the holistic case begins to be ignored with the result that the orientation of the case shifts from its original design.
An examination will be conducted of how an OIC can be conceptualised in the CO and within three business units to test the proposition that the value of dynamic capabilities must be evaluated in the market context within which the business unit operates (Barney et al., 2001, p. 631). In the CO, the OIC will be studied in each of

three business units to understand its emergence, renewal and continued development.

3.4.2 Data Collection

An OIC was studied in three business units in the case organisation (CO) as an anticipatory data reduction strategy to limit the data collected (Miles and Huberman 1994, p. 10). No explicit confidentiality agreement was entered into between the CO and the researcher. However, it was an agreed understanding, based on a high level of trust in the researcher that the name of the case organisation would not be disclosed and that steps would be taken to limit identification without impacting upon the integrity of the case study and analysis.

The focus of the research was to examine in the CO if one OIC model applied or whether different OIC models applied in different business units depending on the organisational and market context. Multiple data collection methods were combined with the triangulation of the resultant data (converging lines of inquiry) from those sources as this led to stronger substantiation of constructs and hypotheses and greater confidence about what is concluded than if only one data source was used (Eisenhardt 1989, pp. 537, 538; Yin 2009, p. 15; Yin 2004, p. 9; Pare 2002).

The primary focus was on qualitative research as the examination of a dynamic OIC within the CO was exploratory and the fundamental variables of the construct were uncertain as capabilities flow from a firm's unique processes (Cresswell 2002, p. 22) and its "fully firm-specific resources, their context, and how they were created or renewed" (Ambrosini and Bowman 2009, p. 37).

Qualitative data techniques included interviews, archival records and observation. Qualitative data was primarily collected through interviews based on a semi-structured instrument (copy included in the Appendix) to guide, but not confine, the boundaries of the conversation. The semi-structured instrument began by asking details of the interviewee's work experience both generally and within the CO. It then proceeded to ask questions about innovation success and failure within the

business unit in which the interviewee was employed. The interviewee was then asked to identify the reasons for and barriers to innovation success as well as describe any innovation processes in their business unit and changes over time to those processes. To conclude the interview, questions were raised in respect of the business unit's structure and culture and the impact of these dimensions on innovation.

Individuals within the selected business units who had expertise and experience, and were involved in the innovation management process were invited to participate. These names were identified by speaking to staff involved in innovation within each business unit or innovation champions within the CO. In addition, one interview was conducted with the Chief Technology Officer of the CO as he played an important and wide-ranging role in regard to innovation. The number of interviews conducted in each business unit and the CO are listed in Table 3.1 below. All but one of the interviews were conducted in the period September to December 2006. One clarifying interview was conducted in December 2008.

Organisation	Interviews
First Business Unit	6
Second Business Unit	7
Third Business Unit	5
Case organisation	3

Table 3.1 Table of Interviews

Consideration was also given to balancing the different professional disciplines and different levels of responsibility and seniority to ensure that a diversity of perspectives was analysed (Verona and Ravasi 2003, p. 582; Brown and Eisenhardt 1997, p. 4) and to minimise the impact of interviewee bias (Eisenhardt and Graebner 2007, p. 30). Interviewees included research and development managers, commercialisation managers, those primarily involved in knowledge creation and those who report to them. These interviews enabled the data to be collected in "close proximity to the specific situation", provide "richness and holism, with a strong

potential for revealing complexity" as well as "'thick descriptions' that are vivid, nested in a real context, and have a ring of truth" (Miles and Huberman 1994, p. 10).

The focus of the interviews was on the personal innovation experience of the interviewee within their business unit. Interviews were conducted either in person or by phone by the researcher and lasted from 60 to 90 minutes. To ensure validity, all interviews were recorded with the permission of the interviewee. One interviewee in the First Business Unit (COFBU) was interviewed twice to gain richer detail and to clarify key ideas which emerged from the initial interview.

The purpose of the interviews was to gain a picture of the situation in which an OIC was built. This included determining the presence of organisational preconditions for innovation such as knowledge management, learning orientation and organisational culture as well as the key activities, processes and behaviours that represent these constructs and the presence, nature and strength of the barriers to innovation. This qualitative research also covered strategies implemented by the organisation to strengthen the innovation preconditions as well as those that contained, removed or reduced the strength of the innovation barriers.

Some archival records and written documentation were also used in the data analysis process as these provided a valuable source of qualitative data (Miles and Huberman 1994, p. 9). The documents included speeches on innovation by the General Manager of the SBU and the Group General Manager of the CO, the SBU's Strategic Technology Roadmap and reports, policies, business and product development strategies. The most important use of these documents was to corroborate and augment evidence from other sources (Yin 2009, p. 18) as well as confirm the business unit's commitment to particular path. In this case the analysis of documents provided the essential preliminary analysis of the CO's position, processes and path dependencies (Teece et al., 1997, p. 522).

Observation of innovation activities such as the annual engineering conference, research and development, and commercialisation meetings, provided the opportunity

to monitor relevant behaviour or environmental conditions and gain impressions and insights rather than relying solely on the opinions of interviewees (Yin 2009, p. 106). These observed activities were not recorded and provided a general background to the primary data collection methods.

A key feature emphasised for theory building from case studies is the frequent overlap between data collection and data analysis (Eisenhardt 1989, p. 538; Miles and Huberman 1994, p. 10ff). Overlapping analysis with data collection gives the researcher a head start in analysis, as well as allowing the researchers to take advantage of flexible data collection (Eisenhardt 1989, p. 538). This flexibility enables the researcher to make adjustments during the data collection process to probe new research themes that emerge, to data collection instruments or data sources. While this flexibility is legitimate as researchers endeavor to understand each case in as much depth as is feasible, it is not a license to be unsystematic (Eisenhardt 1989, p. 539).

Data reduction was essential due to the volume of data collected from the multiple data collection methods (Miles and Hubermann 1994). Data was reduced in an anticipatory way by the research paradigm and design strategies selected. The strategies include preparation of data summaries, data coding, theme identification and clustering (Huberman and Miles 1994, p. 429).

3.4.3 Data Analysis

While data analysis is the heart of building theory from case study research, it is also the most difficult and least codified part of the research process (Eisenhardt 1989, p. 539). The complexities of data analysis often lead to “false expectations that the data will somehow speak for themselves” (Yin 2004, p. 15).

Miles and Huberman define data analysis in terms of three linked sub-processes: data reduction, data display and conclusion drawing/verification with the links and relationships between the sub-processes depicted in Figure 3.2 below (1994, p. 429).

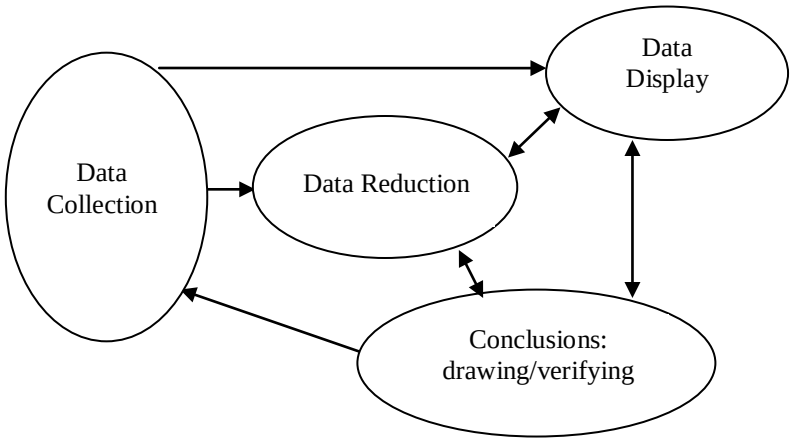


Figure 3.2 Interactive Data Management

It was important to recognise that "these processes occur before data collection, during study design and planning; during data collection as interim and early analyses are carried out; and after data collection as final products are approached and completed" (1994, p. 429).

Data reduction was essential due to the volume of data collected from the multiple data collection methods. It was reduced in an anticipatory way by the research paradigm and design strategies selected. Data reduction strategies include preparation of data summaries, data coding, theme identification and clustering (Huberman and Miles 1994, p. 429). Data display is defined as an organised, compressed assembly of information that facilitates the drawing of meaning and promotes action taking (Miles and Huberman 1994, p. 429). The third sub-process, conclusion drawing and verification, involved drawing meaning from the data with strategies including comparison/contrast, pattern and theme identification, clustering and checking results with respondents (Huberman and Miles 1994, p. 429).

An analytic strategy was applied to "treat the evidence fairly, produce compelling analytic conclusions, and rule out alternative interpretations" (Yin 2009, p. 130). Following Yin's first and preferred strategy, the theoretical propositions guided the case study, shaped the data collection process and gave priority to particular analytic

strategies by focusing attention on certain data and ignoring other data (2003, pp. 111, 112).

Data analysis began with building individual case studies to facilitate intimacy with each case as a stand-alone entity and to allow the embedded unit's unique patterns to emerge (Eisenhardt 1989, p. 540). Cross-embedded unit pattern analysis was implemented to develop conceptual insights, refine the unique aspects of each case and to promote divergent ways of analysing the data such as by selecting categories or dimensions and then looking for within-group similarities coupled with intergroup differences or by selecting pairs of cases and then listing similarities and differences between each pair (Eisenhardt 1989, p. 540; Brown and Eisenhardt 1997, p. 6). By writing up each embedded unit in detail as well as developing individual reflective remarks, coding and other tools, and then undertaking cross-embedded unit comparison, a rich familiarity with the case emerged (Eisenhardt 1989, p. 540).

Effective cross-case analysis promotes deeper understanding and explanation (Miles and Huberman 1994, p. 173). Cross-case pattern analysis was essential to minimise the researcher's limited processing skills as researchers "leap to conclusions based on limited data, (Kahneman and Tversky, 1973), they are overly influenced by the vividness (Nisbett and Ross, 1980) or they sometimes inadvertently drop disconfirming evidence (Nissbet, and Ross, 1980)" (Eisenhardt 1989, p. 540). Cross-case pattern analysis counteracted these tendencies by promoting divergent ways of analysing the data such as by selecting categories or dimensions and then looking for within-group similarities coupled with intergroup differences or by selecting pairs of cases and then listing similarities and differences between each pair (Eisenhardt 1989, p. 540).

The interviews were transcribed and the transcripts compared to the recorded interviews. Initially, the data transcripts were analysed manually (highlighting key passages, identifying themes, repeated concepts and narratives) to determine if it was necessary to use a software package for the data analysis process. Following this preliminary analysis, it was decided that, with the quantity of data and the emerging

nature of the concepts, a qualitative data analysis software would add structure to the process. NVivo v8 was selected based on its data management capabilities and because it addressed some of the limitations of other packages.

All of the interview transcripts were imported into NVivo. The transcripts were then open coded to Free Nodes which were developed based on the initial data analysis and the emerging theoretical properties of the category (Glaser and Strauss 1967, p. 106). After further analysis and prolonged engagement with the data and nodes, Tree Nodes were created to enable common elements to be grouped with each Tree Node "internally consistent but distinct from one another" (Marshall and Rossman 2010, p. 215). During the further analysis there was a continual adjustment of the Tree Nodes to provide additional richness to the analysis (Yin 2009, p. 128). The initial characterisation of the Tree Nodes differed significantly from the final Tree architecture. Some of the Tree Nodes identified included Innovation Factors, Innovation Facilitators, Innovation Barriers and Narratives. With the Tree Node Innovation Factors there were sub-nodes such as Challenging environment, Cross-Functional Team, Flexibility and Relationships. The underlying purpose of the analysis was to allow the data to speak for itself.

3.5 Validity and Reliability

In order to continually maintain the quality of the case study design, four conventional benchmarks were applied: *construct validity*, *internal validity* (isomorphism of findings with reality), *external validity* (generalisability) and *reliability* (in the sense of stability) (Yin 2009, p. 40; Guba and Lincoln 2005, p. 205). These tests were applied throughout the design phase, as well as during the data collection, data analysis and the reporting processes to increase the quality of the case study and overcome traditional criticisms of the weakness of case study research (Yin, 2003, p. 35).

To address *construct validity*, multiple sources of evidence were used during data collection to promote convergent lines of inquiry and establish a chain of the evidence collected (Yin 2009, p. 42). For this research at least five respondents in

each business unit were interviewed to ensure that the observations associated with a single informant were minimised and to provide greater confidence in the evidence collected. *Internal validity* is important for explanatory studies as it confirms causal relationship. Key internal validity analytic tactics included pattern matching across cases and explanation building, particularly where the explanations reflected some theoretically significant propositions (Yin 2009, p. 42). *External validity* was achieved by applying replication logic across multiple cases (embedded business units) to achieve analytic generalisation (Yin 2009, p. 43) as if "two or more cases are shown to support the same theory, replication may be claimed" (Eisenhardt and Graebner 2007, pp. 38, 39). In case study research, *reliability* refers to the stability, accuracy, and precision of measurement (Treloar 2001). To minimise error and bias a case study protocol was developed thereby ensuring that the procedures were well documented and can be repeated with the same results. Procedures for this research involved the preparation of semi-structured interview instruments with the same data collection process followed consistently for each interviewee.

The Table below (Table 3.2) summarises the eleven key recommended tactics covering the four conventional quality tests and also indicates the ways in which the research design and conduct for this case study responded to the recommendations.

Tests	Case Study Tactic	Research Phase in which tactic occurs	Action taken in this research
Construct validity	Use multiple sources of evidence	Data collection	Use of interviews, documentary evidence and physical artifacts
	Establish chain of evidence	Data collection	Interview data both taped and transcribed in real time; multiple evidence sources entered into customised object-oriented database
	Have key informants review draft case study report	Composition	It was intended that the case studies would be reviewed by key informants before publication. However, as the three business units had been sold at the time of completion of this research this tactic was not implemented.
Internal validity	Do pattern matching	Data analysis	Patterns identified across cases
	Do explanation building	Data analysis	Some causal links identified
	Do time series analysis	Data analysis	Not to be performed in this research,
	Do logic models	Data analysis	Not performed- requires time series data
External validity	Use rival theories within single cases	Research design	Not used because of exploratory nature of research and lack of existing competing theories
	Use replication logic in multiple-case studies	Research design	Multiple cases investigated using replication logic
Reliability	Use case study protocol	Data collection	Same data collection procedure followed for each case; consistent set of initial semi structured questions used in each interview
	Develop case study database	Data collection	Interview transcripts, documents, other notes and links to physical artifacts entered into research database

Table 3.2 Case Study Tactics

Source: based on Treloar 2001

3.6 Conclusion

The case study method was selected as the research approach for the study of the research question as this method is an empirical inquiry which investigates contemporary phenomena in the organisation's real-life context. This approach was appropriate for an investigation of an innovation management dynamic capability where theory and understanding are in their formative years (Darke et al., 1998, p. 279). In addition, the answer to the "how" question was likely to be from the

identification and analysis of practice-based routines with embedded and sticky knowledge which cannot be analysed effectively except within its naturalistic context (Yin 2009, pp. 8, 11).

The objective of Chapter 4 is to provide an understanding of the case study data collected, identify the key themes and patterns in the data and to understand the key innovation capability dimensions in each case study. The Chapter begins with an introduction to the CO and follows with the analysis of the three embedded business units in order to identify whether the case data supported the propositions generated through the literature.

A cross-case analysis highlights the similarities and differences in approaches in the formation of an innovation capability. The case-derived OIC is then described.

Chapter Four

CASE ANALYSIS

4.1 Introduction

This research is focused on examining the development of an innovation capability in three embedded business units with an IT solutions business focus within the case organisation (CO). These business units displayed varying levels of innovation performance, and the case analysis will reveal the different innovation capability foundations and approaches to innovation capability reconfiguration to align with changing business environments.

The objectives of Chapter Four are to present the findings of the data analysis, identify key themes and patterns in the data and to present the key innovation capability dimensions within three business units of the CO. This Chapter begins with an introduction to the CO and a discussion of how "history matters" and the paths and positions which defined it. The case analysis continues by exploring the embedded and inherited path dependencies of the three business units to establish how their current innovation approach emerged. The process of analysis involved building concepts from the data and seeking evidence to support linkages between those concepts. Emphasis was placed on routines as the fundamental units of capability operation and drivers of change. In addition, the analysis revealed how the path dependencies have affected each of the business units in their response to internal and/or external environmental pressures and how they embraced change in their approach to innovation.

The data was interrogated to identify evidence that confirmed the presence of dimensions evident in the literature as contributing to an OIC and clarified the constructs that defined them. Evidence was sought to support or reject the research

framework generated through the literature which captured the interrelationships between the components. The data was examined to establish the presence of additional dimensions, interrelationships and constructs that were not evident in prior literature.

A cross-case analysis was then undertaken to highlight similarities and differences in approaches in the formation of the innovation capabilities and to inform the innovation dynamic capability framework which emerged from the data. In Chapter 5 the framework is compared to that derived from the literature, seeking explanations of differences in dimensions, constructs and linkages.

4.2 The Case Organisation – Inherited and Embedded Path Dependencies

4.2.1 Introduction

It is well established that the paths that a firm has travelled shape, guide and constrain the available and viable paths for its future (Helfat et al., 2007, p. 100; Teece et al., 1997, p. 522). This section provides a brief perspective of the inherited and embedded path dependencies of the CO which will inform the analysis of the three business units. An analysis of the CO's paths, resources and processes provides valuable insight into the path dependencies of those business units and how those dependencies, resources and processes impacted upon each business unit's innovation capability in the changing business environments that each faced.

The CO commenced operations in the mid 1990's when it split from its parent organisation. The parent organisation's heritage extended to the mid 1950's. In the second half of the 20th century it had a reputation as a highly regarded contractor in major engineering projects and, later, the government high level security sector (GHLSS). After the split, the CO was primarily a single project GHLSS technology contractor. Through a process of strategic diversification it acquired complementary and expansionary resources and grew to become one of Australia's largest privately owned diversified companies, delivering products and services to government and

commercial markets in Australia, the United States, the Pacific and Europe (CO website).

The CO had, at the time of the research, total assets of approximately A$1 billion, annual revenues of over A$1 billion and employed 3,500 people (CO Innovation Speech by Group Managing Director, 2005). It aimed to build a culture of innovation: a culture which listened to customers; looked for opportunities; invested in research and development; encouraged initiative and capitalised on new ideas. It also claimed to be driven by the challenge of delivering innovative solutions that its customers valued highly.

4.2.2 Path Dependency Challenges

A "risk averse", narrowly defined customer driven innovation culture

When the CO was formed it was a major GHLSS contractor with a long term contract for the delivery of successive shipping infrastructure projects. The tight control of a second generation unlisted family owned company with a single GHLSS project posed significant innovation management challenges. While a desire to devolve management responsibility to the business unit level was evident, "every time something slightly goes out of wack they revert to form and want to control everything" (FBU4).

These path dependency challenges were encapsulated in the following quotation:

> (the CO) has had one major customer being the government and in particular, the (GHLSS) …(P)laying to that customer's needs… sets a certain culture..., a narrow mindedness all of which typically is not the sort of characteristics you are going to look for in encouraging innovation. The (GHLSS)…tends to be hugely conservative, averse to risk.…(O)ur people tend to be therefore conservative and averse to risk, both of which mitigate against having highly creative, innovative minds and highly creative innovative solutions (Cor1).

Knowledge and resource constrained innovation

The CO's key capabilities (project management and system integration for major GHLSS infrastructure projects) were embedded in the management of major long term and highly technical and technology intensive projects, primarily for the

GHLSS. These capabilities led to the organisation having a reputation for completing projects on-time and on-budget (FBU5, SBU6, SBU2, Cor1). The financial imperatives from these projects resulted in a focus on a trilogy of fiscal measures (profit, cashflow and economic value add) without significant recognition of the value of intangible assets, and in particular, knowledge and intellectual property. Senior management in the CO regarded key issues pertaining to innovation, such as knowledge capture and sharing, as "overhead intensive activities" and so relegated them in importance (FBU5, Cor1, Cor6, Report on Knowledge Sharing, Expertise Location and Technology Transfer in the CO, 2005). Staff were required to "stay focused on the hole in front of them" and "were not permitted to look outside of the project to see and react to what (was) on the horizon or even to help and learn from people in adjacent trenches" (Cor1). Activities which might be innovative and could result in cheaper, superior or more expeditious client outcomes were generally ignored (FBU5).

The CO had wide ranging technical skills (engineering for a broad variety of major GHLSS infrastructure projects, system design, software design and implementation, IT security) which enabled it to win GHLSS and Government infrastructure contracts for technology and technical products. As a high proportion of its staff were highly skilled engineers developing technical solutions, they played a dominant role in ensuring that the technical paradigm was the lens through which the world was viewed. While a technical mindset was essential for innovation, it provided a filter which either excluded or minimised the importance of other relevant information (Cor1, TBU3, TBU4). Knowledge sharing within the CO was not a cultural norm with knowledge lost because "people won't share it". The attitude was "I can't tell you that because you'll know as much as I do" induced by the "fear that knowledge sharing will put them out of a job" (Report on Knowledge Sharing, Expertise Location and Technology Transfer in the CO, 2005). In an audit of its knowledge management practices the CO was described as a "knowledge intensive organisation which lack(ed) the culture, process and infrastructure to satisfy its knowledge needs" (Knowledge Management Institute 2002). Where knowledge sharing did take place, it was carried out by passionate knowledge workers "as subversive activities in spite

of management" (Report on Knowledge Sharing, Expertise Location and Technology Transfer in the CO, 2005).

Organisational knowledge generated by projects was primarily technical or engineering based. Knowledge was regarded as project related and not maintained at business unit or organisational level. It was constrained in project silos within business units with the resultant "reinvention of the wheel" within different silos, "group think" and lost opportunities for collaboration and creativity, and, therefore, innovation (ibid., Cor4). This in turn led to substantial rework to develop processes and practices and to recreate engineering knowledge that existed elsewhere in the organisation but which could not readily be discovered in a timely manner (Cor6). Knowledge was also lost because of the culture of blame which resulted in high staff turnover in critical knowledge areas.

Blame oriented, silo thinking mindset

The CO's culture had three layers which originated in the CO's predecessor: firstly, an operationalisation culture responsible for the delivery and production of key assets; secondly, an engineering culture responsible for the engineering design of infrastructure assets; and thirdly, an executive culture (FBU4, FBU6, TBU1, SBU1). The engineering culture was characterised by "problem oriented knowledge workers…focused on delivering acceptable products to their customers" with those in executive management preoccupied with "increasing short term shareholder-added value" (Cor4) at the expense of longer term objectives such as innovation.

The tight management style resulted in a high turnover of line managers. Unsuccessful innovation attracted the "blame game" with "(h)uge recriminations, beating of chests" (FBU2/FBU5). "Line managers were generally hired from outside the organisation, often without (GHLSS) experience but rarely given an opportunity to learn from their mistakes - one strike and they were out" (Cor4). This blame orientation fostered a conservative, compliant, risk averse culture which discouraged innovation within the CO and innovation collaboration between business units.

With the acquisition and development of new business units came a silo mentality. Business units had different cultures (Cor1), competing business objectives and sometimes, unknowingly, competed for the same tender with different alliance partners (FBU1, TBU4, SBU5). Most of the business units wanted "to stick with business within their own units and this resulted in conventional and conforming behaviour. The people who tried and go cross business units were not in the main encouraged" (Cor1). In addition, there were structural impediments to cross-business unit collaboration and innovation.

The impact of this silo thinking mentality was expressed as follows:

> (W)e don't encourage people to cross over boundaries. We love the idea of innovation… but we don't build up a structure that really respects it or encourages it, because all of our economic responses for satisfactory completion are related to our stove pipes and as an organisation, until we can break that barrier, we're not going to have significant successes and innovation outside a single division (FBU1).

4.2.3 Organisational Resources

A strong financial position was one of the CO's key resources. As one of Australia's top 25 privately owned companies it had a low level of gearing. This balance sheet strength enabled it to diversify its operations from a single GHLSS focused business unit to eight business units in related and unrelated industries without external funding or concerns about shareholder reaction or stock market scrutiny (Interview by national business magazine with the Group Managing Director). The CO was highly skilled at sourcing resources externally through the acquisition of firms with complementary or targeted capabilities. Both the First Business Unit (COFBU) and the Second Business Unit (COSBU) were identified as complementary businesses and these acquisitions added learning and experience in dealing with GHLSS and related markets. While the CO successfully acquired complementary business entities with appropriate resources, it was less successful in integrating the acquired resources to maximise their impact within the CO (ibid., FBU1).

Through the technical strength of its workforce and its history of success either on its own behalf or through its acquired entities, the CO also had a strong partnership with

the GHLSS Research Organisation (RO). This partnership provided the opportunity to commercialise technology that either it had developed or had been developed by others, to develop new GHLSS capabilities and enhance to its innovation capability.

4.2.4 Processes

The CO's innovation processes were built in a major GHLSS project environment dominated by a private company command and control executive management culture. Its associated engineering culture was also developed in this narrow and highly constrained world. With its diversification into both GHLSS and non GHLSS arenas the CO became an amalgam of originally independent business units. Consequently, innovation was inhibited as there was little commonality of engineering documentation, technologies, systems or processes, even where the systems or processes were meeting similar business requirements (Cor1, FBU4).

Innovation management processes

In an innovation presentation the Managing Director stated that "innovation is integral to our approach to business, our organisational goals, our passion, our culture and is viewed as our fundamental means of differentiation from our competitors" (CO Innovation Speech by Group Managing Director, 2005). However, he recognised that there was a "gap between understanding innovation, and actually identifying it and turning it into a business proposition". While there was a strong management commitment to innovation as an organisation-wide practice there was a significant disconnect between what was espoused and actual practice. The CO had no innovation strategy and "no processes or platforms for employees to share knowledge across (business unit) silos" or geographic locations within the same business unit (Report on Knowledge Sharing, Expertise Location and Technology Transfer in the CO, 2005). In addition, the level of control and micro management impacted on the organisation's innovation propensity by constraining freedom of thought, freedom of interaction across the business and freedom of action (Cor1).

The Managing Director also recognised that "innovation is driven by culture, and the ability to implement" and that this could be achieved by harnessing the creative

power of its people and encouraging them to be "opportunistic entrepreneurs who are constantly looking for new ways of doing business" (CO Innovation Speech by Group Managing Director, 2005). Despite the General Manager's own warning that corporate leadership should "ever be on guard to ensure that this corporation itself does not become one of the biggest barriers to innovative thought and action" (ibid.), there was, amongst the interviewees, an overwhelming sense of frustration of the unrealised innovation potential of the firm due to the ubiquitous knowledge, structural and business barriers (Cor1, Cor4, FBU5, SBU4, TBU1).

Myopic customer understanding

The single GHLSS client orientation led to the CO having a limited understanding of customer relationship management and of customer value drivers. One major bid was lost because the CO "told the customer what it considered they should have, rather than bidding on what the customer asked for" (Cor4). Many bids were impaired because "of inefficiencies resulting from the failure of the command and control culture to understand time-savings and other benefits to be gained from effective content management technologies and wouldn't listen when these were offered. The resultant effect, in responding to tenders, was crisis management rather than knowledge management" (Cor4). This distance from customers focused the CO's initial innovation attempts on technology innovation due to the absence of an intimate knowledge of customer drivers.

4.2.5 Conclusion

While the CO exercised its leveraging capabilities through the acquisition of many companies, it did not develop an effective integration capability. There was little recognition of where the congruencies and complementarities existed across the firm and limited encouragement for business units to pool their skills and resources with those of other business units or encouragement of cross-divisional linkages or interactions with clients to address existing problems or enhance innovation throughout the organisation.

The innovation capability will now be analysed within three business units of the CO to identify the existence of organisational preconditions supporting the innovation capability. The analysis will initially be based on the framework that emerged from the literature review. Evidence of other components and interrelationships will also be sought. Emphasis in the analysis will be placed on routines as fundamental units of capabilities and drivers for change. The framework emerging from the data will be compared to that emerging from the literature to understand the dynamism that underpins an innovation capability and the factors which enable or inhibit that dynamism.

4.3 The First Business Unit (COFBU)

4.3.1 Introduction[4]

Through its predecessors, the CO had an unbroken chain of experience in the Australian aviation industry spanning eight decades. The history of the COFBU can be traced to a pioneering aircraft manufacturing organisation. It was purchased by the CO in the late 1990's as part of its strategy to broaden its high level security sector capabilities into related high technology areas and to provide a support capability for the Australian aviation programs.

The COFBU did not have an innovation strategy or a disciplined repeatable innovation process (FBU1-5) with innovation being described as ad hoc or happening unofficially (FBU1, FBU5). The innovation which transpired occurred "because individuals (found ways) to carry out innovation" (FBU1) or because "(w)e're innovative by definition – we're engineers" (FBU5). Despite the absence of an innovation strategy, the COFBU encouraged innovation indirectly with innovation solving specific problems within the context of a project (FBU4, FBU5).

[4] The notes inserted in the text indicate where preconditions and components from the case have occurred. The multiple notes supported the various linkages between preconditions and components in each OIC framework.

In 2003 the COFBU's financial performance was unacceptable as one of its acquired businesses had many poorly performing contracts and its business processes and procedures were inadequate to run the business effectively. The COFBU's performance was so poor that the CO's management directed that it be closed. However, the COFBU's management argued that it could be turned around by adopting a new strategic posture and business model (FBU4).

The management of the COFBU recognised that while "history matters" it could not guarantee its survival and that unless substantive changes were made to the business focus (called the business model by the COFBU) the business could fail in the short term. The following two subsections (4.3.2 and 4.3.3) outline the development of the OIC preconditions within the COFBU and the development of the dimensions of the capability supported by those preconditions.

4.3.2 Development of the OIC Preconditions

4.3.2.1 Transforming the Business Model through Strategic Entrepreneurship

The COFBU management perceived that with rising manufacturing costs, aircraft would be purchased from overseas and then fitted to Australian requirements. Its capabilities would, therefore, not be aligned with the new business environment and consequently market demand for its services would be low. The strength of this threat resulted in a decision to retire its aircraft manufacturing capability and so the challenge which confronted the COFBU was how to maximise revenue from its capabilities within the Australian aerospace industry.

- Strategic entrepreneurship
- Innovation culture – Innovation leadership
- Innovation pervasiveness – Strategic innovation (new business model)

To identify new opportunities the COFBU looked beyond its narrow path dependent search horizons and problem solving competencies. After gathering and filtering market and competitive intelligence from inside the firm and across the world, it peered through the fog of uncertainty and adopted a strategy implemented by a national overseas technology firm (FBU4). The focus of its new business model was on *through-life support*

contracts for the Australian GHLSS aerospace industry as these contracts generated 10 to 20 times the revenue that could be achieved from manufacturing aircraft (FBU4). For the COFBU, through-life support meant an integrated approach to ensuring that a major industry infrastructure program such as a fleet of aircraft or helicopters were supported during their operations[5].

- Innovation absorptive capacity

The through-life support contracts would be secured through the capability acquired from partnering with original equipment manufacturers (OEMs) of aircrafts and aircraft systems without representation in Australia. These OEMs were usually the suppliers of the major infrastructure to the GHLSS (FBU4). While the customer would be the same, it would be offered a new and distinct suite of services.

- Strategic entrepreneurship – Business model design & ecosystem shaping
- Alliance building capability – strategic alliance partner identification and assessment
- Alliance learning
- Innovation pervasiveness – Strategic innovation – new business model

To achieve this vision, the COFBU proactively developed three strategies. Firstly, it diverted from its aircraft manufacturer path and began to develop new capabilities such as the through-life support management capability, alliance building capability and partner specific learning capability. The General Manager said, "In our business, innovation is improvement in the business model itself. Transforming the business from what it was before to what it is today" (FBU4). To secure contracts, the COFBU developed strategic alliances which redefined its ecosystem, accelerated its capability development and differentiated it from its Australian competitors which were generally subsidiaries of overseas OEMs.

Secondly, the COFBU became "an industry trend setter" and, building on its commitment to through-life support, positioned itself as a high level system integrator with the capacity to act as a project manager for system integration as well as manage

[5] While major infrastructure projects include fleets of aircraft, fleets of helicopters or the like this dissertation will refer to fleets of aircraft for illustrative purposes.

other lower level or specialist system integrators (FBU6). The third strategic choice was building new aircraft *industry capability*. Capability gaps were generally identified through industry analysis and engaging intimately with customers to identify their technical and business needs. Once a capability gap was identified which aligned with the FBU's strategy it sought to build that capability - "We like to develop capability. We prefer to sell capability rather just ideas on paper. Usually we have to say, 'This is what we *could do* if we did this…' but now we can say, 'This is what we *can d*o now'. It's a much more saleable product" (FBU2, emphasis added). This emphasis on capability was essential to the decision to focus on through-life support and the development of strategic alliances with OEMs.

4.3.2.2 Enhancing Learning and Knowledge through Boundary Spanning

Addressing the silo mentality

- Strategic entrepreneurship – Proactiveness, Entrepreneurial intentionality
- Innovation culture – Innovation leadership

A major structural innovation within the COFBU was the introduction of domains[6] to facilitate the transfer, and transformation of knowledge across silos. In the aviation industry an aircraft manufacturer was required to comply with a regulatory framework for technical airworthiness management. The regulatory framework required two distinct but related competencies: a competency to *review* aerospace work and a competency to *approve* the work (FBU1). As a consequence, silos were created as divisions operated as their own fiefdoms. The silo mentality within the COFBU was also a legacy from the CO as staff focused on their "own local or functional imperatives" and did not cross boundaries (FBU5). The project centric structure reinforced narrowly defined responsibilities with staff focused on their own needs irrespective of the detriment to the COFBU or the CO.

[6] For the COFBU the domain was a professional community based on a sphere of expert knowledge e. g. air vehicle structures and design, avionics, software and project engineering, human factors, or systems engineering. The domain provided professional training, personal support and technical and academic stimulation (FBU2, FBU5).

The management of the COFBU recognised that the silo mentality was affecting its organisational effectiveness and innovation potential so it redesigned its business structure, architecture and processes. The open environment and the flat structure facilitated the flow of knowledge up and down the COFBU and helped minimise the impact of information decay. In addition, the COFBU had engineering management and domain leader meetings that were designed to share challenges, problems and solutions which were then communicated to the domains (FBU2). As a result, the language began to change with senior management speaking of the implications of activities to the COFBU rather than "engineering is doing something" or "commercial is doing its little bit in its own corner" (FBU5).

- Knowledge sharing structures

As a further part of its strategy to promote boundary spanning behaviour the COFBU established "a domain structure as well as a project structure which (made) it very easy to be flexible with your manpower" (FBU2). While domains had existed in an ad hoc manner, they were formalised as part of the COFBU structural re-design to stress their importance and to achieve its "fairly aggressive desire and ambition to bring in change to move to best business practice" (FBU5). This strategy provided a matrix approach to resource management with the projects, the "vertical stove pipes", and with the domains, the horizontal tier, providing the skill sets in engineering or technology (FBU2). In the domains, engineers "have their Alma Marta within the organisation which looks after their training, professional development, fun time… along with professional development" (FBU2). This resourcing strategy ensured that experience, excellence and expertise were spread across the COFBU rather than concentrated in a domain or project.

- Organisational learning capability - Commercially focused boundary behaviours (Generative learning, Unlearning)
- Innovation culture - Increasing employee engagement, Collaboration
- Knowledge sharing structures – Innovation experience/memory

The Human Factors Domain (HFD) – integrating knowledge and accelerating innovation

- Innovation culture - Increasing employee engagement, Collaboration

When the COFBU management identified one capability gap within the Australian aerospace market it established the HFD. The HFD had a defined approach to innovation, and, in particular, "quantum leap innovation" (FBU1), and developed its own innovation capability and innovation routines. With increased complexity in the business environment, the HFD was established as a permanent team based on industrial democracy principles. It became a "self organising organism" as staff were involved in setting the terms and conditions of their work and regularly participated in interdisciplinary work where the team members were empowered to contribute to defining the scope of their roles within the limit of what they, as individuals, considered comfortable. There was also a focus on the empowerment of "individuals and the team substructures academically, intellectually and humanly" and this empowerment facilitated the flow and integration of knowledge (FBU6).

As the COFBU was an engineering organisation, most of its professional staff were engineers. However, the HFD team was comprised of people who were not, in most cases, "traditional engineers" and people "you wouldn't necessarily put together" (FBU1). The domain principal explained the unique combination of people and, in doing so, broadened the traditional definition of an engineer within the HFD:

> … there's probably only one person who started off as an engineer. All of us have Master's and PhD's in relevant areas and are really part of the engineering area. If you take engineering, as anybody outside Australia would, to be a scientist who works in the real world and comes up with real world solutions, we're all engineers. But we include people who don't have "traditional" engineering qualifications. I was originally a medico: there are people who were originally psychologists, there are people who were originally working in kinestheseology, there are all sorts of people - one was a design engineer so on. And we put them all together, and they work together as a team (FBU1).

- Organisational learning capability - Commercially focused boundary behaviours (Generative learning, Unlearning)

Even though most team members were participating actively in one or more projects the HFD team met weekly where open discussion about methodologies, and project challenges and solutions took place. These meeting were also dedicated

to learning new skills and processes. This regular interaction continually challenged the status quo and encouraged effective problem solving, cross-fertilisation of ideas, knowledge sharing and innovation.

- Innovation absorptive capacity – Externally focused innovation learning structures and processes; Embedded resource sharing and external collaboration

The team operated as a pseudo-academic department to keep informed of the latest thinking. The challenging intellectual environment facilitated the integration and transformation of knowledge irrespective of its source. Domain members built networks and social capital within the academic community and with complementary partners. They actively participated in academic forums and made thought leadership presentations. The team members respected each others' intellectual capacities, conducted knowledge generating research projects and shared honours level literature reviews on pertinent research (FBU1). This rigorous intellectual, yet practical, environment was the HFD approach to prepare "for our future where were developing our own toolkit of tools and techniques which we're defining for ourselves" (FBU6).

- Organisational learning capability – Commercially focused boundary spanning behaviours (Generative learning, Unlearning)
- Innovation culture – Innovation leadership

The driver for innovation in the HFD team was selecting team members on the basis of their ability to cross boundaries. Innovation occurred "because boundaries have been crossed,…when you take ideas beyond where you're starting from" (FBU1). In the HFD team, crossing boundaries enabled staff to "take a systems approach to the world around them in a way that very few people actually know how to do" (FBU6) and this provided a broader view of what was salient to problem identification and resolution and avoided taking a simplistic view of causality.

- Organisational learning capability – Commercially focused boundary spanning behaviours (Generative learning)
- Knowledge sharing structures

One of the key benefits of the HFD was "that often people learn something in a different domain, a different area, and apply it in a new way" (FBU1). In a typical project, the team comprised representatives from various functions. If a problem arose the representative with the most appropriate functional expertise would

be asked to solve the problem irrespective of their capability to do so. Under the HFD approach, the domain contact person would identify the most appropriate domain staff member to address the particular problem (FBU6), thus enhancing the innovation capability.

4.3.2.3 Strategic Alliances – Rapid Capability Acquisition to support Innovation

- Alliance building capability – Strategic alliance partner identification and assessment
- Strategic entrepreneurship
- Innovation pervasiveness - Strategic innovation (new business model)

With the decision to focus on through-life support, it was essential that the COFBU develop strategic alliances with aircraft and aviation supplier OEMs (FBU4) and reach beyond its organisational boundaries to access new resources and develop new capabilities. The aim was that within three years the COFBU would be different to its competitors because "we'll have a much more diverse aerospace business with strong links back into those OEMs" (FBU4). The development of alliances with aircraft manufacturers and suppliers would provide preferential access to expertise and intellectual property which would enable the COFBU to be a centre of excellence in the South Pacific Region for an OEM.

- Alliance building capability – creation of idiosyncratic alliance resources and capabilities
- Innovation absorptive capacity

The benefit of establishing strategic partnerships was that the COFBU would rapidly build capability and achieve heterogeneity in the technical fitness of its capabilities as most of its "aerospace competitors …(were) subsidiaries of overseas (OEMs) so their product portfolio (was) limited (to) …what their parent produces or deals in" (FBU4). This capability heterogeneity and the barriers to imitation and substitution through multiple exclusive strategic partnerships enabled the COFBU to achieve a competitive advantage. The COFBU established key relationships with OEMs from the inception of the new focus to the time of the research. This enhanced its alliance building capability and, consequently, its innovation capability.

- Knowledge sharing structures Innovation experience/memory
- Strategic entrepreneurship
- Innovation absorptive capacity
- Alliance building capability – Alliance learning

A strategic alliance was also formed by the CO with the RO which provided the COFBU with the opportunity to conduct contract research and development (FBU2). While this approach provided the RO with valuable research, intellectual property and enhanced GHLSS capability, it was a mutually beneficial arrangement as it also enabled the COFBU to develop new or complementary competencies and deep partner-specific learning. Through the strength of relationships developed and innovation demonstrated by the HFD, the COFBU positioned itself strategically as a trusted adviser and source of problem solving expertise for the RO (FBU4) so that "when the government has a question they ask (the RO), and when (the RO) can't answer it they come to us" (FBU1).

4.3.2.4 Capability Life Cycle

The implications for the business model transformation are reflected in the capability lifecycle in Figure 4.1 below. This diagram depicts the evolutionary path of the through-life support capability. The COFBU's trigger of change was the realisation that with the GHLSS's move to acquire aircraft from overseas, its manufacturing capability would need to be retired. The decision to change the business model is reflected in the development of the through-life support capability supported by the COFBU's regenerative and renewing dynamic capabilities.

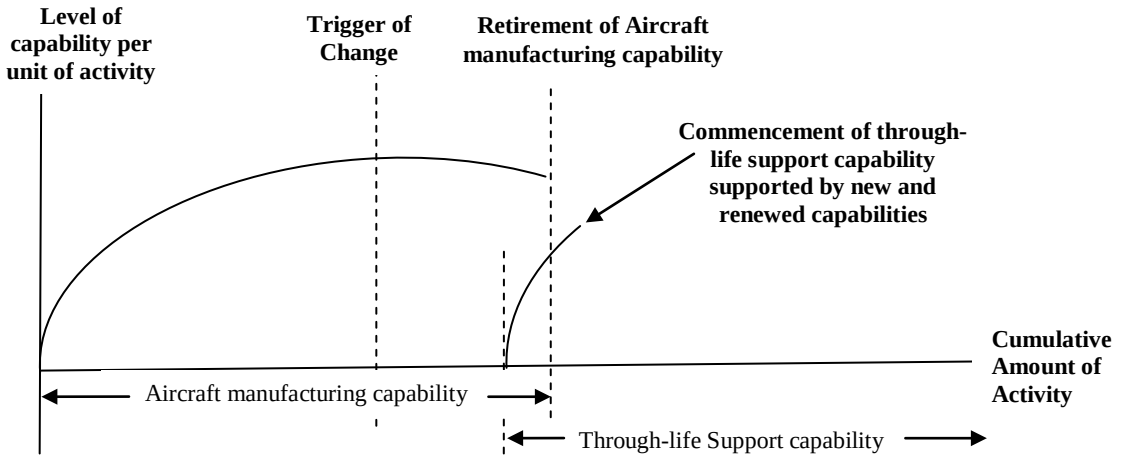


Figure 4.1 Capability Life Cycles within COFBU

4.3.3 Development of Dimensions of the OIC supported by the Preconditions

4.3.3.1 Innovation Pervasiveness

- Innovation pervasiveness – Multi innovation focus (process), Strategic innovation (new business model)
- Organisational learning capability – Commercially focused boundary spanning behaviours (Generative learning)

With the change in business model came the realisation that the COFBU would need to redesign its strategic architecture and that its integration and co-ordination routines would need to be transformed. Four significant innovation themes were implemented. Firstly, the COFBU developed new business process architecture within the context of external and self-imposed constraints (FBU5). In addition, there was an emphasis on increasing innovation into the design process through elegant design and rapid prototyping (FBU2, see section 4.3.3.2). The second innovation driver was the need to solve problems which arose within projects. Through-life support contracts for aircraft fleets offered sporadic problem solving opportunities which had long run cost implications (FBU5). The staff's passionate problem solving propensity was encapsulated by the General Manager:

> The guys go off and say, "How are we going to solve this?"…They will not lie down and die. We have some excellent people who say, "We can find a solution for this". Our guys are very good at it. We have found solutions in some instances for some of our overseas partners where they just didn't know what to do (FBU4).

- Knowledge sharing structures – Innovation memory/experience
- Innovation absorptive capacity – Transformative and exploitative learning

The COFBU recognised that "ad hoc problem solving" was not a capability. Through the introduction of domains, embedded problem solving capabilities and cross-functional interaction, the COFBU focused on accelerating its managerial cognition capability by challenging the assumptions and mental models upon which prior path-dependent decisions had been made. The third area of innovation activity was in research and development where activities were limited to those which directly aligned with the COFBU's business objectives, met anticipated project needs or built new capability (FBU5). Finally, innovation occurred through the reconfiguration of resources arising from the formal implementation of the domain/project matrix structure.

With the absence of effective business processes and procedures impacting its performance, the COFBU mapped, streamlined and aligned its business process architecture to its new business model. "Essentially it is our aim to completely re-do the entire set of process, policies and procedures of the organisation from top to bottom" to give the COFBU a business-wide view (FBU5). One of the key initiatives was to implement the Capability Maturity Model Integration (CMMI) to integrate its traditionally separate functions, to continually identify process improvement priorities, to provide guidance for quality processes and a point of reference for assessing the current processes (FBU4). However, while the COFBU achieved CMMI level 2, its driver to achieve level 3 was meeting business and customer needs rather than simply process improvement (FBU5).

- Innovation pervasiveness – Multi innovation focus (process)

4.3.3.2 Reconfiguration and Integration Capability to support Successful Innovation

The change from manufacturer to through-life support business service provider and the delivery of capability required new business, operational and knowledge management models as the life cycle of an aircraft could extend over 30 years or more. With objectives of continuous airworthiness and continuous process improvement, the COFBU needed an intimate understanding of its customer's operational environment to ensure that aircraft fleet availability was maximised. Accordingly, the management of knowledge within the COFBU was essential to deliver a through-life support program that satisfied customer expectations. The effective capture, deployment and use of knowledge would lead to increased innovation resulting in improved airworthiness, safety and increased availability, profit and employee satisfaction.

- Innovation pervasiveness - Multi innovation focus (Product, Managerial, Process)

Removing obstacles to knowledge sharing and Lessons Learned

Through proactive leadership the COFBU sought a business model outside of traditional aircraft manufacturing and its learning boundary (represented by arrow A in Figure 4.2 below). Its boundary spanning extended to functions within domains, within projects,

- Innovation Culture – Innovation leadership

between domains, between projects, between business units of the case organisation and with external alliance partners. Through its new behaviours it developed market orientation and relationship management dynamic capabilities which would improve its market sensing, market seizing and learning capabilities (vertical, horizontal, project and domain) as well as its alliance building capabilities. The COFBU also put in place structures and processes to learn how to acquire, synthesise and act on market knowledge better and how to improve their ability to form and maintain relationships.

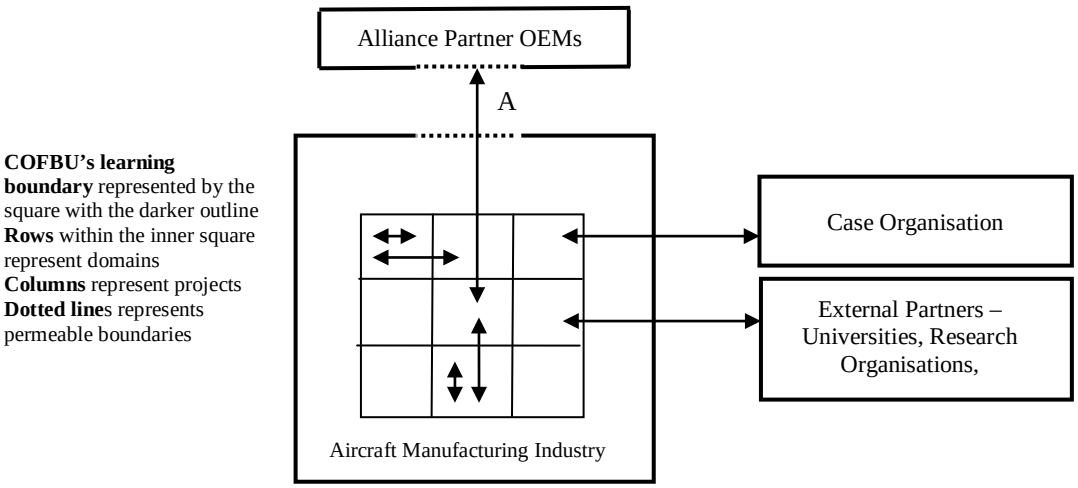


Figure 4.2 COFBU Boundary Spanning Behaviours

- Innovation culture – Increasing employee engagement, Innovation leadership, Collaboration
- Knowledge sharing structures – Innovation experience/memory

Some subject matter experts were impediments to sharing expertise but they were replaced with "those generally younger and more amendable to change and sharing knowledge" (FBU4). This has resulted in improved knowledge sharing and ideation for products and innovation. Lunch and learn forums were held twice every month to facilitate the integration of internal and external knowledge. Information and learning were shared and ideas presented for discussion and refinement (FBU2, FBU5). Even though these forums were "in your own time, bring your own lunch" style of meeting, the COFBU has "a never ending stream of people coming and attending" (FBU2).

Lessons from a legacy acquisition provided business clarity and managerial innovation resulting in the focus on through-life support contracts (FBU4). However, at the project level the COFBU had a "minimalistic lessons learned process" (FBU5). Lesson learned routines were carried out on a project basis with opportunities for improvement and the avoidance of project errors identified. However, while lessons learned project reports were generated and shared with middle managers, lessons learned routines were inconsistently applied within the COFBU (FBU5).

- Knowledge sharing structures – Innovation experience/memory

Problem solving and rule breaking as catalysts for innovation

Problem solving, either of a specific challenge or a serendipitous project need, was a core capability of the COFBU. While the entitlement culture encouraged conventional and conforming behaviour a new cultural paradigm was introduced which no longer accepted the status quo (FBU4).

- Innovation culture – Increasing employee engagement

The COFBU problem solving capability was enhanced by staff who encouraged people to persistently ask questions and to critically examine what they did (FBU1, FBU2). A young production manager in a south coast hangar facility was concerned with the efficiency of his work area. His persistence in asking "why" questions led to a review of the procedures and the streamlining of the work practices. His initiative and his unwillingness to accept the status quo led to a reduced turnaround time for the project, a much happier workforce and a delighted customer (FBU2).

- Organisational learning capability – Commercially focused boundary spanning behaviours (Generative learning, Unlearning)

Elegant Design and Rapid Prototyping

One of the key routines that the COFBU developed was called "elegant design". This process ensured that the object designed not only achieved what it was intended to do but also did it "efficiently and effectively" taking into account the environment in which the equipment would be used, the materials from which it would be manufactured and

- Innovation pervasiveness - Multi innovation focus (Process)

how it would be maintained (FBU1, FBU2). Because of its emphasis on the integration of multiple disciplines, elegant design required engineers to view the design brief holistically. It required the ability to see relationships between seemingly unrelated fields, to detect patterns of activity and to achieve innovation by combining elements in new ways. Accordingly, "when you start thinking about what elegant design is, then you're going to actually deal with innovation in one way or another, be it sequential or be it quantum leap" (FBU1).

- Innovation pervasiveness - Multi innovation focus (Process)

The HFD team also established a rapid prototype routine to accelerate and reduce the cost of development. Typically, most aerospace designs comprised highly developed and detailed plans and specification even though a prototype had not been developed to test the design. The high workload and cost involved in developing the plans and specifications encouraged personal and economic attachments to the plans. There was consequently a reluctance to change plans even though the change would have produced a superior outcome. The importance of rapid prototyping to "getting it right the first time" (FBU4) is stated below:

> In a rapid prototype environment, what you're doing is you're actually developing and testing your prototypes, prior to putting them on paper. You're keeping a record, but the record isn't a paper record, it's an electronic and visual, and so we're actually able to significantly evaluate the success of a product, in the lab, prior to it officially being designed. And that of course means that we're nearly there by the time we've actually put in down onto paper. And we're nearly there in a way that succeeds in engineering terms. (FBU1)

4.3.3.3 Creating a Dynamic Innovation Culture

- Innovation culture - Innovation leadership, Increasing employee engagement

The General Manager said "the biggest challenge" was to change the culture from an entitlement engineering culture with an orientation towards analysis, the centrality of technology and following institutional rules to a pragmatic performance based culture (FBU1, FBU4). Many of its staff came from the GHLSS and had an expectation that they had a job for life. Others from the predecessor organisation had the same expectation because of its entrenched hierarchical career path which emphasised "training and

developing people over 30 to 40 years" (FBU6). The staff were accustomed to highly formalised rules with detailed procedures leaving little opportunity for initiative. The narrowly defined job descriptions meant that there were low levels of responsibility resulting in staff only doing the minimum work. People also tended to be risk averse with creativity and innovation sacrificed for security and consistency (FBU4).

- Innovation culture - Increasing employee engagement, Innovation leadership, Performance results based culture

The culture was "keep working until you get the job done" irrespective of the contract requirement or commerciality of such an approach, and "all care, no responsibility" with a strong blame element (FBU4). There was "a tendency with our engineers who like to be perfectionists to just keep doing things and we've found that we've moved completely away from the (contract) baseline…". "We had to change the culture to a 'can do' approach", "a results oriented culture, rather than a hard work culture, where people are held accountable…" The General Manager consistently built trust by demonstrating his own accountability: "If I've said "I'll do this for you", I've done it...That's when people give you their trust" (FBU4).

The need to ensure that the business not only survived but was well positioned for growth resulted in a new approach. As the General Manager said, "we've been able to change that pace. We operate as if there's no tomorrow and operate as though we're constantly in a recession" (FBU4). The transition to a performance culture was achieved by ensuring that the staff of the organisation supported the corporate vision. "(I)f we found people who weren't going to change we helped them to move on. So we've brought in quite a new regime now. It has been done quite intelligently as we didn't just throw the baby out with the bath water" and "we captured intellectual property that those leaving held". In recruiting new employees, the COFBU targeted staff who had a record of achievement and who had a "can do" attitude, "Not people who just say, 'We work bloody hard'" (FBU4).

- Innovation culture - Increasing employee engagement

In the COFBU's culture there was a lack of decision making capability and initiative, particularly in middle management, as the price of failure was blame and rejection.

In the new culture greater accountability was balanced by increased empowerment with staff being "given a fairly free hand to go off and do things within the constraints of our contractual obligations. So no one's stopped from doing things" as long as its "ethical and in the interests of the company and shareholder" (FBU4). Leadership training and the introduction of improved business systems provided better and increased information for decision making. An incentive scheme, aligned to performance, was introduced for the management team with rewards for achieving agreed business results (FBU4).

- Innovation culture - Increasing employee engagement, No blame

One of the other major changes to promote innovation was the acceptance of failure. While the CO had a blame culture which had infected most of its business units, the COFBU recognised that "if you make a decision you are either right or wrong. So we don't punish those who make wrong decisions. My view is that if you deliberately break the rules twice then that's trouble. I'm sure there's an exception but we don't want to make rules to control the minority, the 2%" (FBU4). The capability extended to, where appropriate, abandoning existing rules and finding or developing an alternative practice or process which was better than the existing practices and processes (FBU1).

- Innovation culture – Innovation leadership, Increasing employee engagement

Another factor which helped change in culture was the change of premises. The previous "hard work/long hours" culture was aided by the availability of free parking. The move to the new premises facilitated a "results oriented culture" as "people plan their work better and catch the train. So if you walk down at 6.30 or 7.00 pm you can shoot a cannon and no one's there. But I think they have a better work/life balance" (FBU4).

The former culture was characterised by a lack of vitality, energy and passion. The General Manager stated that when he first toured the COFBU there were "just staring eyes and as you keep walking, they keep following you around. When I told them these were the things we were going to do they just looked at you in disbelief". As a result of the changes, employee engagement rose from 25% to 44% (in an eighteen

month period) and there is a lot more life and energy as "people feel they can do a lot of things that they thought previously they couldn't do" (FBU4, words in parenthesis added). The new life that emerged in the COFBU stimulated innovation as staff were passionate about their work and encouraged "to practice their calling i.e. allowing engineers to engineer" (FBU2). This understanding of the people-centeredness of organisational performance as well as innovation has borne results as customers can now see a visible change in the COFBU's operations and this has, in turn, created stronger customer relationships (FBU4).

4.3.3.4 Innovation Absorptive Capacity and Knowledge-sharing Structures

As the new business model was based upon intimate engagement with overseas OEMs, the innovation absorptive capacity is inextricably linked to the externally focused boundary spanning behaviours which resulted in the acquisition of complementary knowledge and to the alliance building capability (see sections 4.3.2.2 and 4.3.2.3). The knowledge sharing structures (principally the domain/project matrix structure) have also been described at length in the former section.

4.3.4 Conclusion

With the GHLSS sourcing aircraft from overseas the COFBU changed the primary focus of its business model to seek leadership in through-life support for the Australian GHLSS aerospace industry. In this major organisational shift, the COFBU recognised that it was not trapped by its history and that it could shape its business by investment choices and identifying and implementing new strategic priorities. The key to the COFBU's success was the ability of its entrepreneurial management to perceive the discontinuity between its former and new environments and the identification and development of appropriate dynamic capabilities to calibrate the new business model to the new environment.

The three COFBU's OIC preconditions – strategic entrepreneurship, organisational learning capability and alliance building capability – are depicted in Figure 4.3 together with the underpinning constructs. The preconditions were essential

antecedents for the formation of the COFBU's OIC. The framework demonstrates the centrality of strategic entrepreneurship as it provided the impetus for the organisational learning and alliance building capabilities as well as focusing the COFBU's attention on acquiring relevant external knowledge. These capabilities are dynamic as they support continual learning as well as changes in the processes, behaviours and structures that define them. They facilitated multi-directional learning - vertical, horizontal, project and domain – and accelerated the development of absorptive capacity routines for the acquisition of alliance partner knowledge as well as enhancing the breadth and depth of firm and individual absorptive capacity.

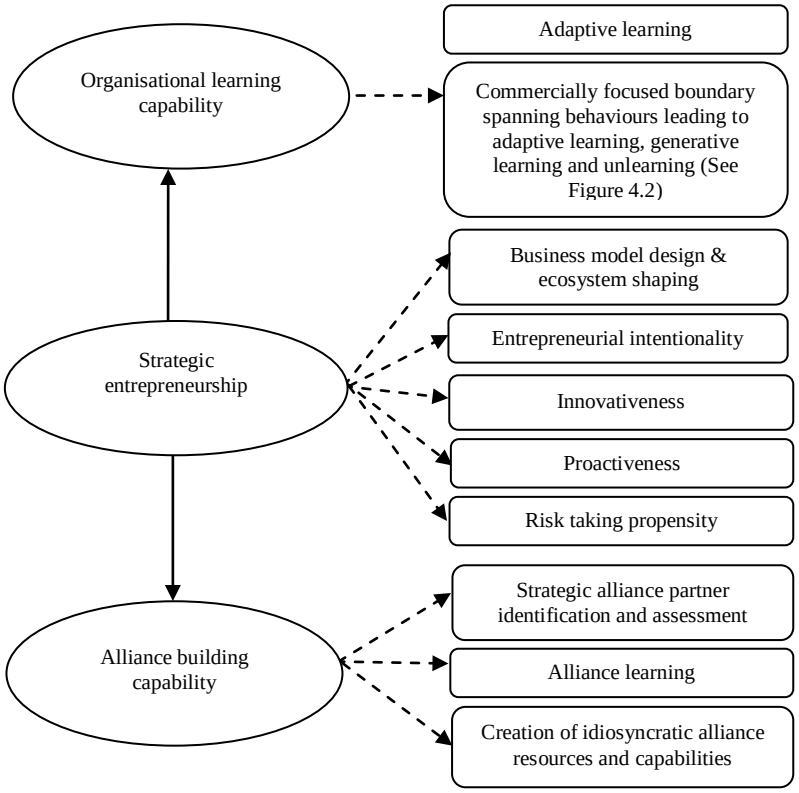


Figure 4.3 COFBU Preconditions and their Underpinning Constructs

Strategic entrepreneurship is linked to the business unit's organisational learning capability through the COFBU's extensive search process to identify alternative business models and the dynamic learning in the iterative process of information gathering, information processing and further information search. The primarily outward focus of the inquiry and its focus on strategic alliances provided the linkage to the alliance building capability and innovation absorptive capacity. The business

model transformation involved strategic alliance partner identification, assessment and the subsequent creation of idiosyncratic alliance resources and learning capabilities. The breadth of the business transformation created the need for proactive decisions in relation to innovation pervasiveness and the need for the development of knowledge sharing structures to ensure that acquired knowledge was shared, transformed and exploited.

The external focus of the alliance building capability stimulates and supports the innovation absorptive capacity component through alliance learning. Building innovation knowledge was the primary driver for the establishment of the relationship, and learning how to facilitate this knowledge flow fed back into reconfiguration of the business unit's organisational learning capability. The four components of the OIC framework - innovation absorptive capacity, innovation pervasiveness, knowledge-sharing structures and innovation culture – are depicted in Figure 4.4 (see page 107).

Innovation within the COFBU was pervasive and this component is linked to all three preconditions. Innovation was driven through strategic entrepreneurship and captured within the new business model. As a consequence of a dynamically changing organisational learning capability, new business-wide process architectures were developed, and the project/domain matrix structure established to ensure that knowledge within the organisational memory was shared and developed. Innovation pervasiveness also expanded as a consequence of increasing the number of external partners with whom it shared, acquired and developed complementary knowledge (i.e. its alliance building capability).

Finally, components of the unit's innovation absorptive capacity and knowledge-sharing structures emerged as a consequence of the dynamic properties of the COFBU's organisational learning capability. These dynamic changes were driven by the strategic objective to acquire external knowledge from alliance and other complementary knowledge owners, and to capture and reuse the innovation knowledge and experience to facilitate learning and optimise the sharing of that

knowledge. Underpinning the organisational learning capability was the business unit's innovation culture. Through innovation leadership a performance-based collaborative culture was introduced, and this provided the impetus to challenge the status quo and for the acceptance of failure in innovation without blame.

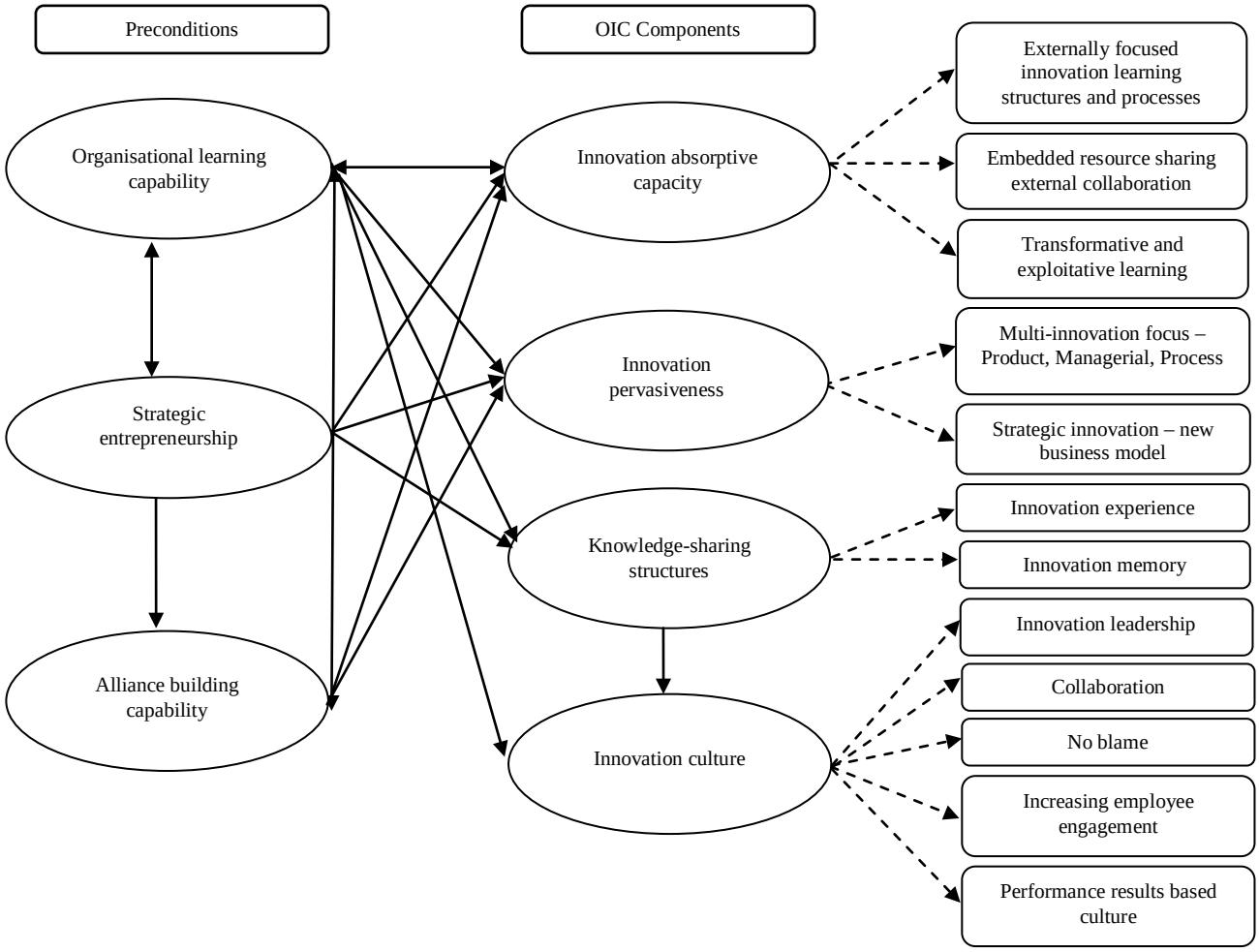


Figure 4.4 Organisational Innovation Capability Framework as derived from the First Case Analysis

4.4 The Second Business Unit (COSBU)

4.4.1 Introduction

This embedded case study focuses on the transformation of the COSBU from an enterprise with primarily one large GHLSS client to a business which was diversifying its reach in clients and technologies. This expansion into the commercial sector and other security-conscious Government organisations was accelerated by the increased emphasis on national security following the events of September 11. The transformation from entrepreneurial adhocracy to strategic entrepreneurship ensured that innovation was at the forefront of the COSBU's operations, and confirmed strategic entrepreneurship as a precondition driving innovation capability change.

The following two subsections (4.4.2 and 4.4.3) will outline the development of the OIC preconditions within the second business unit and the development of the dimensions of the capability supported by those preconditions.

4.4.2 Development of the Preconditions

4.4.2.1 Transforming the Business Focus through Strategic Entrepreneurship

- Strategic entrepreneurship – Business model design
- Business-wide strategic innovation – new business model

With the changing focus of its major client to the engagement of overseas contractors, and with limited project and tender opportunities, the COSBU's management reviewed its strategy and developed a Strategic Technology Roadmap (the Roadmap) to provide it with a new direction. The COSBU's leadership understood the impact of path dependencies by recognising that its position was the result of its formation as an entrepreneurial engineering firm (the original firm) with primarily a GHLSS client base and its subsequent purchase by the CO. As the General Manager stated: "It was important for us not to let our past successes limit our future approach to innovation. Don't let the past get in your eyes!!" (SBU8). The COSBU's new strategies demonstrated that "history matters" and that changes were required to its organisational routines to ensure that the constraints of its history and the investments that its predecessors had made in its repertoire of routines did not impair its innovation capability.

Following its scanning of the environment and the assessment of changing opportunities and competitors, the COSBU took definitive steps to broaden its historical path of selling primarily to the GHLSS. It exercised its integration and co-ordination capabilities to expand its focus to the sector of the (commercial high level security sector) CHLSS which had similar needs to the COSBU's existing client base (SBU1).

- Strategic entrepreneurship - Entrepreneurial intentionality

The new strategy had three planning horizons. The major third horizon objective was for non GHLSS revenues to match revenues from GHLSS sources. In the strategy, management recognised the need to place innovation at the forefront of its operations and, in doing so, provided a clear reference point for all decisions. This common understanding facilitated better communication and strategic alignment across the lines of business, disparate teams and organisational boundaries. The Roadmap identified key synergies within and across the lines of business, interdependencies in regard to technologies and capabilities, and gaps in COSBU capabilities and within the product and solution portfolio.

- Strategic entrepreneurship - Entrepreneurial discipline

The Strategic Technology Roadmap provided strategic innovation practices to move the COSBU from its ad hoc entrepreneurialism and its project oriented GHLSS dominated path dependency (SBU4). The aim was to provide deep co-specialisation between parts of the COSBU innovation system and tight co-ordination across sub-systems. These practices included a portfolio approach to product and capability development, a product pipeline framework with a Stage-Gate based process, management commitment to the provision of innovation resources and a cultural shift towards a product mindset. The COSBU also implemented strategies to calibrate the strategic goals with the organisational structure and routines pertaining to idea capture and management and the personnel required to ensure the goals were achieved (SBU1).

4.4.2.2 Achieving Entrepreneurial Fitness through Strategic Entrepreneurship

- Strategic entrepreneurship - Entrepreneurial intentionality, Entrepreneurial discipline, Proactiveness
- Innovation culture - Facilitative leadership

One of the key approaches adopted by the COSBU to reshape its path dependencies was to improve its entrepreneurial fitness. Its management recognised the need to be more strategic in order to achieve the value enhancing orchestration of assets within its own boundaries, and between enterprises and other institutions within its business ecosystem. The COSBU had an entrepreneurial philosophy which could be traced to the firm's founder. He was technically creative but also understood that research was needed to achieve business goals (SBU7). However, entrepreneurship was ad hoc and needed discipline and focus to achieve its business objectives (SBU1, SBU8).

- Innovation culture - Facilitative leadership, Collegiality, No blame
- Strategic entrepreneurship – Risk taking propensity

The entrepreneurial philosophy was enhanced by the firm's collegiate culture (SBU7, SBU6, SBU5) which recognised the "people-centredness" of innovation. It was characterised by the sharing of information, acceptance of failure, ease of access to management, "working hard, (and) solving difficult problems" (SBU6). In addition, "you did what you had to do", "were free to think and put up ideas" and staff felt comfortable working in "an entrepreneurial environment, where risks were taken" (SBU5). The open access to management and the "freedom to get up and walk around, talk to one another" promoted information sharing and also reduced the impact of information decay (SBU3).

The culture was symbolised by the beer fridge. The founder was a traditional engineer where beer was a part of the culture so the fridge became "a meeting place where guys could just have a beer and sit down around the table and discuss anything from technical problems to the projects they were working on" (SBU6, SBU1). It continued to be part of the culture in the COSBU (SBU1).

- Innovation culture – Facilitative leadership, No blame

The imperative for action and the entrepreneurial culture in the original firm, was encapsulated in the frequently quoted maxim -"Seek forgiveness, not permission but don't be suicidal"

(SBU1, SBU5, SBU7). This approach was exemplified by the founder's reliance on the heroics of individuals and their ability to achieve the right results for the business. "He gave you a pretty blank canvass…(and the) freedom to bring whatever you thought was right to the table" and wanted staff to "(g)o out and do things" (SBU7).

The leadership was proactive in focusing the entrepreneurial drive of the COSBU on strategic and disciplined innovation. The General Manager said:

> As leaders we need to be constantly generating, otherwise at best we will sustain the business at its current level or worse, it will decline. The requirement to "generate" is intimately linked to the *process of innovation* and it must become *a core competency* throughout the organisation, not just within an R&D group or isolated within one section of the company. It needs to pervade the way we do business (SBU1, emphasis added).

- Strategic entrepreneurship - Entrepreneurial discipline
- Systematic innovation – Innovation Management System

The Roadmap provided the analytical framework for innovation and focused on the COSBU's Innovation Management System – ideation, product evaluation and selection, product development and product commercialisation. The General Manager recognised that new routines were required to expand absorptive capacity to effectively and efficiently transfer, translate and transform the new knowledge acquired from the new relationships formed (see strategy 2 below in Figure 4.5 on page 112).

- Strategic entrepreneurship - Entrepreneurial discipline, Proactiveness
- Innovation culture – Facilitative leadership
- Alliance building capability - Strategic alliance partner identification and assessment
- Innovation Absorptive Capacity

In order to "generate" the required innovation, build on the COSBU's ad hoc innovation processes and develop a sustainable competitive advantage, the COSBU leadership team implemented three strategies (SBU8). The impact of these strategies on the COSBU's Innovation Management System is depicted in Figure 4.5 below.

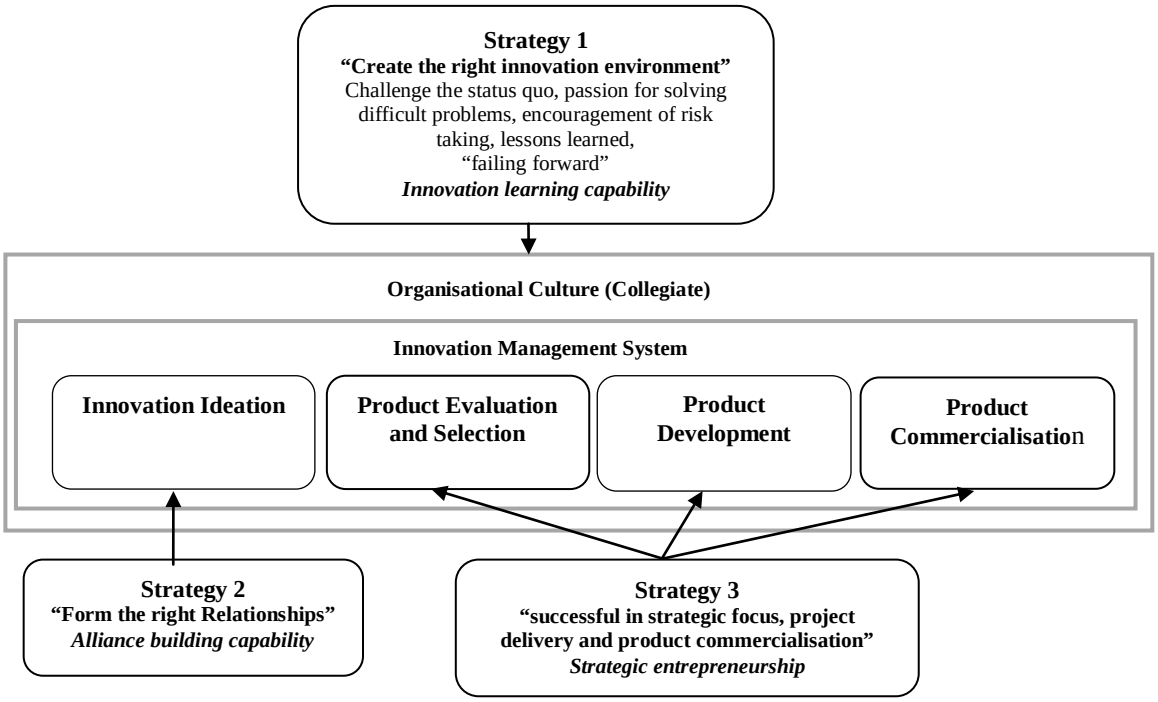


Figure 4.5 Innovation Management System Strategy Impact

The *first* strategy was to create the right environment for innovation (Enhancing the Innovation Culture section 4.4.3.4). This required a commitment to innovation at the leadership level and the commitment of time and resources even though immediate revenue targets were of primary concern. The COSBU appointed a Product and Innovation Manager with responsibility to manage and champion the innovation process. The Manager reported to the General Manager and was a member of the Management Team.

The Roadmap created a shared understanding of the COSBU's objectives and accelerated the innovation process through the prioritisation of products and solutions and the development of capabilities aligned to the Roadmap.

The *second* key initiative was to form the *right* relationships with external research organisations, customers, partners and, where appropriate, with competitors to gain access to research, intellectual property and complementary knowledge (SBU7) (Developing an Innovation Absorptive Capacity, section 4.4.3.1). The *third* strategy, to be successful in project delivery, product commercialisation and strategic focus

(this section), recognised "that innovation was ineffective unless it could be converted to a business outcome" (SBU8).

4.4.2.3 An Organisation-Wide, Generative Learning Capability supporting a Problem Solving approach to Innovation

- Innovation learning capability – Generative learning
- Innovation culture – Facilitative leadership

The importance of learning to the COSBU can be readily inferred as its organisational values and problem solving capabilities support a strong learning orientation (SBU7). One of the key elements of the COSBU's Vision was to "solve difficult problems" and this was supported by its people-centered employment value proposition crafted around the understanding that its staff were passionate about technology, highly intelligent and committed to solving difficult and unique problems. Staff were "challenged to do something that someone else hasn't been able to do or no one else has done before which is going to stretch them as well and take technology to a new level or take design to a new level for them. That's what they get turned on by. That's what they think is exciting and good fun" (SBU7).

- Systematic Innovation– Innovation Management System

The COSBU employed highly skilled staff and fostered an environment of trust (SBU1). This environment allowed staff to feel comfortable about failing in their quest for the next innovative product or solution. The COSBU introduced a reward and recognition scheme and key performance indicators for its line of business managers related to their involvement in and support of the innovation process to ensure they provided their staff with the necessary "thinking time" away from projects to be innovative (SBU1). This allocation of time for ideation and innovation was critical as there was pressure to ensure that all employees were engaged in paid project work (SBU5).

- Innovation learning capability – Generative learning

The COSBU's learning capability was reflected in the desire of its staff to "challenge old assumptions". This generative, double-loop learning approach enabled the COSBU to "change its view of the world" and solve difficult and novel problems (SBU1). The COSBU had formal and informal learning routines to facilitate knowledge

sharing and socialisation. "Lunch and Learn" was a regular forum where 50-100 people heard about lessons learned from project successes and failures, innovative research or interesting technology developments from internal or external speakers (SBU1, SBU3, SBU5, SBU6). These information dissemination sessions also provide opportunity for discussion about technical and co-ordination issues and difficult challenges within projects.

- Systematic Innovation - Innovation experience/memory
- Innovation absorptive capacity - Externally focused innovation learning structures and processes
- Innovation learning capability

Most sharing of technical knowledge took place at the monthly meetings of the Product and Innovation Group where representatives from each line of business shared project-related technology developments, identified opportunities for collaboration or joint projects and transferred, translated and transformed knowledge gained from customers and external sources. This Group sponsored forums and some informal networks (SBU1). The COSBU also shared knowledge in the various engineering communities of practice. All of these knowledge acquisition and sharing routines facilitated the integration and assimilation of learning so that it could be applied and implemented in new projects, and in doing so, facilitated innovation.

4.4.2.4 Alliance Building Capability

The COSBU's second key initiative was to form the right business relationships. As with the COFBU case study, there is a strong correlation between this capability and the innovation absorptive capacity. These two capabilities are described together in more detail in section 4.4.3.1.

4.4.2.5 Capability Life Cycle

The capability life cycle implications of the business focus transformation are reflected in Figure 4.6 below. The GHLSS capability was an established capability of the COSBU and CO. The trigger of change was the realisation that the GHLSS was primarily focused on the engagement of overseas contractors and that, as a consequence, the COSBU would need to broaden its capabilities in order to survive (SBU1). The decision to expand the business focus is reflected in the development of

a CHLSS capability which is depicted as starting with a low degree of maturity relative to the COSBU's capability in the GHLSS.

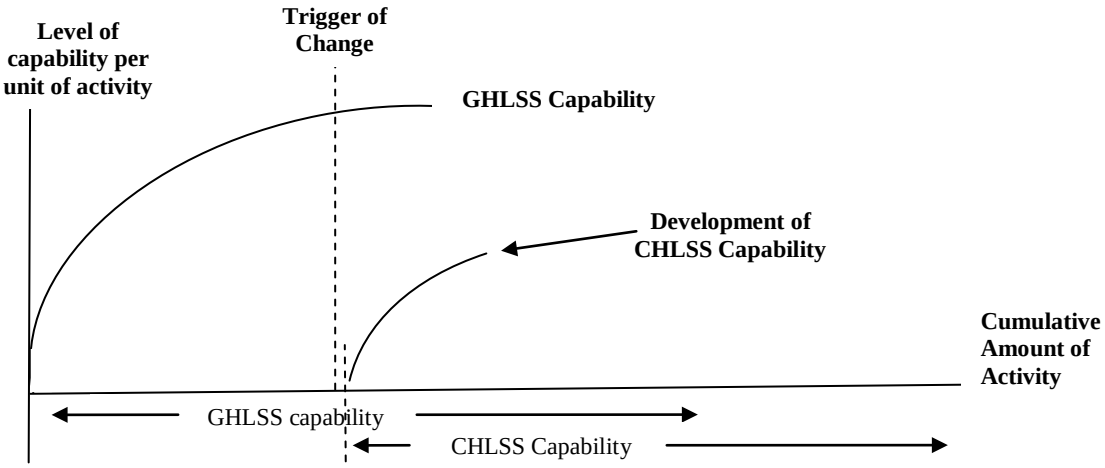


Figure 4.6 Capability Life Cycles within COSBU

4.4.3 Development of Dimensions of the OIC supported by the Preconditions

4.4.3.1 Developing an Innovation Absorptive Capacity

Inside-Out Path Dependency

The technical project orientation of the COSBU resulted in insular management practices and a limited understanding of customer drivers (SBU3). In the GHLSS environment any compromise could endanger lives, so the highest level of technical capability was utilised irrespective of the cost, so engagement with the COSBU was, therefore, frequently based around the technology and the technical capabilities of its personnel. In contrast, the commercial business environment balanced the cost of achieving technical excellence with the benefit or desirability of achieving that level of excellence.

The research and development work of the COSBU tended to be opportunistic technical projects with limited time frames and budgets. When a tender was won it was a long term project with a highly technical orientation. While customer relationships were of some importance the technical outcome of the project was the predominant consideration so a mindset developed which was "driven by schedules and costs" (SBU6). While this mindset did not inhibit innovation in the original firm,

it was a barrier in the COSBU because of its inherited project behaviours. The focus was a major inhibitor of innovation as "We don't necessarily have any room to do anything on standard projects other than that which was originally planned" (SBU6).

Outside-In Approach

- Innovation absorptive capacity - Form the right relationships, Transformative and exploitative learning
- Systematic Innovation - Innovation Management System

The key elements of the outside-in approach were *firstly*, to "form the right relationships" with external parties who could enhance the quality and relevance of the ideas submitted to the ideation process; *secondly*, to re-structure of the COSBU to reflect the new external business focus; and *thirdly*, to import knowledge through the introduction of new staff who had experience in the markets the COSBU was targeting.

- Innovation absorptive capacity - Form the right relationships, Transformative and exploitative learning

Forming the right relationships was intended to facilitate outside-in innovation and energise the product ideation process and cross-fertilised teams that collaborated across lines of business (SBU7). To limit its dependence on the GHLSS, the COSBU engaged more broadly with the science and technology community (co-operative research centres, universities specialising in key technology areas which enhanced its technical capabilities and expertise). Regular forums were convened to share technical and innovation knowledge, and intellectual property, and to identify opportunities for idea prototyping, solution development or collaborative research (SBU7). This proactive engagement with customers was essential to gain insight into their articulated and latent needs.

- Business-wide, strategic innovation
- Innovation learning capability – Generative learning
- Innovation absorptive capacity - Transformative and exploitative learning
- Innovation culture – Facilitative leadership

The COSBU's strategic management focus was not limited to technology innovation. It extended to managerial innovation in all parts of the business. The Outside-In approach helped the COSBU appreciate that it did not have a product and sales focus and this recognition provided the impetus to change the COSBU structurally (SBU1, SBU3). The COSBU recognised that its knowledge was limited primarily to

dealing with GHLSS and that this would constrain its ability to implement its product and market development strategies. It recognised it "didn't have anyone that had an understanding of the market and the sales process for products" and so appointed a business development manager with expertise in the GHLSS and experience and established relationships in the CHLSS. This manager brought understanding of the CHLSS, new selling skills and knowledge of channel management, and accelerated the assimilation of external knowledge (SBU1).

Systematic Stakeholder-focused Ideation supported by an Innovation Absorptive Capacity

- Systematic Innovation - Innovation Management System, Innovation experience/memory
- Business-wide, strategic innovation – multi innovation focus
- Strategic entrepreneurship – Entrepreneurial intentionality

Innovation ideas were generated spontaneously by staff, by planned and unplanned customer needs identification activities or through the development of "the right relationships". In addition, ideas were also captured in relation to process and business improvements (SBU1). These ideas were screened based on established criteria such as market attractiveness and strategic alignment with the strategy of the business unit.

- Innovation absorptive capacity - Transformative and exploitative learning

The COSBU was proactive in its attempts to acquire specific knowledge from customers, competitors and from other generators of knowledge pertinent to its technology roadmap. This emphasis was directly related to the COSBU's unsuccessful attempts to commercialise technology where it "innovated so much, we cost ourselves a fortune, because it was bleeding edge instead of leading edge" (SBU3, SBU7). In many cases the COSBU ignored market requirements and were "developing something and being innovative for the sake of it" (SBU3). These experiences reinforced the learning that "(a)ny innovation has to be done within the framework and the context of the market" (SBU3). The COSBU also collaborated with competitors who had "part of the puzzle" which could help it to achieve a technology or solution objective (SBU7).

Part of the COSBU's strategy in building closer relationships with customers, particularly commercial customers, was to appoint business development managers with experience in working in the CHLSS (SBU3). It also appointed a manager of sales and marketing for "product" in order to inject commercial reality into the R and D process (SBU3) to ensure that "at the end of the day, if one of these ideas did get up… there is always an assurance that it gets justified against market demand" (SBU1).

- Innovation absorptive capacity - Externally focused innovation learning structures and processes

4.4.3.2 Business-wide Strategic Innovation

Evidence supporting the notion of business-wide strategic innovation includes the sourcing of ideation from all areas of the business unit as well as from external partners, the systematic innovation referred to in the following section as well as managerial innovation.

4.4.3.3 Systematic Innovation through Portfolio Management and the New Innovation Process

From Ad Hoc Product Development to Portfolio Management

The original firm had such a small number of employees that "(e)veryone else knew what was going on" (SBU6). Product development was ad hoc as products were developed based on GHLSS's perceived or articulated needs and often isolated and costly capabilities were built irrespective of the firm's ability to leverage such capability. These unstructured innovation processes were transferred from the original firm to its successor and also existed for a period in the COSBU (SBU4). Accordingly, project selection decisions were often ineffective as decisions were made without reference to any strategic framework. There was also a strong reluctance to kill projects even when they were unlikely to be successful (SBU5, SBU8).

The aim of the portfolio approach was to provide strategic focus and assist the COSBU achieve its business goals, including winning projects, developing and selling products,

- Systematic Innovation– Innovation Management System, Innovation experience/memory

developing adjacent markets, enhancing capability, and developing strategic relationships (COSBU Strategic Technology Roadmap). Portfolio management was critical to innovation in that it provided a balance of activities between the competitive tensions of short and long term priorities, across lines of business and also of the type of activities undertaken. Portfolio management required sufficient levels of activity at each stage of the technology maturity continuum aligned with the strategic goals of the COSBU. The implementation of the portfolio approach generated more targeted innovation opportunities with the intention of increasing financial performance without increasing the amount spent (SBU1, SBU4).

- Strategic entrepreneurship - Entrepreneurial intentionality
- Alliance building capability - Strategic alliance partner identification and assessment

Capability development was also a key priority. With key capabilities mapped in the Technology Roadmap, the COSBU identified opportunities for *capability enhancement* through the winning of key projects or the building of external alliances; or *capability development*, where the capability did not exist within the COSBU. The focus was on developing capabilities which could be applied in multiple contexts to increase the probability of success (SBU1). Even where the technology itself may not have achieved a favorable business outcome for the COSBU, opportunities for capability development were identified and delivered competitive advantage by securing profitable new projects and business opportunities based on that capability (SBU7).

From Ad Hoc Idea Management to Disciplined Product Pipeline

- Systematic Innovation - Innovation Management System, Innovation experience/memory

The COSBU established infrastructure for the capture and evaluation of ideas for product innovation and process improvement. The systematic process for idea evaluation was essential as the CO required a "convincing business case to demonstrate that the idea (was) worth investing in" (SBU7). To provide this discipline, the COSBU developed a "repeatable mechanism by which you could document an idea and develop a business case for it" (SBU7).

The COSBU used the NASA Technology Readiness Level framework to assess the maturity of its evolving technologies. Most of the innovation activities of the COSBU were in the Early Stage R and D/Concept Development and Prototype Development/Concept Proving stages. External projects tended to be small to medium in size and attracted margins typically of 10%. However, margins in excess of 30% were required for product and business sustainability (SBU4). The challenge for the COSBU was to select product opportunities that could be successfully transitioned from the prototype stage into mature products with well-defined routes to attractive markets. The COSBU leadership team recognised that "crossing the chasm" was difficult and usually required a strong market pull. Hence, a key success factor was a greater focus on an outside-in approach to understanding its customers. To solve this challenge the COSBU developed a series of key themes within which it categorised new product ideas and only funded one or two projects within each theme (SBU8).

- Systematic Innovation - Innovation Management System

The need to prioritise financial and intellectual resources to efficiently manage product ideas was a major challenge so the COSBU implemented a structured framework based on Cooper's Stage Gate process (Cooper 2002) (SBU4). By establishing objective criteria on which go/kill decisions in the stage gate process could be made, the COSBU improved the quality and timeliness of decisions, improved prioritisation within the Product Portfolio and managed resource allocation more efficiently. The General Manager stressed the importance of the process as follows:

> The lesson for us has been to try and drown those puppies that don't stack up in the early stages of the business case, and focus on just a few key products in the pipeline. Initially, we tried to do too many things at once, and ended up starving a bunch of puppies to death over a long period of time (SBU1).

4.4.3.4 Enhancing the Innovation Culture

- Innovation culture

COSBU management was committed to providing a challenging innovative work environment to the extent that "if we don't give you what we say we're going to give you then you come and kick us in the head and tell us we're not doing it...That's where we can differentiate as an employer because you

work on really interesting innovative jobs" (SBU1). The COSBU's recruitment policies also reinforced the employee's desire to solve difficult problems with recruitment targeted at "the top 10% of graduates – very bright and highly motivated - who are really passionate about technology". So over a beer or coffee "the ideas tend to get the better of them and they start to run away with themselves and get enthusiastic and imaginative. That sort of culture breeds ideas so the collegiate environment helps the idea generation process" (SBU7).

- Innovation culture – Collegiality
- Innovation learning capability – Generative Learning/Unlearning

The COSBU had a culture amendable to learning through its "open-mindedness" and its collegiate culture (characterised by egalitarian knowledge sharing and problem solving around the beer fridge). Unlearning was also implicit in some of the structural changes within the COSBU. With path dependent knowledge largely relating to the COSBU's interaction with the technical projects for the GHLSS, there was an imperative to develop new learning routines for engaging with commercial customers and the sale of technology products and solutions.

- Innovation learning capability
- Innovation culture - No blame/failing forward
- Systematic Innovation - Innovation experience/memory

The responsible risk seeking propensity was balanced by the acceptance of failure. The General Manager said, "You've got to just push the boundaries and by pushing the boundaries you will at times fail" (SBU1). His role was to create the "environment to allow people to feel comfortable about failing … and giving them the framework in which to fail comfortably and feel that that's not career limiting for them". By providing this psychological safety, a no blame culture was promoted with a focus on "failing forward" - learning from the failure, analysing why it went wrong and sharing the lessons (SBU1).

4.4.4 Conclusion

The changing focus of the GHLSS in engaging overseas prime contractors rather than local system and technology integrators resulted in a significant loss of revenue for the COSBU. While its path dependent success could have limited its vision, management recognised the importance of not being constrained by its history. Like

the COFBU's OIC, this OIC had three preconditions - strategic entrepreneurship, innovation learning capability, alliance building capability - which emerged from the case analysis of the COSBU. These are depicted in Figure 4.7 together with their underpinning constructs.

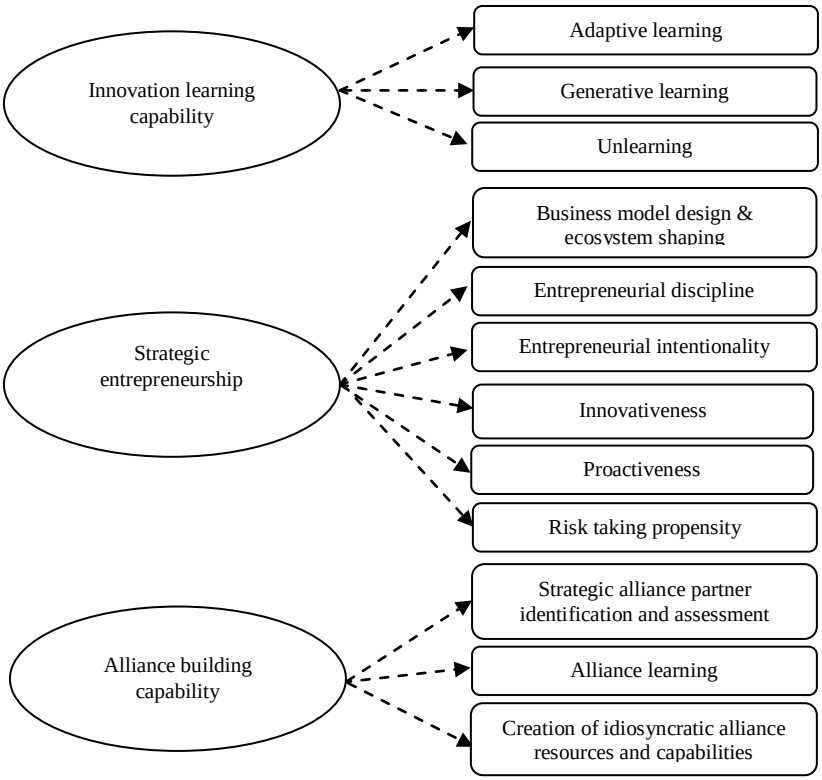


Figure 4.7 COSBU Preconditions and their Underpinning Constructs

The case analysis identified the pivotal role of strategic entrepreneurship through the COSBU management's orchestration and co-alignment of assets and resources to meet its changing environment. An essential element of its transformation was the purposeful transition from entrepreneurial adhocracy to a strategic entrepreneurship which added discipline, structure and focus. Strategic entrepreneurship established the critical role in successful innovation of systematic approaches to capturing and synthesising knowledge generated internally and through alliance partners (innovation learning capability, alliance building capability and systematic innovation). Through proactive leadership, the COSBU introduced an outside-in approach by leveraging and building social capital and forming the right relationships with external partners who could enhance the quality and relevance of the ideas

submitted to its ideation process (alliance building capability and innovation absorptive capacity). This provided a continuing stimulus for innovation.

These preconditions were complemented by four components - innovation absorptive capacity, business-wide strategic innovation, systematic innovation and innovation culture – which are depicted in Figure 4.8 together with their supporting constructs. The COSBU's goal to acquire complementary knowledge and innovation experience from external knowledge providers and to exploit that knowledge to commercial advantage, stimulated the development of changes to the business unit's innovation learning capability, alliance building capability and innovation absorptive capacity.

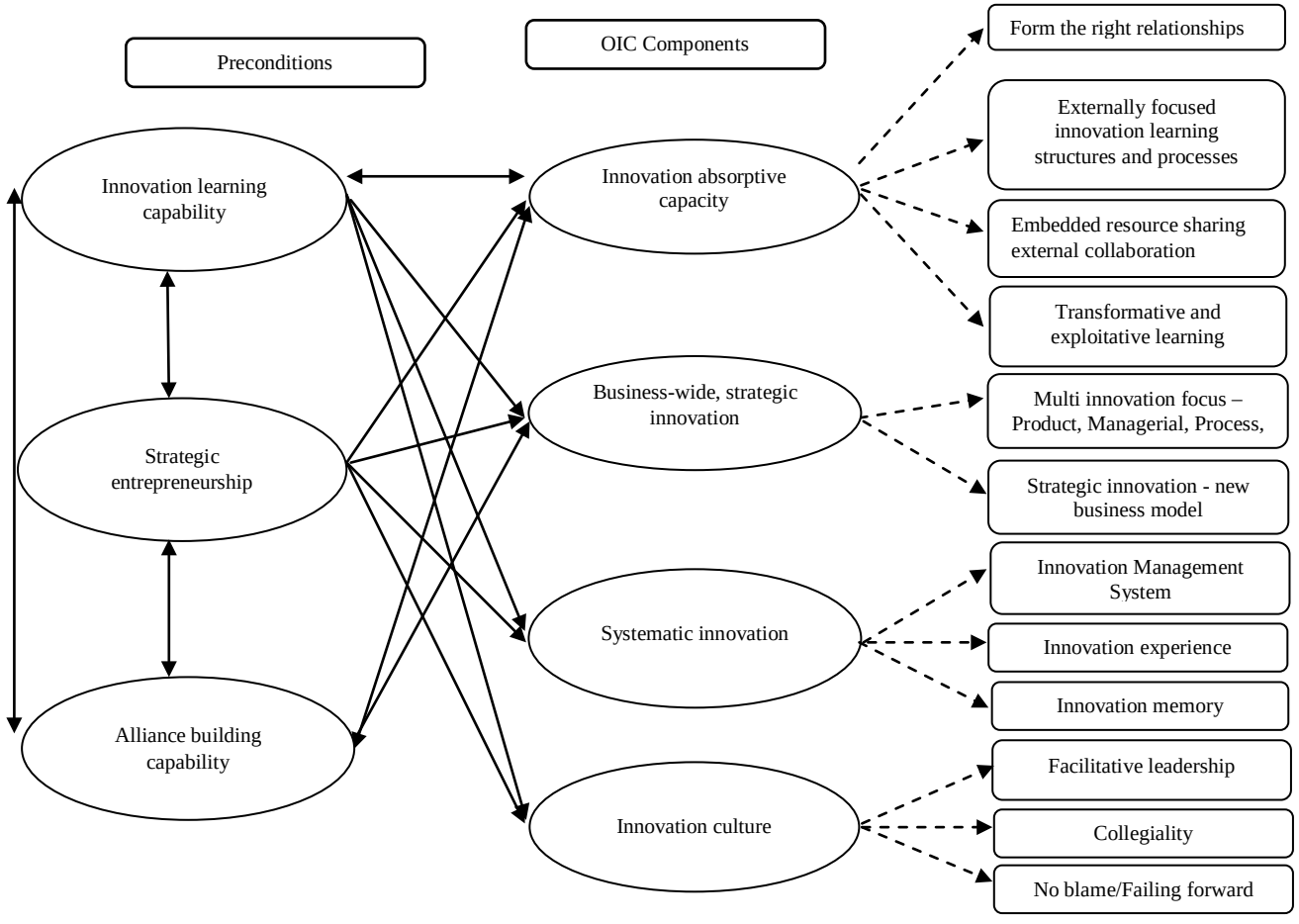


Figure 4.8 Organisational Innovation Capability Framework as derived from the Second Case Analysis

The business-wide, strategic innovation resulted from the firm's strategic entrepreneurship. It encompassed an extension in the business model to the CHLSS

and widespread changes in innovation processes and routines to add structure and discipline (Entrepreneurial discipline and intentionality). All of these management decisions were underpinned by the COSBU's collegiate culture, and the willingness of the staff to solve difficult problems and to challenge the status quo. The dynamism of these capabilities is evidenced through the continual learning and change in the processes, behaviours and structures that defined them.

Like the COFBU, the relationship between the alliance building capability and innovation absorptive capacity was readily apparent as the COSBU's strategy involved a high level of proactive engagement with external knowledge providers and partners. The strong emphasis upon generative learning (stemming from the collegiate culture and willingness to challenge the status quo) provided the basis for continuous learning and the renewal of innovation infrastructure and business processes (business-wide strategic innovation and systematic innovation) to build congruence and complementarities among and between those processes.

4.5 The Third Business Unit (COTBU)

4.5.1 Introduction

The Third Business Unit (COTBU) was established in 2002 when the CO leveraged the resources of the COSBU and established a business unit to commercialise a suite of IT security products based on intellectual property developed by the COSBU for the RO. The resources transferred to the COSBU included the IT security product suite, GHLSS brand, intellectual property, a key technical security researcher and the ability to leverage the reputation, alliances and relationships of the COSBU and the CO.

The COTBU claimed to be a world leader in the provision of secure information management solutions to both government and private enterprise clients. Its products facilitated the secure transfer of information between separated IT networks of different classifications whilst maintaining the integrity and availability of both the network and the information transferred. A critical element of the value proposition

was that the product suite was independently certified through a costly and detailed examination of its security features to ensure that it met the claims of the vendor.

The COSBU had developed the intellectual property and secured the early sales. When the COTBU was established there was resentment even though the COSBU was contracted to continue the development of the product suite. The relationship between the COSBU and the COTBU was not a normal commercial relationship (described as "a working relationship") (TBU4) as the business units in the CO were organisational silos with little co-operation or knowledge sharing between them. Even though the COTBU was the COSBU's customer, it had little influence on the product development timetable as the COSBU had limited time for non-scheduled enhancements or, when time was available, it was generally some time in the distant future (TBU2). Because of its previous project focus, the COSBU also had limited understanding of commercial customer needs or time priorities and so were unwilling to change schedules to reflect customer imperatives (TBU4).

- Innovation culture (Negative) – Collaboration
- Knowledge sharing structures (Negative)

The silo mentality was also evident between functions in the COTBU. Despite its small size most discussions took place within the specialised functional groups. The COTBU culture, which still existed to a degree, "suggests that people had defined roles and job descriptions and if innovation was not part of your job description then you were not part of the innovation process. It's related to knowledge and who perceives they have the actual knowledge or access to the knowledge in the environment" (TBU4). Those at lower levels within the firm who worked in isolation from customers had ideas about product innovation, but had not been empowered to share their ideas (TBU4).

Unlike the COFBU and COSBU, which were the outcome of the CO's acquisition capabilities, the COTBU was formed as a stand-alone businesses unit. In contrast to those business units, which tendered for major high value GHLSS infrastructure projects, the COTBU sold a product suite in the commercial market as well as the GHLSS. While it had established customers in the GHLSS, the COTBU's goal was

to drive sales in the Australian CHLSS and in overseas commercial and GHLSS markets, particularly the United States. While the COFBU and the COSBU brought with them the paths, positions and processes of their predecessors, the COTBU followed the paths of its parent. Accordingly, this case differs from those of the COFBU and COSBU and provides a contrasting negative case and perspective of the formation of an OIC.

The CO's decision making and problem solving frameworks were developed for high value long term GHLSS projects and were inappropriate for the dynamic environment of commercial markets. In addition, while the COTBU and COSBU adapted to a rapidly changing external environment and developed dynamic capabilities which enhanced their innovation capability, the COTBU was unsuccessful in its entrance into the CHLSS market in Australia and in its expansion efforts (TBU1).

4.5.2 Developing a New Business

- Organisational learning capability (Negative) - Generative learning, Unlearning

Having a ten year exclusive license of the IT security product suite (initial license was granted to the original firm in the mid 1990's), and after successful initial sales to a select part of the GHLSS by the COSBU, the CO considered other sales opportunities within Australia and across the globe. It commissioned a consultant to examine market opportunities for the IT security product suite and also market research from a leading IT research organisation. On the basis of this research, which it accepted without questioning the assumptions upon which it was based, the CO decided to target other participants in the GHLSS as well as the CHLSS (TBU5).

As the technology was unique the COTBU had first mover advantage with high barriers to entry. The major challenge in making sales to the CHLSS was that the products were based on an IT security architecture that was rarely found outside the GHLSS. While the architecture offered much greater security there was a significant trade off in terms of accessibility and flexibility. Accordingly, a large part of the "go to market" effort was directed at customer education as failure to develop broad

market acceptance would limit product uptake and, therefore, the success of the COTBU (COTBU Five Year Strategic Plan, 2002/2003).

The new paths developed by the COTBU were highly divergent from the paths of the CO in the following ways:

- **Solution Sale**: Firstly, in the CHLSS the COTBU would be selling an IT security *solution* to satisfy an undefined and often unarticulated client need where in GHLSS there was a specific need defined in detail through the tender process;
- **Entering New Markets**: Secondly, the CO and COSBU had been engaging in known and familiar GHLSS markets where now the COTBU would be competing in unknown and unfamiliar markets in Australia (CHLSS) and internationally (CHLSS and GHLSS), either directly or through unfamiliar channels.
- **Managing Distributors and Value Added Resellers**: Thirdly, the CO generally secured projects by a tender process with a known customer and specified deliverables. When successful the CO became the prime contractor managing a large long-term, high value, Government infrastructure project controlled by project managers with an engineering and technical orientation. The sale of the IT security product suite involved the sale of product, in large quantities but at a fraction of the price of a major GHLSS project, on a continuing basis either directly to the GHLSS or indirectly through distributors and value added resellers to the GHLSS or the CHLSS.

The Solution Sale in Commercial Markets

To demonstrate the attractiveness of the new market for value added resellers, the COTBU needed to engage directly with commercial buyers whose buying propensities were largely unknown. Even though the US GHLSS market was similar to the COTBU's Australian market, it was more complex, highly parochical and wary of new vendors. In competing in the CHLSS, the COTBU adopted a solutions-based approach to satisfy an undefined client need. For the COTBU, this required the

development of a level of customer intimacy to which it was unaccustomed and for which it was ill-equipped.

- Innovation absorptive capacity - Transformative and exploitative learning

The COTBU benefited from the reputation of the CO and the COSBU as major Australian GHLSS contractors and the strength of their relationship with the RO. However, while the CO brand was strong in Australian Government procurement its brand strength did not transfer to commercial IT markets. To enhance its selling capability to industry sectors in the CHLSS, business development managers were hired to target specific commercial sectors (utilities, health, banking and finance) that were considered to be more susceptible to education about the increasing importance of IT and information security. Hiring industry specialists was designed to increase understanding of commercial customer product selection drivers.

Entering New Markets and Managing Distributors and Value Added Resellers

The COTBU was committed to developing its capability to enter new markets both in Australia (the CHLSS market) and overseas (the CHLSS and GHLSS markets). The initial demonstrable market was anticipated to be from the GHLSS which was familiar with the network-separation architecture. The largest of these targets was the US GHLSS, followed by GHLSS agencies in the UK, Canada and other NATO countries, which had formal certification requirements for IT products connected to government networks (COTBU Five Year Strategic Plan for 2002/2003).

The major challenge for the COTBU was that the product suite was in a new product category as everybody "trusted their operating system" and there were insufficient incidents to warrant commercial organisations increasing the level of security (TBU5). The development of the end user market was a necessary condition to stimulate a distributor and Value Added Resellers (VARs) interest as they would provide access to high volume commercial markets as they had strong customer connections. Tapping into this network was intended to give the COTBU a multiplier effect providing potentially hundreds of front line sales staff marketing the IT security product suite. However, the COTBU had little experience in engaging with

these top tier distributors as a supplier and little understanding of its target markets. As a consequence, the COTBU sought to enhance its alliance management capability and by extending its existing partner learning capabilities into new areas. By developing these capabilities it hoped to improve its understanding of customer needs and drivers (COTBU Five Year Strategic Plan for 2002/2003).

4.5.3 The Unsuccessful Business Outcome

- Organisational learning capability (Negative) – Generative learning, Unlearning

The COTBU was largely unsuccessful in its attempts to enter the commercial market in Australia and the GHLSS markets in the US and UK. While the COTBU identified reasons for the failure as the absence of the mainstream adoption of the separated networks methodology, the lack of global distributions channels in place and the inability to achieve commercial sales (COTBU Five Year Strategic Plan, 2002/2003), the lack of success was attributed by interviewees to its failure to move from its engineering focus, its failure to understand customer drivers and failure to adapt its value proposition to reflect customer needs (TBU1, TBU3).

- Organisational learning capability (Negative) – Generative learning, Unlearning

In its first two years commercial sales were low with three of the four Australian based CHLSS business development managers failing to make a sale. "(T)he appropriate market research of the customer base hadn't been done to a degree and a level that was required" (TBU1) and "we didn't study or understand the market enough" (TBU3). While product trials were offered to customers there "have been times where we've thrown the (IT security product suite) 'over the fence' to the customer and said, 'You guys test it and come back to us with a purchase order'" (TBU2).

- Organisational learning capability (Negative) – Generative learning, Unlearning

The COTBU failed to learn from its lack of success due to the technically oriented information barriers it unconsciously held. As one interviewee expressed it, "failure has been accepted for a long time. We are one big failure or one succession of failures" (TBU3). The reliance on its parent's knowledge caused the COTBU to adopt a product push focus with emphasis on the technical merits of the product rather than looking at value and

benefits from a customer's perspective. The limited absorptive capacity and information barriers led to the misguided assumption that "if we build a better IT security product suite the world will come knocking at our door and that we would sell thousands of seats to organisations such as Telstra" (TBU3).

- Organisational learning capability (Negative) – Generative learning, Unlearning
- Organisational learning capability - Adaptive learning

These information barriers led to the COTBU's failure to assimilate customer feedback and marketing practice which would have guided customer engagement. The General Manager said, "There weren't major strategic changes. There were more subtle incremental changes which eventually led to abandoning the approach to the commercial market. I don't think there was one major strategic change" (TBU1).

4.5.4 Capability Life Cycle

An example of the capability development life cycle for the COTBU is depicted in Figure 4.9 below.

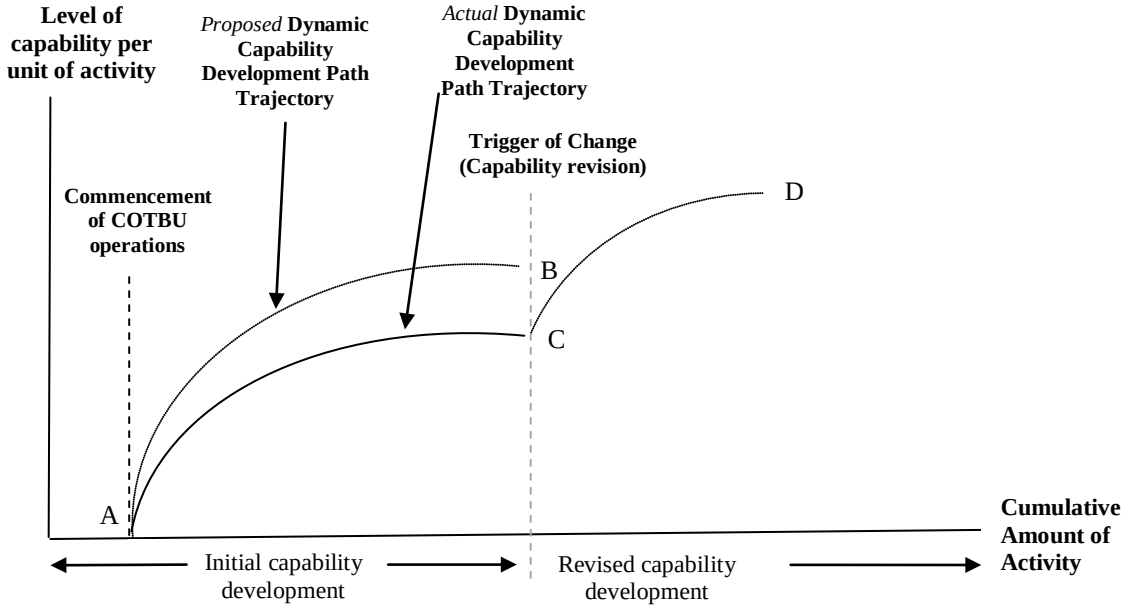


Figure 4.9 Capability Life Cycles within COTBU

The COTBU projected the trajectory of the change capability it was building to facilitate its entrance into the CHLSS (depicted by the dotted line AB). However, its trajectory (AC) was inhibited by the COTBU's path dependence and lack of managerial perception, and so the capability failed to reach the projected level. With its lack of success, the change in management and the realisation of the inadequacy of its capabilities the COTBU renewed its strategies by implementing new capability initiatives resulting in a proposed new trajectory of CD.

4.5.5 Capability Renewal

After several years and a change in senior management the failure to achieve success in the commercial market place forced the COTBU to adopt new strategies and develop new capabilities.

The Boundary Spanning Approach

- Organisational innovation intensity – Multi innovation focus (Managerial)
- Innovation Culture - Facilitative leadership
- Innovation absorptive capacity - Transformative and exploitative learning

In 2006 the Australian Region of the COTBU appointed a technical manager ("the new manager") from the GHLSS. He brought new knowledge and contacts, and a broader understanding of high level security sector customer needs. The manager was experienced in product certification and, more importantly the accreditation of systems in which the IT security product suite would be embedded, and understood both the engineering and political issues within GHLSS. Accordingly, he was "able to build something or conceptualise something that he knows is going to address the concerns and issues" in the Australian and international GHLSS (TBU1). From a business perspective he was "imported innovation" (TBU3).

- Organisational learning capability – Generative learning, Unlearning

The new manager also became a catalyst for change:

> I've been a change which has made it possible for other changes to take place in the organisation. So any time you get new blood opens up some of the old wounds or can of worms with regard to things. When I come in I'm allowed to ask the stupid questions. I am allowed to ask the "why" question whereas a lot

> of people after they've been there for a period of time feel that they can no longer ask that question (TBU4).

- Innovation culture – Collaboration
- Innovation absorptive capacity – Externally focused innovation learning structures and processes

As a result staff "are starting to ask questions about why things are occurring…and we're starting to see some major changes over the last six months", particularly with the discussion of innovation more on the agenda than what it had been in the past (TBU4). The COTBU looked to enhance its absorptive capacity by scanning within the industry for complementary knowledge and also engaging academia in the information security area to understand the latest developments. The appointment of the new manager was also part of the strategy to import new and diverse knowledge and to introduce external knowledge and knowledge sources.

- Organisational innovation intensity – Multi innovation focus (Process/Product)
- Innovation culture - Collaboration

The COTBU began to improve its innovation process and the way it progressed from ideation to business case to product development to product commercialisation. The requirements gathering process was identified as of prime importance to ensure product development reflected real customer needs (TBU4). Associated with these changes were changes in the innovation ideation process both within the COTBU and from external sources (TBU1, TBU5). These new ideation collection routines were implemented to provide a degree of discipline and strategy to the ideation process. While the sources of ideation had been limited to a few technical specialists, ideas were now welcomed from all parts of the organisation "making sure that it's all inclusive". Some of the best ideas "emerged from people who in the past thought that they didn't have much to add or contribute but they have been sitting on a bit of a gem" of an idea. Tentative steps have been taken to keep up to date on current research and development trends in information security (TBU4).

Increased Customer Engagement and Understanding

- Organisational learning capability – Generative learning, Unlearning

Despite the COTBU's adaptive approach to learning, one business development manager recognised that "(u)nless you can add value there's no point in proposing something to a customer…". He realised that the IT security product suite's technical merits

were the qualifier for consideration by the customer and not the primary determinant for purchase and refined the value proposition to focus on business efficiency and productivity (TBU3).

- Organisational innovation intensity – Multi innovation focus
- Innovation absorptive capacity - Externally focused innovation learning structures and processes

Managerial innovation also took place in regard to partner identification. The COTBU had been focused primarily on identifying channel partners who were suppliers of IT security products. With a greater understanding of its business as a solution provider, the COBTU identified companies that worked in the same IT security domain or provided products or services that were complementary to its own. In doing so it gained additional industry knowledge and identified areas where it can "get effective multipliers by working together in greater partnership with other companies or organisations" (TBU4).

Creating an Innovation Culture

- Innovation culture – Facilitative leadership, Collaboration

The new leader of COTBU stated that "The big thing is that we're trying to bring in cultural change. Trying to create an environment where, at least, the discussion of innovation is more on the agenda than what it has been in the past" (TBU4). Routines which created this environment included more open communication, wider sources of ideation within the business unit and new knowledge sharing routines both within and between functions (TBU4).

- Innovation culture – Collaboration
- Knowledge sharing structures – Innovation experience/memory

In the COTBU, communication had been along functional lines with limited communication between groups either locally or regionally. With the focus on innovation the technical group gained a greater appreciation of its role as an internal service provider to the sales group. New innovation knowledge sharing routines were developed which facilitated sharing of details of its technical projects and product enhancements. This insight provided the sales group with an understanding of the impact of project schedule changes and enabled them to prioritise needs more effectively (TBU4).

Through these new routines the culture began to change. "There's an atmosphere that things are happening; things are moving forward. There's this general feeling that the openness of sharing ideas from all parts of the organisation is less of a problem that what it was in the past…" (TBU4). The new openness and flexibility provided better job satisfaction as the engineers feel good about themselves as they have a direct influence on the success of the company and this gives them the motivation to be more innovative (TBU2).

- Innovation culture – Collaboration

4.5.6 The Development of the OIC Preconditions

The COTBU case study provided little evidence of the two preconditions (entrepreneurial intensity and organisational learning capability) derived from the literature. While the formation of the COTBU was in itself an act of entrepreneurship, little entrepreneurship was demonstrated thereafter. The COTBU's leadership was not proactive and failed to promote innovation as a corporate-wide task. As a result "the culture wasn't one which actively promoted an environment where innovation could come from anywhere" (TBU4).

- Organisational innovation intensity (Negative)
- Strategic entrepreneurship (Negative) – reactive
- Organisational learning capability- Adaptive learning

The COTBU had no innovation strategy. Innovation was narrowly defined and largely limited to incremental product innovation: "We are reactive. Everything we've done has been incremental. There have been no giant leaps forward" (TBU2). Apart from technical innovation directly pertaining to the IT security product suite, innovation routines were ad hoc with innovation "primarily left up to the individual" who had to sell the idea themselves, establish a business plan, and justify the concept before they could move the idea forward (TBU1, TBU5). There was a "short term business orientation" focused on the "here and now" (TBU3).

- Strategic entrepreneurship (Negative) – reactive

Within the COTBU there was no formal process for gathering ideas from staff, customers or competitors. Ideation was ad hoc and serendipitous: "We don't go and solicit ideas but sometimes the sales force comes back with suggestions about ways to improve

the products" (TBU3). Customers, of their own initiative, generated many of the new ideas and identified "different things that we haven't thought of applying our product to" and, in these cases, the COTBU looked at ways to build a solution around its products to meet those requirements (TBU2).

- Organisational learning capability (Negative), Unlearning, Adaptive learning

The COTBU's learning was adaptive and, generally in response to a business crisis. The COTBU, like the CO, had a highly technical focus. While market research was gathered, it was conducted without reference to commercial customers or their buying propensities. The COFBU "had a 'rose colored glasses' culture at the time" and was "committed to innovation but not committed to adding value". The COTBU management *assumed* that the fledgling technology from the GHLSS would be rapidly adopted in the commercial world but had little understanding of commercial customers (TBU3).

Adaptive learning was applied consistently when generative learning and unlearning were required to overcome deeply ingrained assumptions, information filters, and problem solving strategies that made up its largely inherited world view. Accordingly, due to the absence of renewal in behaviours and routines, no organisational learning capability could be identified in the case study. Despite its continued lack of sales and innovation success, it failed for several years to identify the need for change and, consequently, failed to formulate a response or implement alternative courses of action. Its learning approach can best be characterised as crisis reactive adaptive learning.

The absence of effective preconditions demonstrates that the innovation capability within the COTBU was not dynamic and was merely a function of a new product development process and individual innovation champions. This case demonstrates that the preconditions derived from the literature are critical to building an organisation-wide innovation capability where emphasis is placed on continued renewal of the capability through firm-wide commitment to innovation and ensuring that the capability is constantly renewed to enhance the efficiency and effectiveness of its stakeholder perspective and the commitment of staff to innovation.

4.5.7 Developing the Dimensions of the OIC

The OIC experience of the COTBU can be segmented into the period before and after the appointment of the new manager[7]. Before the appointment, the COTBU business activities, particularly those which focused on the CHLSS, were unsuccessful due to the absence of the preconditions identified in the literature. The transition from the GHLSS to the CHLSS required the COTBU to understand the significant differences between these markets, the nature of the distribution channels to reach the CHLSS and the difference between a project and a solutions market. Its product-push focus promoted the technical merits of its product suite without regard to the customer's needs or it's entrenched IT security platforms and supplier relationships. As a result of the absence of a generative learning approach and the bounded rationality of the management of the COFBU and CO, the COFBU had a low innovation intensity (limited primarily to adaptive technical innovation), limited absorptive capacity and innovation leadership.

Around the time of the appointment of the new manager the COTBU attempted to develop new capabilities. The employment of this manager, with new synergised customer and technical knowledge and broad business and technical contacts, brought learning, relationships and experience to the COTBU and facilitated organisational change and innovation. His experience enabled the COTBU to achieve broader and proactive engagement with customers to better define their solution requirements.

Change began to occur as a result of this appointment with increased innovation leadership, knowledge sharing and collaboration. The framework which emerged from this case study *after* the appointment of the new manager is depicted in Figure 4.10 below.

The preconditions and components of the OIC had begun to emerge at the time of the research but had not reached any degree of maturity. Limited evidence was provided

[7] It is recognised that the catalyst for change is the result of several factors. The selection of the appointment of the manager has been selected as a major trigger for change due to the multiple impacts that his appointment had upon the COTBU.

in terms of its effective implementation. While other components of an OIC were present in the case study they did not have sufficient strength, intensity or frequency to warrant inclusion in the COTBU OIC framework.

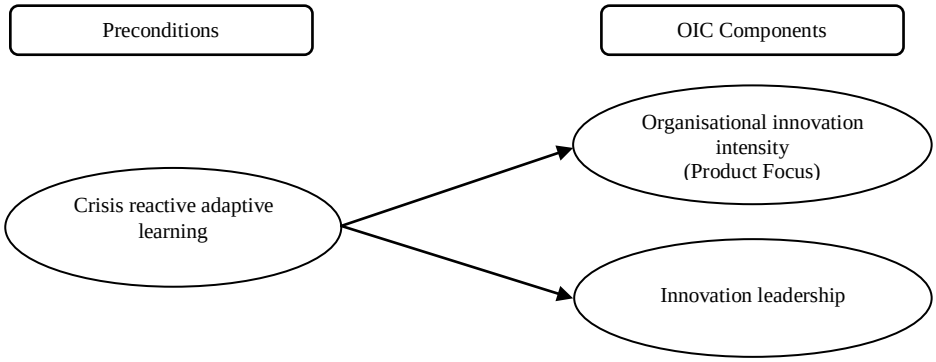


Figure 4.10 Organisational Innovation Capability Framework as derived from the Third Case Analysis

4.5.8 Conclusion

While the COFBU and COSBU provided different but interrelated OIC frameworks, the COTBU provided a compelling negative case. The absence of any definitive evidence to support the presence of the two preconditions identified in the literature, entrepreneurial intensity and organisational learning capability, limited the business unit's ability to build an OIC. The absence of generative learning enabled the COTBU's inherited innovation barriers to remain unchallenged.

Following the appointment of the new manager, the COTBU attempted to develop new capabilities to address its poor performance. New innovation behaviours began to appear (collaboration, innovation leadership, a broader view of organisational innovation) and, as a result, a third OIC model began to emerge.

4.6 The Cross-Case Comparison

4.6.1 Introduction

The previous sections of this Chapter focused on the within-case analysis of three business units within the CO. The focus of this section will be a cross-case analysis *between* the three business units to identify similarities and differences in the OIC

frameworks. As demonstrated already in this Chapter, the three business units inherited path dependencies from the CO. For the COFBU and COSBU, these dependencies were blended with those inherited from their predecessor organisations.

An essential element of the case comparison is the emphasis on how the management of each business unit recognised the existence and impact of path dependent behaviours and took steps to counter the constraints of those dependencies and build an OIC to achieve environmental fitness with their new business environment. The cross-case analysis reveals the key triggers of change within each business unit and the leadership and process dimensions which were preconditions for the change within the business unit. Following this analysis, the culture change to support the new capabilities is identified together with the key components of the OIC framework which emerged from the case analysis.

4.6.2 Triggers of Change

The COFBU and COSBU were both faced with the possibility of an exogenous shock – the decline in income as their principal client, the GHLSS, transferred all (in the case of the COFBU) or part (for the COSBU) of its contracts to overseas suppliers. For the COFBU, the move to purchase aircraft from overseas meant it would be unlikely to survive without changing its business model and operating routines as these routines would become core rigidities. While the situation for the COSBU was not as severe, it was likely that it would lose significant revenue with the GHLSS largely contracting with overseas prime contractors.

The COFBU and COSBU management both recognised that they were not trapped by their history and that they could shape their businesses through strategic renewal. For the COFBU the market was more dynamic than for the COSBU and COTBU with the outcome of the GHLSS changes predictable in terms of its impact of revenue but unpredictable in regard to the likely or most profitable alternative revenue opportunities available.

Unlike the COFBU and COSBU, the COTBU was a new business unit. Despite its lack of experience in the sale of products and in dealing with commercial firms, the COTBU anticipated high demand based on the world-leading technical merits of its product suite. The COTBU encountered a relatively stable environment with a limited degree of dynamism. The market boundaries and key players (customers, competitors) as well as the accepted IT security systems and routines were well defined. Changes to systems and routines were slow as in IT security first mover advantage was not considered desirable. However, the COTBU's product suite was a disruptive technology. While this could have been a significant trigger of change for the COTBU, its management failed to perceive the implications of the disruption. Its lack of success in the CHLSS (both in Australia and the US) and the slowness of its adoption in the US GHLSS ultimately provided the trigger for change.

4.6.3 Higher Order Capability Building as Preconditions of Change

The development of higher order capabilities through which a OIC could function was critical for all three business units as they were each entering new markets. In the cross-case analysis, the data demonstrated that three higher order capabilities were important as preconditions to the effective operation of an OIC: the development of a strategic entrepreneurial capability, an organisational learning capability and a strategic alliance capability. The absence of these preconditions in the third case prohibited the development of an OIC beyond isolated actions.

4.6.3.1 Building a Strategic Entrepreneurship Capability

When the COFBU and COSBU were confronted with a threat to their survival, management scanned their respective environments to identify the capabilities required to achieve environmental fitness. The COFBU and COSBU were intentional in their commitment to developing an operation-wide entrepreneurial business unit through strategic renewal. They were proactive in risk taking and in disciplined and informed exploration and both had strong senior management commitment to and visible support for innovation. While the COSBU's business model transformation was incremental, the transformation for the COFBU was related to but beyond its existing suite of capabilities.

The COSBU demonstrated its entrepreneurship through its proactive transformation from an enterprise with one GHLSS client to a business which was diversifying its reach both in terms of clients and technologies. A key element of its transformation was the transition from the entrepreneurial adhocracy of the original firm to strategic entrepreneurship, which added discipline, structure and strategic focus and ensured that innovation was commercialised "within the context of the market" (SBU3). The COSBU management also demonstrated a strong and consistent commitment to innovation. It developed a Strategic Technology Roadmap which provided a shared understanding of its increased focus on business and customer outcomes and enabled the COSBU to determine what products, solutions and capabilities to develop and which projects to prioritise in the tender process.

The strength of strategic entrepreneurship in the COSBU can be attributed to the shared entrepreneurial vision inherited from the original firm as well as the continued articulation of that vision and the characterisation of innovation failure as "failing forward". The latter approach is consistent with Hamel and Prahalad's "mandate to learn when inevitable setbacks occur" (1991) and reinforces the relationship between strategic entrepreneurship and organisational learning.

While entrepreneurship per se was not mentioned in the case analysis of the COFBU, the approach of management in anticipating the exogenous shock and in taking decisive, yet risky and measured, steps to preempt its impact is entrepreneurial in nature. To achieve its commercial and results-oriented emphasis, the COFBU focused on internal and external boundary spanning behaviours. There was recognition within the COFBU that silo thinking was a major problem in the CO and between and within the business units (FBU6). Through proactive leadership the COFBU conducted a global search and identified a new business model outside of its traditional learning boundary. It developed a considered strategy to become the leader in through-life support for the Australian GHLSS aerospace industry. In this major shift, the COFBU recognised that despite the risk of entering what was for it an untested and untried business, new strategic alliances would provide a mechanism for quickly achieving competitive advantage through acquiring new capabilities.

By contrast with its peers, the COTBU was limited by the technical orientation of the CO. The COTBU reflected the view of its parent organisation with innovation purportedly being important but, with little support from senior management, there was a mismatch between the espoused theory and theory in use. Innovation was generated by individual action or occurred as result of customer initiative. The organisational myopic focus was on the technical merits of the product (TBU3). Functional and disciplinary separation was evident. Management reinforced, rather than challenged existing, entrenched mental models which were a barrier to knowledge acquisition and sharing, proactive risk taking and open communication (TBU4).

Where there was a strong (COSBU) or a moderate/strong (COFBU) level of strategic entrepreneurship, the dynamic components of the OIC were generally of comparative strength. Similarly, the COTBU, with no strategic entrepreneurship, provided an example of a negative case. The weakness of the intensity resulted in the COTBU's innovation activities being ad hoc. Its strong technical orientation and associated information barriers ensured that any learning was adaptive. The need for significant marketing innovation, because of its failed sales strategies, was not recognised. The dynamic components of the OIC were largely non-existent or, where they existed, were weak or ineffective.

4.6.3.2 Building a Learning Capability

Organisational learning capability was common to the OICs of the COFBU and COSBU. The COSBU, because of the greater maturity of its business, focused its organisational learning on innovation learning while for the COFBU organisational learning was broader because of the novelty of its business. The framework for building the organisational learning capability differed between the COFBU and COSBU. While the COFBU transformed its learning capability through a change in organisational structure, the COSBU used its collegiate culture and recruitment strategy as the foundation for innovation learning.

The COSBU's culture was a learning culture characterised by its "open-mindedness", its appreciation of the importance of "failing forward", and its willingness to challenge the status quo. It also recognised that failure to refresh its existing knowledge base could result in organisational insularity and so it developed new learning routines for engaging with commercial customers and for the sale of technology products and solutions. This business focused learning arose from the lessons learned from previous failures in developing "bleeding edge" technologies which were often innovative for the sake of it (SBU3, SBU7). The learning culture was also reinforced by formal and informal learning routines to facilitate the socialisation, absorption and integration of the acquired knowledge (SBU1, SBU3, SBU5, SBU6) so that it could be applied and implemented in new projects, and consequently facilitate the commercialisation of its innovation.

The COFBU's learning focus was on boundary spanning behaviour across silos, projects and teams, between CO business units and complementary entities external to the organisation. Its matrix approach provided the overlap between projects and domains to facilitate interaction, knowledge sharing and learning between individuals or groups in a strategic and disciplined manner (FBU2). This restructure leveraged the use of organisational memory and experience pertaining to innovation, and provided access to complementary knowledge from customers, partners and research organisations. This increased its absorptive capacity and improved the efficiency of knowledge sharing and acquisition, and utilisation as well as encouraged the sharing of relationships and insights.

While the COFBU and COSBU were committed to advancing their learning capability through a generative approach, the COTBU's organisational learning culture was adaptive and characterised by a resistance to unlearn its embedded technical orientation or to challenge the mental models which constrained its business approach. It was not until the new technical manager was appointed that it began to integrate new customer specific knowledge and to share that knowledge across the

organisation with the introduction of the new manager improving the capabilities of all staff (Penrose 1995, p. 47).

The knowledge-questioning values in relation to the market, while of critical importance to the business units, were only part of the learning that was required (Slater and Narver 1995, p. 63). Accordingly, this position is consistent with the view that market-focused learning is a subset of the overall learning activity (Weerawardena 2003, p.411; Slater and Narver 1995, p. 67) and that "a superior learning environment will leverage the use of all resources" (Baker and Sinkula 1999, p. 411). In these case studies, the evidence supports the view that the priority placed on a market perspective and its use in the strategic planning process was a function of the strategic entrepreneurship of the business unit rather than a lower order market orientation (see Baker and Sinkula 1999, p. 412; Slater and Narver 1995, p. 63).

4.6.3.3 Developing an Alliance Building Capability

An alliance building capability was essential to the rapid acquisition and integration of knowledge. Alliance building was the foundation of the COFBU's business model transformation as it placed the COFBU on a related, although divergent learning, track aimed at increasing its knowledge breadth. This higher level of alliance learning was essential for the COFBU because an incremental variation to its business model or simply increasing its knowledge depth would not have been sufficient for its survival.

Once the COFBU's new business model had been implemented, the COFBU's alliance building focus was on increasing the depth of its knowledge base. It developed inter-organisation routines to facilitate alliance-based knowledge sharing and collaboration based on common objectives. It expanded its alliance building capability by establishing multiple relationships within the RO to gain broader insights into customer needs.

While the COTBU made attempts to establish meaningful external alliances with prospective channel partners when it first entered the CHLSS, its lack of alliance

development skills and experience in both the GHLSS and CHLSS, and its adaptive learning approach, meant the COTBU failed to understand the best ways to establish meaningful alliances with Tier 1 distributors both in Australia and in its key target market.

4.6.4 Changing Culture to support New Capabilities

4.6.4.1 Changing Mental Models

The COFBU's objective was stated emphatically by the General Manager: "(w)e don't accept the status quo. We have got to have a paradigm change" (FBU4). The COSBU's move to strategic entrepreneurship ensured that the new behaviour was entrenched in its innovation infrastructure and routines. Sharing across boundaries ensured that information was widely utilised and applied in the product development process. While both the COFBU and COSBU sought to move from the CO's mental models through cultural change (acceptance of failure, knowledge sharing, and collaboration) and proactive strategic entrepreneurial leadership, they did so in different ways. The COSBU's mental models were continuously scrutinised as a consequence of hiring staff that challenged the status quo and were passionate about solving difficult problems. While the COFBU aimed to achieve a similar outcome, its focus was on implementing a matrix structure to facilitate knowledge development, sharing and utilisation in and across functions, projects and domains.

The mental models of the COTBU reflected those of its parent. As the COTBU had an adaptive learning orientation its mental models remained unchanged and unchallenged. This led to its failure to effectively assimilate customer feedback or explore alternative marketing strategies.

4.6.4.2 Changing Attitude to Risk

The CO had a "risk averse", narrowly defined customer culture, characterised by defensive reasoning, low levels of freedom of choice and when things went wrong, the "blame game" with "(h)uge recriminations, beating of chests" (FBU2/FBU5). This culture was evident in the COFBU and the COTBU (FBU5/TBU4) and it

fostered conservative, compliant, risk averse behaviour which discouraged innovation within the CO and within and between business units.

The COFBU's blame culture originated from in its predecessors and was reinforced when it was acquired by the CO. However, its management was aware of the impact of the "blame game" upon innovation, and so there was, at the time of the change in business model, a focus on reducing blame and increasing personal responsibility and accountability (FBU1, FBU5). This change was reinforced by the introduction of a participative performance-based culture with acceptance of failure as integral to innovation.

The COSBU's risk taking propensity was part of the entrepreneurial ethos of the original firm where the General Manager was a risk taker and encouraged responsible personal initiative (SBU6). While the COSBU had, amongst the CO business units, a relatively high risk taking propensity, its level of risk taking was lower than within the original firm as its behaviour was modified by the risk averseness, blame culture and the organisational impediments to personal initiative of the CO (SBU7).

While there was no discussion in regard to risk by any of the COTBU interviewees the entrance into the CHLSS market in Australia and the US involved risk-taking behaviour. However, the high level security nature of the product and the high cost involved in making any changes meant that risk taking behaviour was not encouraged or supported.

4.6.4.3 Culture Change Drivers

The COFBU and COSBU were committed to culture change to facilitate their transition to the new competitive environment although the degree of change required varied. For the COFBU, its generative approach reflected management's desire to shift from the entrenched entitlement mentality to a results-oriented culture. It sought to improve employee engagement in the belief that engaged employees were more committed, involved and enthusiastic about their roles. This focus on personal performance, responsibility and accountability resulted in a significant increase in

engagement in 18 months (FBU4). The COSBU had an engaged workforce with an engagement score double that of the COFBU, so its approach was adaptive. It sought to build on its collegiate culture by increasing the systematisation of its innovation process but without losing the spontaneity and willingness to challenge of its staff.

Initially, the COTBU's management was unaware of its cultural impediments to innovation. It was not until there had been a continued lack of success in the commercial sector that the new technical manager was appointed, and his appointment became a catalyst for change (TBU4). These changes included increased collaboration across functions, increased facilitative leadership and the encouragement of ideation from all parts of the business unit.

4.6.5 Innovation Infrastructure and OIC Renewal

The three business units did not have a defined and documented innovation strategy (FBU4, SBU1, TBU1). However, both the COFBU and COSBU recognised that structural change was an important enabler of behavioural and innovation system renewal and initiated the appropriate change within their organisations. The difference in approach to innovation infrastructure renewal should also be noted. While the COFBU's focus was on using organisational structure (project and domain matrix) to facilitate innovation learning and knowledge sharing, the strategy for the COSBU was to establish disciplined innovation processes and an innovation portfolio planning approach. In contrast to the COFBU and COSBU, the COTBU had little innovation infrastructure or the capacity to renew its infrastructure. Innovation, where it did occur, was limited to the technical experts. Its product development process was described as "infantile" and it had no formal ideation capture process or innovation strategy (TBU4). As a consequence of its lack of market success, the COTBU's management began to increase knowledge sharing and collaboration through increasing interaction between the functions and to develop a more structured innovation process.

4.6.6 Organisational Innovation Intensity

The COSBU had a high innovation intensity (called business-wide innovation). There was recognition that in order to grow and be competitive, the COSBU needed to develop a strong framework of innovation that encompassed "all of its business model" and was a "core competency throughout the organisation" (SBU1). Senior management recognised that innovation needed to encompass all the business - business processes, financial processes and customer engagement - and took steps to ensure that innovation pervaded the way it did business (SBU1). While ideas were sought from trusted external parties, innovation took place primarily within the confines of the COSBU.

The COFBU also had high innovation intensity (innovation pervasiveness). However, it was not articulated in such a holistic manner as within the COSBU and was not supported by the same level of innovation infrastructure. It adopted CMMI as a guide to process improvement across the organisation with the ultimate objective to improve business performance. It had mapped all of the business processes with the aim of revising all process, policies and procedures from top to bottom (SBU5). In addition, it also ensured that its research and development activities were aligned with its business objectives. The COTBU also introduced new ways to improve customer relationships and interactions and this encompassed all aspects of the business with "no boundary to it" (FBU2). The latter term implied an innovation expansiveness which extended beyond the firm (FBU4) and this strategic entrepreneurship resulted in the development of the through-life support business model (FBU4).

The high innovation intensity of the COFBU and COSBU was fuelled by their drive for improved commercial outcomes and management's increased recognition of the need for greater customer intimacy and awareness (SBU1, FBU4). This increased awareness was the catalyst for cultural change within the business unit and the high level of targeted engagement with customers, complementary partners and research organisations to gain a greater understanding of research and development

imperatives and market drivers. This in turn resulted in innovation in business processes, customer engagement and idea capture.

Conversely, the CO's knowledge and resource constrained innovation and myopic customer understanding were evident in the COTBU interviews (TBU2, TBU3), and frustrated the interviewees. This resulted in low innovation intensity with innovation being reactive, incremental and adaptive, and primarily being limited to technology (TBU2). Any innovation within the COTBU was the result of individual initiative or prompted by the customer (TBU4), rather than a firm-wide innovation focus.

4.6.7 Innovation Absorptive Capacity

Both of the positive cases were committed to proactively building relationships with external parties which could provide accelerated access to complementary knowledge. This knowledge, when combined with the knowledge each held, provided a stimulus for innovation and capability development, which in turn, provided further impetus for innovation (SBU1, FBU4). Both business units had externally focused innovation learning structures and processes to facilitate the development of innovation oriented managerial competencies.

In analysing absorptive capacity within the case studies, depth and breadth dimensions were identified. When new knowledge was added which pertained to the firm's existing knowledge base, it increased the depth of its knowledge and, with this increased specialisation, it enhanced the rationalisation, routinisation and efficiency of knowledge absorption. The breadth dimension of absorptive capacity enabled the absorption of knowledge from domains which were outside, but related to, the firm's existing knowledge base. This dimension is of particular relevance to increasing knowledge scope as well as to knowledge exploration.

The relevance of analysing absorptive capacity in terms of its depth and breadth is that it provides alternative strategies for transforming a firm's knowledge. The two positive cases support this view as the COFBU significantly increased the breadth of its knowledge through the addition of its through-life support capability. In contrast,

the COSBU increased the depth and specialisation of its knowledge, but also slightly increased its knowledge breadth through its acquisition of knowledge and experience pertaining to the CHLSS. These innovation knowledge acquisition strategies are depicted in Figure 4.11 below. As the COTBU entered the CHLSS as well as the GHLSS in the US and UK, its innovation knowledge acquisition map should have been similar in breadth to that of the COFBU and depth to the COSBU.

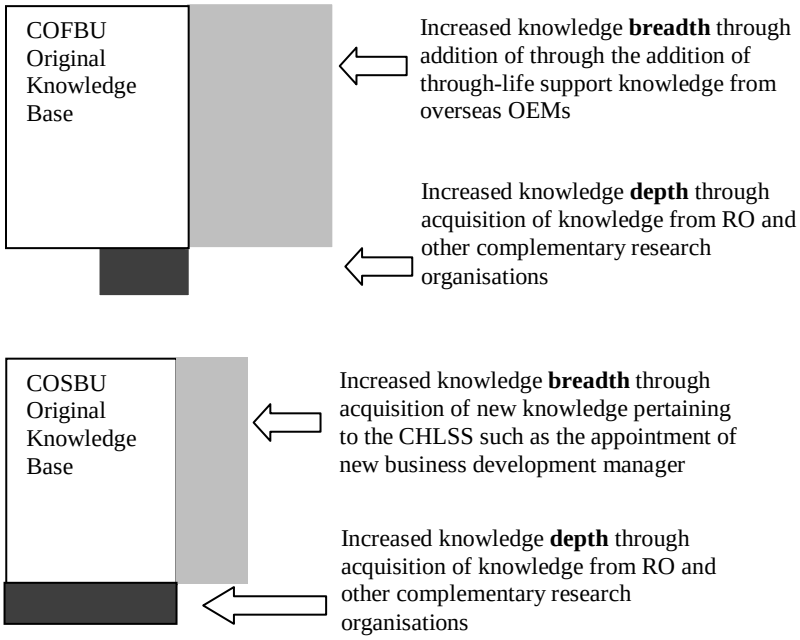


Figure 4.11 Knowledge Acquisition Strategies – Breadth and Depth

While knowledge transformation is important, it is the commercial exploitation of that knowledge that can lead to competitive advantage. "(A)bsorptive capacity refers not only to the integration or assimilation of information by an organisation but also to the organisation's ability to exploit it" (Cohen and Levinthal 1990, p. 131).

Both the COFBU and COSBU were committed to increasing the absorptive capacity of their external knowledge sources through a process of mutuality and embedded resource sharing external collaboration. The COSBU had regular workshops with the RO, for example, a forum on national security where COSBU specialists spent a day with their counterparts sharing research on seven subjects and, in the process, generated ideas which could be developed in co-operation with the RO. The COFBU

also encouraged its staff to participate in both RO and academic knowledge transfer through presentations at or participation in conferences and post doctoral seminars and, in doing so, it extended its expertise and absorptive capacity (FBU6).

Another strategy for external innovation knowledge acquisition for all three business units was the employment of staff that had expertise or experience that the business unit lacked. The employment of the business development manager by the COSBU (SBU3) and the new manager employed from the GHLSS who brought with him knowledge of IT security product acquisition processes as well as knowledge of product certification and accreditation of systems (TBU1, TBU3), provide examples of this approach.

4.7 Core Dimensions of an Innovation Capability: Processes, Skills And Integration

This research examined the development of an OIC within three business units of the CO to seek to explain how heterogeneity of innovation resources is developed and how firms use resources and capabilities to achieve competitive advantage.

From the case analysis the OIC is represented by the following elements:

- three preconditions which facilitated development of an organisational innovation capability: *strategic entrepreneurship, organisational learning capability* and *alliance building capability;*
- A functional *innovation infrastructure and OIC renewal* component, which provided the organisational structure which supported innovation and included an innovation management system, innovation experience and innovation memory;
- An integrative *innovation absorptive capacity* component incorporating externally focused innovation learning structures and processes, embedded resource sharing external collaboration, and transformative and exploitative learning;

- An *innovation culture* component which included values that support and encourage innovation (facilitative leadership, collaboration, and tolerance for risk taking and no blame behaviour);
- An *organisational innovation intensity* component which incorporated a multi innovation focus – product, managerial, process, marketing, and strategic innovation.

The three preconditions and their underpinning constructs are depicted in Figure 4.12 while the OIC framework components, supporting constructs and linkages are presented in Figure 4.13.

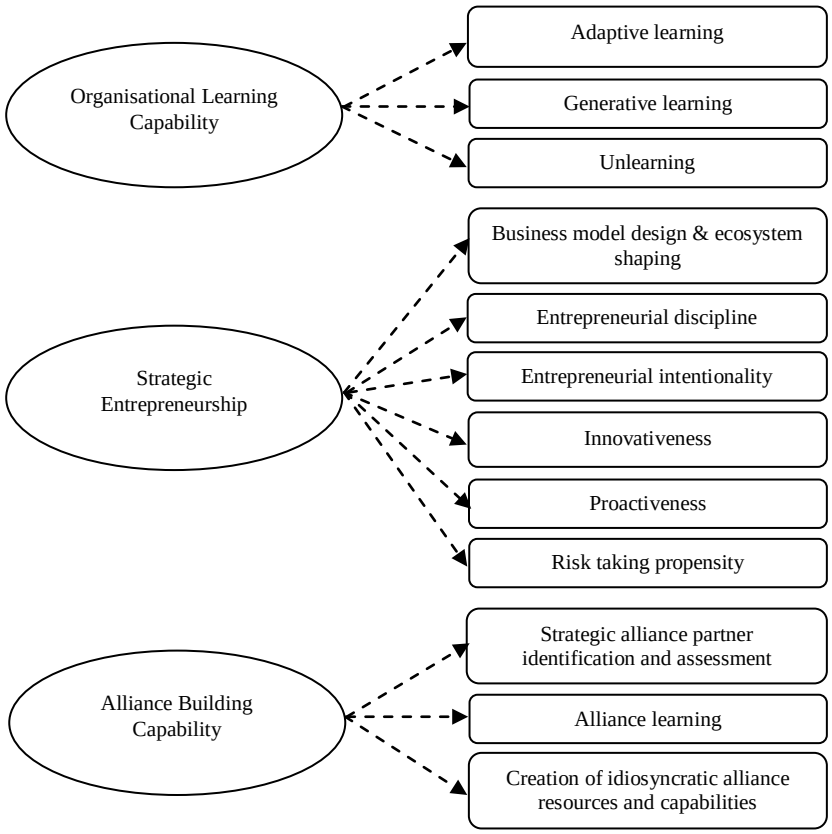


Figure 4.12 Case-derived Preconditions and their Underpinning Constructs

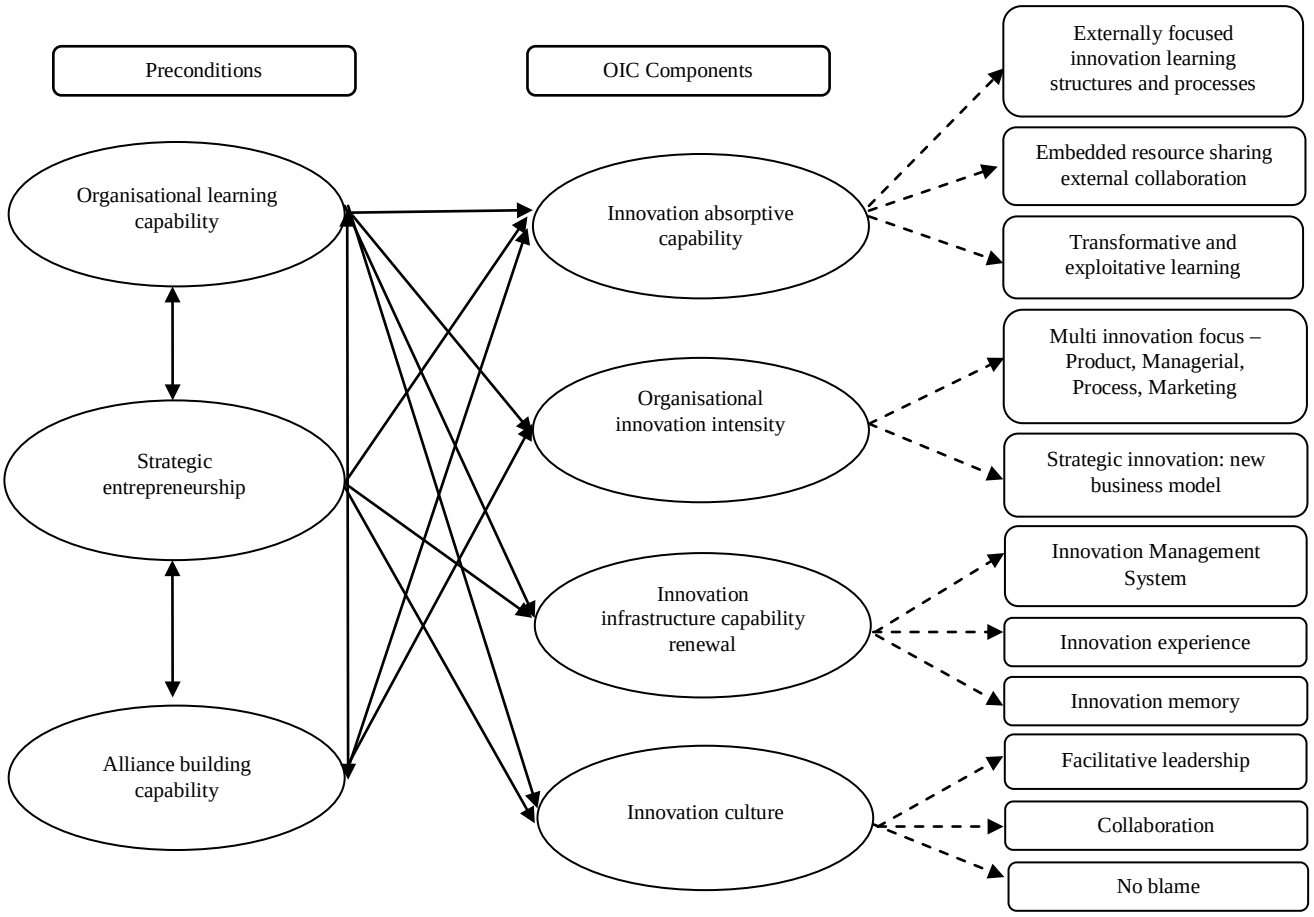


Figure 4.13 Organisational Innovation Capability Framework as derived from the Case Analysis

4.8 Preconditions required to support an OIC

Weerawardena contends that the firm's entrepreneurial intensity is the key factor determining its capability building activity (2003 p. 410). The case analysis supports this position as where there was either moderate or strong levels of strategic entrepreneurship the impetus existed for organisational learning, such as learning about markets, learning about customers, learning about new research and learning about building system efficiency and effectiveness. Management sensed, in their strategic decision-making, the changing environmental conditions and the need for business model revision or overhaul, and proactively and purposefully took measured business risks in identifying and entering adjacent (COSBU) or new markets (COFBU) and building strategic alliances. It was the entrepreneurial decisions which

provided the basis for differentiating these business units from their competitors. The analysis of the COFBU and COSBU case studies also suggests that there was a strong correlation between the strength of the strategic entrepreneurship and other preconditions and the subsequent development of the four innovation capability components. Conversely, in the negative case, as a consequence of the absence of strategic entrepreneurship, there was limited organisational learning and similarly low levels of the other OIC dimensions.

Strategic entrepreneurship provided the purpose (intentionality), focus (discipline) and impetus from most innovation behaviours and played a key role in the innovation capability building routines of the COFBU and COSBU. The pre-eminence of strategic entrepreneurship is also supported by the experience of the COFBU where the dynamic capabilities built were designed to assist in achieving evolutionary fitness, in part by helping to shape the evolving aerospace environment in Australia. This environment shaping element of dynamic capabilities is entrepreneurial in nature supporting Teece who equated the importance of entrepreneurial fitness with evolutionary fitness (2007, p. 1321). The combination of evolutionary fitness with strategic entrepreneurship results in the expanded definition of innovation intensity from an internal focus to include innovation of the business model and ecosystem. Through strategic entrepreneurship the COFBU identified the need for strategic renewal beyond the boundaries of the firm. In doing so, by its proactive leadership, a new business model was designed which reshaped its ecosystem. The new business model directly impacted on organisational innovation intensity and, in particular, strategic innovation.

Strategic entrepreneurship and organisational learning capability are important in shaping innovation culture. In particular, facilitative leadership provided the impetus for the behaviour change required to foster and encourage innovation. Facilitative leadership created the “right environment” (either from a cultural or structural perspective) to encourage knowledge sharing and collaboration, and the psychological safety to challenge the status quo (Edmondson 1999) and take innovation risks without the institutionalised blame. Consistent with Augier and

Teece this leadership also led the organisation forward to seize opportunities that were sensed by the firm's entrepreneurial function (2009, pp. 417, 418).

It was entrepreneurial proactiveness and intentionality that focused the COFBU and COSBU's attention on the identification and assessment of alliance partners and complementary external knowledge sources that could accelerate learning and capability development or provide augmented resources. The external focus of the alliance building capability suggests a strong relationship between innovation absorptive capacity and organisational innovation intensity. The presence of innovativeness, proactiveness and risk taking propensity were also strongly associated with (a) knowledge acquisition through exploration and, therefore, alliance building capability and innovation absorptive capacity, (b) challenging assumptions to create generative learning and, therefore, the organisational learning capability, and (c) the rapid development of new behaviours to leverage learning and, therefore, innovation culture. These causal associations observed in the case data are consistent with those described in Slater and Narver (1995, p. 68).

Learning from external organisations (a component of an organisational learning capability) is facilitated through an effective and efficient alliance building capability (particularly the alliance learning construct) and integrated through an innovation absorptive capacity (particularly the transformative and exploitative learning). The case analysis supports Slater and Narver's contention that "(o)rganisational learning is a function of the form and strength of the organisation's interdependence with its learning partners" (1995, p. 70). Organisational learning capability is an important driver of an innovation infrastructure and OIC renewal. Learning from and about innovation became entrenched in organisational memory and experience and was deployed to renew the innovation management system.

Innovation culture was both a facilitator of and driven by the CO's organisational learning capability. Leadership values and attitudes to the status quo and existing mental models determined whether behaviour change and generative learning took place within the business unit. This relationship between culture and learning also

provided the organisational flexibility to reconfigure architecture or resources to meet environmental changes. The learning experiences, such as the COSBU's "failing forward" where no blame was attached to failure, also became embedded in the innovation culture.

4.9 Conclusion

This chapter has presented the analysis of the data collected, identified key themes and patterns in the data and revealed new understandings of innovation capability preconditions and OIC components in each of the three embedded case studies. The case analysis explored the embedded and inherited path dependencies of the three business units to establish how those path dependencies affected each case in its response to internal and/or external environmental pressures and how or if they embraced change in their approach to innovation. The data was interrogated to identify how each business unit's innovation approach emerged.

In the case comparison, triggers of organisational change were identified as well as similarities and differences in approaches in the formation each OIC. An OIC framework was developed based on the case comparison with three preconditions and four OIC components. The three preconditions which facilitated renewal of an innovation capability are strategic entrepreneurship, organisational learning capability and alliance building capability. The four components of the OIC are an innovation absorptive capacity, an innovation infrastructure and OIC renewal, an innovation culture and organisational innovation intensity. Constructs defining each of these preconditions and OIC components were also identified from the case analysis and the interrelationships between the preconditions and OIC dimensions supported.

Chapter 5 provides a comparison between capability preconditions, components and linkages between the literature and case-derived OICs. The Chapter continues with an outline of the contributions of the research to innovation theory and management practice.

Chapter Five

CONTRIBUTION AND CONCLUSION

5.1 Introduction

In the continuous search for organisational competitive advantage, business and academic commentators recognise that innovation is fundamental with the expectation that it is endogenous to the firm (Hunt and Davis 2008, p. 12). However, despite this universal recognition of the importance and value of innovation, innovation success rates are at unacceptably low levels. Even more baffling is that numerous innovation critical success factors lists have been compiled over the last forty years, yet innovation is still a significant challenge for most organisations (McKinsey 2010).

What most organisations have failed to recognise is that the very foundation of entrepreneurship is the practice of systematic innovation (Drucker 1985, p. 31). While there is often a focus on the new product development process, there has been a failure to recognise that innovation is essential for the entire organisation, but, most importantly, the management of innovation itself (Hamel 2005; 2006). "As Peter Drucker often points out, every failure is a failure of management" (Leonard 1998, p. 55).

The imperative for the development of an innovation management capability is founded in the identification of barriers to innovation and the recognition that organisational core capabilities can simultaneously be core rigidities (Leonard 1998, p. 55; Newey and Zahra 2009). Therefore, when an organisation operates in a turbulent environment, a dynamic organisational innovation capability is essential.

An organisational innovation capability (OIC) was conceptualised from the literature in an IT solutions context. The literature derived OIC consisted of two preconditions - organisational learning capability and entrepreneurial intensity – and three components - organisational innovation intensity, market-focused learning capability and innovation infrastructure and OIC renewal. The OIC was then studied in three embedded business units within the one case organisation. As each business unit had its own distinctive paths, processes and positions, the analysis provided an opportunity to study the development of an OIC within different organisational contexts.

This research focused on answering the following research question: "*How can an OIC be conceptualised in an information technology solutions context, and what is the role of learning in organisational innovation capability renewal"*. The intention of this research question was to provide an explanation of the components of an organisational innovation capability, the organisational preconditions that support its renewal and the ability of the OIC to support innovations that are both continuous and discontinuous to the organisation.

This fifth and concluding chapter provides a comparison between the capability descriptors and linkages between the components of the literature and case-derived OICs. The Chapter continues with an outline of the contributions of the research to innovation theory and management practice.

5.2 Capability Descriptors: A Comparison with the Literature

Tables 5.1 and 5.2 consolidate the descriptors from the three embedded cases in the case organisation (CO) and the OIC capability and identify where the descriptors have been previously identified in the innovation literature. The Tables comprise four columns with the first indicating the Preconditions/Components and Constructs; the second, the key descriptors from the case analysis which support the constructs; and the third the key concepts from the literature. The fourth column indicates whether the descriptors from the case analysis support, extend, refute or are silent with respect to the literature (Column 3). Where the literature has been extended a

section entitled “Comments” has been added at the end of the precondition or component. A more detailed analysis of the content of the Tables is included in the Appendix.

While the analysis of the capability descriptors was generally supportive of the innovation literature it has highlighted an expanded and integrated conceptualisation of the strategic entrepreneurship precondition and innovation intensity OIC component. In addition, it has provided alternative strategies for developing an organisational learning capability and an innovation infrastructure and OIC renewal.

While most of the elements of the strategic entrepreneurship precondition have been identified previously in the literature, this dissertation has brought them together for the first time and provided a framework for strategic entrepreneurship. Of particular importance, this research has highlighted the role of strategic entrepreneurship in stimulating the development/renewal of linked organisational preconditions (i.e. an organisational learning capability and an alliance building capability) critical to developing an organisation-wide innovation capability. The case data confirmed that where these preconditions were absent, innovation was contained within an innovation development process and limited by individual product championing.

The inclusion of the traditionally accepted entrepreneurship constructs of innovativeness, proactiveness, and risk taking propensity has been supported by the comparison between the case findings and the literature. The addition of the business model design and ecosystem shaping construct, and entrepreneurial discipline provide qualitative evidence in support of the current literature (Teece 2007, pp. 1325, 1326; Drucker, 1985, p. 19; Helfat et al., 2007, p. 7). The final construct in the strategic entrepreneurship precondition is entrepreneurial intentionality. While the definitions of dynamic capability have a strong focus on intentionality of resource configuration, the case analysis requirement for entrepreneurial intentionality focused on intentionality at the strategic level. The purposeful creation, extension, and modification of a firm’s resource base is encapsulated in such a characterisation but, while it is an important tool of strategic management, it is but one strategy tool from

of a "dynamic set of initiatives, activities and processes" (George and Bock 2011, p. 102).

The comparison also revealed a broader definition of the innovation intensity capability. The first construct of the capability, multi-innovation focus – product, managerial, process and marketing - is consistent with and supportive of the literature. Through this research the definition has been extended from an internal focus to include external factors such as the firm's business model, strategic alliances and its ecosystem. While success may lie with innovation of the firm's products, process or management behaviour, in dynamic markets managers must be prepared to examine the sustainability of the firm's business model and take appropriate steps to refresh, rejuvenate or even retire the model.

Table 5.1 Comparison between Case Descriptors and Innovation Capability Literature – OIC Preconditions

Preconditions	Case Descriptors	Literature	Impact on Literature
Strategic entrepreneur-ship		Managers sense and shape the future, address path dependency barriers and augment knowledge assets to establish new resources (Teece 2007).	Extend
Innovativeness, Proactiveness, Risk taking propensity	The COFBU and COSBU proactively surveyed their environment, identified threats and took anticipatory steps to transition to new business models.	Conceptualised in terms of its innovativeness, proactiveness and risk taking propensity (Weerawardena 2003, p. 410). Focus on looking outward/forward (Cope 2005).	Support
Business model design and ecosystem shaping	Evident in the selection and implementation of the COFBU's differentiated and hard to imitate through-life support business model.	Managers shape ecosystem and marketplace outcomes through innovation, entrepreneurship, and semi-continuous asset orchestration and business reconfiguration (Teece 2007; Garnsey et al., 2008).	Support
Entrepreneurial discipline	COSBU – demonstrated by its move from ad hoc to strategic entrepreneurship.	"Discipline of entrepreneurship" (Drucker 1985). The business strategy provides focus and a filter for all enterprise decision making (Teece 2007).	Support
Entrepreneurial intentionality	Purposeful steps taken to analyse the exogenous "shock" and development of new strategies to pre-empt impact.	Dynamic capability definitions focus on *purposefulness* (Helfat et al., 2007; Zahra et al., 2006).	Support

Preconditions	Case Descriptors	Literature	Impact on Literature
Comments	The research was supportive of the elements of the strategic entrepreneurship precondition which had been identified previously in the literature. However, this dissertation has brought them together for the first time and provided a framework for strategic entrepreneurship. Of particular importance, this research has highlighted the role of strategic entrepreneurship in stimulating the development/renewal of linked organisational preconditions (i.e. an organisational learning capability and an alliance building capability) critical to developing an organisation-wide innovation capability.		
Organisational learning capability	Case analysis reinforced the importance of organisational learning in a positive and negative sense.	Organisational learning is endogenous to the firm. Provides the basis for learning about marketplaces, clients, competitors and, themselves (Hunt 1999).	Extend
Adaptive learning	All business units displayed evidence of adaptive learning. In COTBU, generally occurred in response to a business crisis.	Only capable of facilitating incremental innovation (Baker and Sinkula 1999a). Occurs within a set of recognised and unrecognised organisational constraints (Wang 2008).	Support
Generative learning	Staff passionate about challenging "old assumptions" and mental models.Achieved through culture (COSBU) and structure (COFBU).	Challenging paradigms, perceptual filters and fundamental beliefs/practices that define a firm's innovation processes (Baker and Sinkula 1999a; 1999b; Kang et al., 2007; Morgan and Berthon 2008).	Extend
Unlearning	as above	Past learning inhibits new learning (Sinkula 2002); unlearning crucial for absorptive capacity (Cepeda-Carrion et al., 2010).	Extend
Comments	Organisational learning capability has been extended primarily though the identification of the different strategies employed by two of the business units to achieve the same path dependency breaking outcomes through generative learning and unlearning. While the COSBU achieved this objective through its collegiate culture where staff were passionate about challenging "old assumptions" and an unwillingness to accept the status quo, the COFBU achieved the same generative learning paradigm through a change in organisational structure (project/domain matrix) as this provided the framework for knowledge sharing and questioning of the status quo.		
Alliance building capability			Support
Strategic alliance partner identification and assessment	The focus of COFBU and COSBU was on identifying partners to fill their knowledge and capability gaps and accelerate their learning.	In dynamic environments, knowledge absorption is focused on exploration (scope and flexibility dimensions) and partners who have that knowledge (Van den Bosch et al., 1999).	Support
Alliance learning	Focus on accelerating external learning through strategic alliance partnerships at varying levels of complexity.	Important strategy for joint capability building and learning (Hamel 1991) and learning about the process of alliance management (Kale and Singh 2007).	Support
Creation of idiosyncratic alliance resources and capabilities	Crucial aim of the COFBU's OEM strategy - develop exclusive and idiosyncratic alliance resources and capabilities which augmented the firm's resources.	Firms need to move to systematic investments in the alliance relationship in order to create an idiosyncratic combination of resources and capabilities (Dyer and Kale 2007).	Support

Table 5.2 Comparison between Case Descriptors and Innovation Capability Literature – OIC Components

OIC Components	Case Descriptors	Literature	Impact on Literature
Organisational Innovation Intensity			Extend
Multi innovation focus	Broad innovation focus encompassing all aspects of the firm.	Internal innovation primarily focused on products, processes, work organisational systems or marketing systems" (Weerawardena 2003).	Support
Strategic innovation: new business model	COFBU – new through-life support business model.	See literature relating to *Strategic Entrepreneurship, Business Model Design and Ecosystem Shaping* (above)	Extend
Comments	The research extended the definition of organisational innovation intensity. The first construct of the capability, multi-innovation focus – product, managerial, process and marketing - is consistent with and supportive of the literature. Through this research the definition has been extended from an internal focus to include external factors such as the firm's business model, strategic alliances and its ecosystem.		
Innovation absorptive capacity		Ability to exploit external knowledge a critical component of innovative capabilities/performance at all levels of a firm (Cohen and Levinthal 1990).	Support
Embedded resource sharing external collaboration	Collaborative knowledge sharing by strategic alliance partners entrenched in organisational routines.	Collaboration, inter-partner trust relationship interconnectedness and openness are key behavioural dimensions that demonstrate that a relational association exists (Jarratt 2004; Inkpen 2000).	Support
Externally focused innovation learning processes and structures	Development of structures and processes to capture external innovation knowledge from complementary knowledge owners or holder.	Learning structures and processes focused on acquiring knowledge external to the firm (Cohen and Levinthal 1990; Lane and Pathak 2006; van den Bosch et al., 2003).	Support
Transformative and exploitative learning	Understanding depth and breadth dimensions provides alternative strategies for transforming a firm's knowledge.	External knowledge must be exploited and then applied in the commercialisation of that knowledge (Lane and Pathak 2006). Knowledge has depth and breadth dimensions (van den Bosch et al., 2003).	Support
Innovation Infrastructure and OIC Renewal		Focus on renewal leads to proactive innovation and continuous learning designed to anticipate customer needs and necessary structural changes to innovation infrastructure (Hunt 1999).	Extend
Innovation Management System	COSBU - Innovation Management System included project prioritisation routines and embedded learning.	Portfolio management approach with a balanced project mix, and continuous and discontinuous innovations (Cooper and Edgett 2003).	Extend

OIC Components	Case Descriptors	Literature	Impact on Literature
	COFBU - project/domain matrix provided innovation knowledge sharing.	Ecosystem framework to sense market and technological opportunities (Teece 2007).	
Innovation experience and memory	Development of organisation routines to capture and share innovation experience in structured and unstructured ways.	Repetition and experimentation enable tasks to be performed better and quicker (Teece et al., 1997). Learning becomes embedded into behavioural routines (Moorman and Miner 1997).	Extend
Comments	This OIC component has been extended on a similar basis as to the organisational learning capability through the identification of the different strategies employed. The difference in approach between the COFBU and the COSBU demonstrated two options available for firms involved in innovation infrastructure and OIC renewal. While the former's focus was on knowledge sharing, organisational structures and routines, the renewal process for the COSBU focused on increasing the discipline and strategic alignment of its innovation management system.		
Innovation culture		Behaviour which challenges established organisational norms (facilitative leadership); supports learning (collaboration, Jarratt 2004, p. 302); provides an understanding of risk taking in innovation (tolerance of risk/no blame behaviour) (Weerawardena 2003).	Extend
Facilitative leadership	Proactive leadership involved in creating the right environment for innovation.	Essential to create the innovation behaviour change needed to perform in complex environments and to manage paths to effective generative learning (Slater and Narver 1995; Osterberg 2004).	Support
Collaboration	Achieved through collegiate culture and formal informal knowledge sharing routines COSBU and structural transformation (COFBU).	Essential for knowledge sharing and influences the type/depth of knowledge from partners. Behaviours include sharing information/ideas, communication openness and forbearance (Jarratt and O'Neill 2002).	Extend
No blame	Importance of responsible risk seeking propensity balanced by the acceptance of failure in innovation (failing forward).	A risk taking propensity is an essential part of entrepreneurship in strategic decision making (Weerawadeena 2003).	Extend
Comments	The extension to innovation culture was primarily driven by the increase in collaboration through alternative strategies. In the COSBU it was achieved through its collegiate culture and formal and informal knowledge sharing routines while in the COFBU increased collaboration was the result of its structural transformation. In addition, while risk taking is widely recognised as imperative to innovation, this research stresses the importance of responsible risk seeking propensity *balanced by* the acceptance of failure in innovation (failing forward).		

The other primary contribution of this research is the contrast between how two business units addressed the constraints of path dependencies and mental models through different strategies. The strategy used by the First Business Unit (COFBU)

and the Second Business Unit (COSBU) to overcome these barriers was generative learning. The COSBU achieved this objective through its collegiate culture where staff were passionate about challenging "old assumptions" and unwillingness to accept the status quo. This generative approach enabled the COSBU to gain a reputation for solving difficult problems and anticipating client needs (SBU1).

By contrast, the COFBU achieved the same generative learning paradigm through a change in organisational structure (project/domain matrix) as this provided the framework for knowledge sharing and questioning of the status quo. This structure also provided the foundation for the COFBU's innovation infrastructure and OIC renewal as it facilitated the capture of innovation memory and the sharing of innovation experience. The COSBU achieved the same renewal objective through its line of business structures, its Strategic Technology Roadmap and collegiate culture.

5.3 Comparing OIC Frameworks

In the following section a comparison will be made between the framework derived from the literature and the OIC framework that has emerged from the case analysis. Figure 5.1 depicts the literature derived OIC superimposed over the case derived OIC. The oval shapes with bolded lines and descriptors represent those preconditions and constructs which are common between the two OICs. The dotted lines represent a component and linkage from the literature derived OIC (market-focused learning capability) which has not been included in the case derived OIC. The remainder of the Figure represents components and linkages in the case derived OIC not present in the literature derived OIC.

The case derived OIC consisted of three preconditions – organisational learning capability, strategic entrepreneurship (instead of the literature derived entrepreneurial intensity) and alliance building capability. The third pre-condition, alliance building capability, provided vital external knowledge sources to increase the depth or breadth of knowledge within the business unit (van den Bosch et al., 2003, p. 14). While two of the same components from the literature derived OIC were present (organisational innovation intensity and innovation infrastructure and OIC renewal), two additional

components emerged from the case analysis (innovation culture and innovation absorptive capacity). The market-focused learning capability component evidenced through the literature review was incorporated in the organisational learning capability pre-condition.

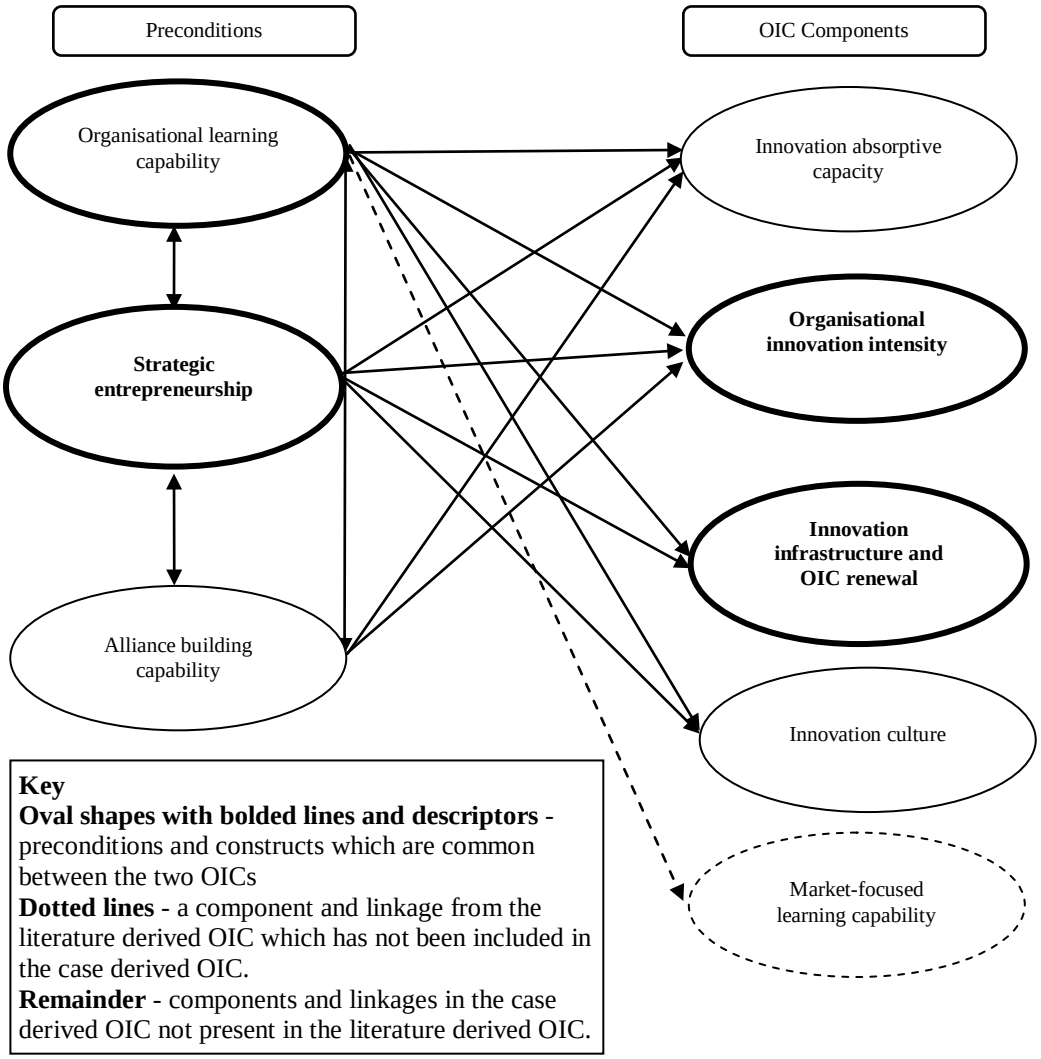


Figure 5.1 Organisational Innovation Capability Framework Comparison

5.3.1 OIC Preconditions

5.3.1.1 Strategic Entrepreneurship

In the literature derived OIC entrepreneurial intensity was defined in terms of innovativeness, proactiveness and risk taking propensity (Weerawardena 2003, p. 410). While this analysis has reinforced the importance of these constructs, three

additional constructs were added as the literature derived entrepreneurial constructs were not, of themselves, sufficient to achieve competitive advantage.

Following Teece's submission that firms "with good dynamic capabilities will have entrepreneurial management that is strategic in nature…" (2007, p. 1344), *entrepreneurial intensity* (a dimension of the literature derived OIC) emerged from the case data as *strategic entrepreneurship* to reflect the need for entrepreneurial behaviour to be exercised with a purpose (*entrepreneurial intentionality*) and in a systematic and disciplined manner (*entrepreneurial discipline*). This is an important finding from the research and a key difference between the two models.

While the three original entrepreneurial intensity constructs were similar between the two frameworks, there were distinct differences in application. Innovativeness, proactiveness and risk taking propensity take place within a context including different industries, technologies, functional areas and organisations (Helfat et al., 2007, p. 7). For example, Weerawardena determined the entrepreneurial intensity of machinery and equipment manufacturing and metal products manufacturing firms (2003, p. 414). According to IbisWorld (2008), these industries are in the mature life cycle stage where the industry is growing slower than the economy (over an extended period), innovation is focused on existing products and there is the rising threat of import penetration. In addition, there is typically a well defined and established product market which provides little incentive to undertake the manufacture of new goods which can be a time consuming and costly procedure. Accordingly, the entrepreneurial intensity measures are predominantly product, service or project related with only one measure extending beyond these limitations (item 10, Weerawardena 2003, p. 427). Weerawardena also acknowledged that research in other industries, particularly the rapidly growing services sector, is required to validate the relationships explored in his study (2003, p. 420). The sixth component, business model design and ecosystem shaping (following Teece 2007, p. 1341), is included to reinforce the importance of looking for innovation at a more fundamental level than product, service or project and often beyond the firm's boundaries.

5.3.1.2 Organisational Learning Capability

In both frameworks organisational learning capability was of high importance. The case analysis supports the view that organisations are residues of past learning with the lessons of prior successes and failures embodied in their routines (Grey and Antonacopoulou 2004, p. 23; Edmonson and Moingeon 1998, p. 7). These routines dominated the CO's organisational life with the result that "action stem(med) from a logic of appropriateness or legitimacy, more than from a logic of consequence or intention" (Levitt and March, 1998, p. 320).

Wijnhoven's argument that there is a direct relationship between environmental complexity and dynamics and learning needs (2001, p. 183) is supported from the case analysis although it is the accuracy of management's perception of the environment which is of importance. As the COFBU and COSBU's complex and dynamic environments were characterised by a wide diversity of dissimilar environmental factors which were in a constant state of change, learning needs were high and, therefore, double loop learning was required to develop and innovate existing action-outcome theories and mental models (Wijnhoven 2001, pp. 183, 185). Successful innovation required each business unit to adopt a new way of looking at things and it was generative learning and their unlearning capability, which enabled the COFBU and COSBU to question long held assumptions and mental models (Senge 1990, p. 8; Argyris 1999, p. 68). By contrast, it was the COTBU management's bounded perception of the environment, the inadequacy of its inherited adaptive learning orientation and the absence of a generative learning approach which led to its poor business performance.

From each of the three case studies organisational unlearning was as important as organisational learning (Sinkula 2002; de Holan, Phillips and Lawrence 2004, p. 49, Fiol and Lyles 1985, p. 804). It was essential to counteract the path dependent mental models and defensive routines, eliminate old logics and develop new approaches in order to achieve superior value for the stakeholders (Prahalad and Bettis 1986). As the competitive intensity of the market in which the business units competed was changing (in the case of the COFBU and COSBU) or novel (in the case of the

COTBU), unlearning was required to reorient the organisational values, norms and behaviours by changing cognitive structures, mental models, dominant logics, and the core assumptions which guided behaviour (following Sinkula 2002, pp. 255, 256). Perhaps this also offers an explanation of why the market learning capability in the case data was integral to the organisational learning capability, and a separate dimension of the OIC within the literature derived structure.

The difference in how the COFBU and COSBU learnt should also be noted as the former's learning and knowledge sharing processes were based on its reconfigured organisational project/domain matrix structure. By contrast, the COSBU achieved its generative learning through its collegiate culture and recruitment strategies. Both of these strategies appeared successful in leveraging innovation.

5.3.1.3 Alliance Building Capability

The alliance building capability was not a dimension of the literature derived OIC. Strategic alliances have been defined as the "relatively enduring interfirm cooperative arrangements, involving flows and linkages that utilise resources and/or governance structures from autonomous organisations, for the joint accomplishment of individual goals linked to the corporate mission of each sponsoring firm" (Parkhe, 1991, p. 581). Following Dyer and Kale's argument that relational capabilities are preconditions for firms to access the benefits of their networks, it is argued that this capability was critical as a precondition because of the close correlation between it and innovation absorptive capacity and the need to move quickly in reconfiguring its market position. The establishment of alliances with partners with complementary knowledge was the impetus for the implementation of the innovation absorptive capacity and a major contributor to achieving environmental fitness (Dyer and Kale 2007, p. 71). The formation of alliances was also important in helping the COFBU manage the increased perceived competitive complexity within its target markets (Mazzarol and Reboud 2008, p. 248).

Traditional models adopt a more organisational centric understanding of innovation and the incorporation of an alliance building capability within an OIC framework is

recognition of the fundamental importance of alliances as sources of innovation, reflecting a stakeholder approach to innovation. Therefore, the case data confirms that an OIC represents the integration of innovation, relationship linking, and market linking, i.e. the core marketing capabilities.

5.3.2 OIC Components

5.3.2.1 Innovation Absorptive Capacity

In the literature derived OIC the innovation absorptive capacity was not a component as external learning was derived from market focused learning (Weerawardeena 2003). The case analysis supports the view that there is a recursive relationship between innovation and absorptive capacity (Lane and Pathak 2006, p. 849). In the framework arising from the case analysis the innovation absorptive capacity was comprised of three constructs – externally focused innovation learning structures and processes, embedded resource sharing external collaboration, and transformative and exploitative learning.

5.3.2.2 Organisational Innovation Intensity

Weerawardena defined innovation as "the application of ideas that are new to the firm, to create added value either directly for the enterprise or indirectly for its customers, regardless of whether the newness and added value are embodied in products, processes, work organisational systems or marketing systems" (2003, p. 412). While the definition appears expansive, its primary focus is innovation *within* the boundaries of the firm, an approach consistent with the early broadening of the definition of innovation from technical innovation to non-technological value-creating activities. The measures that were adopted by Weerawardena reinforce this view as they capture the extent of the firm's product, process, managerial, and marketing innovations with high scores on the innovation intensity scale indicating that the firm has introduced radical innovations in the four value creating activities (2003, p. 415). This current analysis parallels the discussion with respect to strategic entrepreneurship where the narrowness of the definition emanated from the mature manufacturing industries chosen for analysis by Weerawardena.

Like strategic entrepreneurship, the COFBU and COSBU provide a more expansive definition of innovation intensity. For the COFBU, innovation intensity encompassed both technological and non-technological innovation within the firm but, because of the loss of its manufacturing business, also extended to "improvement in the business model itself" (FBU4) and, by implication, innovation of the ecosystem in which it operated even though the customer remained the same. Similarly, the COSBU sought to sell its security solutions to a new target market. While this form of innovation could arguably be included within Weerawardena's intensity measures (perhaps under the headings managerial or marketing innovations), the data suggests that innovation of a target market, i.e. market leadership, would be an explicit measure of a market learning capability. Therefore, as a consequence of this research, the understanding of innovation intensity has been expanded beyond product, process, managerial, and marketing innovations to innovation in relation to primarily external factors such as the business model and strategic alliances.

5.3.2.3 Innovation Infrastructure and OIC Renewal

From the case analysis, the innovation infrastructure and OIC renewal component included the establishment and renewal of the firm's innovation management system, and the accumulated experience, expertise and knowledge embedded in the organisational memory. The difference in approach between the COFBU and the COSBU demonstrated two options available for firms involved in innovation infrastructure capability renewal. While the former's focus was on knowledge sharing, organisational structures and routines, the renewal process for the COSBU focused on increasing the discipline and strategic alignment of its innovation management system.

The move to formalise the project/domain matrix structure was a key initiative by the COFBU. This structure removed the functional barriers that constrained knowledge flow, facilitated the sharing of innovation experiences, increased innovation memory as well as access to that memory, and encouraged open-minded communication within a commonly held framework. It also increased the number of strategic partners with whom it shared, acquired and developed complementary knowledge.

The COSBU's focus was on its Strategic Technology Roadmap which, when combined with its Product Portfolio and Stage-gate processes, achieved a disciplined ideation capture and management process for new products/solutions, processes and management ideas. For these two business units infrastructure renewal was driven by the need to ensure that innovation achieved commercial, and not simply research, outcomes (a function of its strategic entrepreneurship) as well as the need to ensure that the new business model and its associated routine and process changes were rapidly adopted (organisational learning capability). For the COSBU, this analysis is consistent with the view that portfolio planning and management is a dynamic capability that lies at the heart of routine adaptability of the organisation (Newey and Zahra 2009, p. S97).

5.3.2.4 Innovation Culture

The fourth component of the case derived OIC is innovation culture, which included facilitative leadership, collaboration and a no blame orientation. Culture can act as a de facto governance system as it influences the behaviour of individuals (Teece et al., 1997, p. 520).

The CO's culture comprised Schien's three cultures of management (1996): firstly, an operationalisation culture responsible for the delivery and production of key assets; secondly, an engineering culture responsible for the engineering design of infrastructure assets; and thirdly, an executive culture. This amalgam of cultures originated in the CO's predecessor and was transferred notwithstanding the change in the ownership structure. The engineering culture was characterised by "problem oriented knowledge workers…focused on delivering acceptable products to their customers" with those in executive management in the "deep command and control hierarchy" preoccupied with "increasing short term shareholder-added value" at the expense of longer term objectives such as innovation (Cor4).

As Slater and Narver concluded, there is a correlation between entrepreneurship and organisational culture as new behaviours can leverage learning (1995, p. 68). These behaviours generally enable the entrepreneurial firm to "innovate, initiate change, and

rapidly react to change flexibly and adroitly" (Naman and Slevin 1993, p. 137). In the OIC developed from the case analysis, it was essential that the three business units recognised, understood and confronted the strategic limitations of the CO's culture and its impact on their business operations.

5.3.3 OIC Component Relationships

While entrepreneurial intensity was one of the two preconditions identified in the innovation literature its importance was not compelling. Zahra et al., without differentiating between preconditions and components, identified entrepreneurship as the starting point for dynamic capability development as it influenced the selection of skills and resources and promoted organisational learning processes to capture external knowledge as new situations arise (2006, p. 925).

This research identified strategic entrepreneurship as the commencement point for the development of an OIC as it provided the impetus for the organisational learning capability (the learning orientation) and the alliance building capability (the learning focus). Without the proactiveness and intentionality of strategic entrepreneurship, possibly prompted by the likelihood of an exogenous shock, the OIC development process was unlikely to have commenced. In the literature, entrepreneurial intensity was linked to the organisational innovation intensity and the innovation infrastructure and OIC renewal. While the case-derived strategic entrepreneurship precondition had the same linkages, it was the nature and strength of the linkages, rather than their existence, which was of importance. Strategic entrepreneurship extended innovation intensity from an internal focus to considered innovation of the business model and elements of the firm's ecosystem.

5.4 Further Implications for Theory

5.4.1 Opening the Organisational Innovation "Black Box"

By opening the innovation "black box", this research has provided a higher order capability which may provide some guidance to strategic managers as they attempt to build, systematise and replicate an innovation capability within their organisations.

The OIC is a capability which provides managers with the capacity to manage the component capabilities of the framework together with their linkages and interdependencies. It enables managers to impact the firm's existing "resource base and transform it in such a way that a new bundle or configuration of resources is created so that the firm can sustain or enhance its competitive advantage" (Ambrosini and Bowman 2009, p. 35).

The OIC framework which emerged from the case analysis answers the call to address the "abstract and intractable" nature of dynamic capabilities (Danneels 2008, p. 536) through detailed, micro mechanisms based on qualitative fieldwork to identify how a capability is deployed and how it works (Ambrosini and Bowman 2009, p. 37). Through the analysis of the formation of an OIC in three embedded business units in the CO, this research has focused on understanding the complex world of contemporary experience from the point of view of its participants (Yin 2009, pp. 8, 11), and, in doing so, provided a closer, richer, thicker, more subjective view of an idiosyncratic organisational innovation phenomena (McKelvey 2003, p. 6) beyond the common unit analysis of the firm.

The research examined whether an OIC existed for the CO or whether the capability is conceptualised differently depending on the organisational context of the business unit. By exploring a dynamic capabilities perspective to innovation, the case analysis demonstrated that although the three business units were embedded in the one case organisation, one OIC was not common across the three business units. The analysis found that different but interrelated OIC frameworks existed in the COFBU and COSBU and that a third model was beginning to emerge in the COTBU. Although each model exhibited some differences in dimensions and the constructs defining those dimensions, nevertheless a common framework emerged out of the cross-case analysis of the two positive cases and the negative case. The difference between the three OICs reflected the different environmental contexts, management's perceptions and interpretations of those contexts, and the effectiveness of management's actions in relation to the constraints of path dependency.

Despite the different component names there was a high degree of commonality in the intent and operation of the respective components and this commonality facilitated the development of the OIC from the case data. This outcome supports the view that "while dynamic capabilities are idiosyncratic in their details…specific dynamic capabilities…exhibit common features that are associated with effective processes across firms" (Eisenhardt and Martin 2000, 1108). For instance, a primary strategy of the COSBU was to "create the right environment" for innovation (SBU1). A major environmental element was its collegiate culture which was characterised by open communication, respect for the views of colleagues and a willingness to collectively solve difficult technical problems. For the COFBU the focus was on increasing employee engagement through peer to peer knowledge sharing, a "can do attitude" and high degree of personal accountability (FBU4). It was also moving quickly to tolerate failure without blame while the COSBU had the same approach although expressed in terms of "failing forward" (SBU1).

The case derived OIC consists of three preconditions – an organisational learning capability, strategic entrepreneurship and an alliance building capability – and four components - innovation infrastructure and OIC renewal, an integrative innovation absorptive capacity, an innovation culture and organisational innovation intensity. Idiosyncratic constructs for each of the preconditions and components have been derived from the case studies. From the case analysis, an OIC is defined as a higher order capability which has the capacity to systematically reconfigure the firm's resource base in order to transform knowledge and ideas into new business models, products, processes and systems for the benefit of the firm and its stakeholders.

The case analysis also supports Eisenhardt and Martin contention that "(t)he existence of common features among effective dynamic capabilities does not, however, imply that any particular dynamic capability is exactly the same across firms" by demonstrating that while the OIC's in the two positive cases had common attributes, the constituent elements of those differed and also, there are many starting points and "multiple paths (equifinality) to the same dynamic capabilities" (2000, pp. 1109, 1116). The development of the innovation infrastructure and OIC renewal

of the COFBU and COSBU reflected their different starting points and organisational contexts, similar though different paths and the different decisions of their respective managements. However, they serve to illustrate this argument as the capability was established through the COFBU's project/domain matrix structure while for the COSBU the same objective was achieved through its Strategic Technology Roadmap, stage gates and its portfolio planning approach. Similarly, the COFBU's structure provided the foundation for its generative learning while the COSBU achieved this objective through its collegiate culture and recruitment strategies.

5.4.2 Intentional and Disciplined Strategic Entrepreneurship

Ireland et al. highlighted the need for empirical research "to explicate and understand how entrepreneurial leaders manage resources strategically to create competitive advantages" (2003, p. 983). Welter argued that a contextualised view of entrepreneurship is required to increase our knowledge of when, how, and why entrepreneurship happens and stresses the need for qualitative research to capture the richness and diversity of organisational context (2011, pp. 176, 177). O'Connor et al. commented on the difficulty experienced by firms "in making an immediate, strong, shared or consistently helpful connection between 'discipline' and 'entrepreneurship'" and in the understanding of entrepreneurship as *bricolage* (freedom to play and do whatever is necessary) and disciplined thought and activity…" (2007). This research provides valuable insights into these and other entrepreneurship issues and increases the understanding of its nature, richness and dynamics (Zahra 2007, p. 451).

This research has brought together for the first time the previously identified entrepreneurship components and provided a framework for strategic entrepreneurship. In doing so, while supporting the innovation literature and the inclusion of each construct, it extends the current understanding of entrepreneurship by combining it with the intentionality and discipline of strategic management to complement the risk orientation inherent in entrepreneurship. While Helfat et al. consider that entrepreneurship and strategy are *often* linked (2007, p. 1), this research suggests that the linkage is a *requirement* for innovation success.

Weerawardena's entrepreneurship model reflects the *display* of firm behaviours (innovativeness, proactiveness and risk-taking propensity) (2003, p. 410) without identifying the underlying causes and the firm's level of intentionality in implementing those behaviours. Entrepreneurial intentionality has been included as a construct as the invisibility of innovation critical success factors and the low innovation success rate (Cooper 1999, pp. 2, 8, 9; de Waal, Maritz and Shieh 2010) requires the development of an organisational capability to bring about innovation such that "the outcome bears a definite resemblance to what was intended" (Dosi et al., 2000, p. 2; see also Helfat et al., 2007, p. 4). It should be noted that the source of the purposefulness arises from the entrepreneurial mantra to identify and respond to change to achieve a higher productivity and yield (Drucker 1985, p. 25). Intentionality is important as an "organisation that adapts in a creative but disjointed way to a succession of crises is not exercising a dynamic capability" (Zollo and Winter 2002, p. 340).

The research supports Teece's contention that the key strategic function of entrepreneurial "management is to find new value-enhancing combinations inside the enterprise, and between and amongst enterprises, and with supporting institutions external to the enterprise", develop new organisational structures and business models and make brave decisions to develop new business models, ecosystems and strategic architectures (2007, pp. 1341, 1346). It also emphasises the importance of making disciplined and purposeful entrepreneurial decisions. This intentionality enables a firm to better prioritise the allocation of its scare resources (Teece 2007, p. 1324) as the purposefulness narrows the search horizon and enables those resources to be applied more effectively and efficiently. This requirement for intentionality is also consistent with the Zahra et al. definition of dynamic capabilities "as the abilities to reconfigure a firm's resources and routines *in the manner envisioned* and deemed appropriate by the firm's principal decision-maker(s)" (2006, p. 924 emphasis added). The conceptualisation of entrepreneurial intentionality is consistent with the entrepreneurial strategic vision of Ireland et al. which "represents a commitment to innovation and entrepreneurial processes and behaviour that is expressed as the organisation's philosophical modus operandi" (2009, p. 26).

Strategic entrepreneurship enables a firm to be more in tune with its business environment and to sense changes or potential exogenous shocks and to proactively find new and better opportunities for revenue generation and competitive advantage. Newey and Zahra suggest that endogenous entrepreneurship, that is, "the firm's initiatives in developing new products, services and/or businesses arising from the firm's own internal opportunity recognition", causes the firm to take the initiative "without the dominating pressure *from* an exogenous shock" (2009, p. S83, emphasis added). In the case analysis, the management of the COFBU and COSBU acted through endogenous entrepreneurship *in anticipation of* an exogenous "shock" and, in doing so, minimised the later impact of the exogenous "shock" when it occurred. This proactive and anticipatory action enabled its entrepreneurial managers to sense and shape the future, unshackle their business unit from the past, and implement strategies to augmenting their knowledge resources, establishing new value enhancing asset combinations, and transforming organisational structures to achieve evolutionary and entrepreneurial fitness (Teece 2007, p. 1346).

The relationship between strategic entrepreneurship and organisational discipline is evident from the need for the function that a dynamic capability performs to be repeatable and to consist of patterned and practiced activity (Helfat et al., 2007, pp. 4, 5), for discovery to be grounded in organisational processes" (Teece 2007, p 1323) and to be "a learned and stable pattern of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness" (Zollo and Winter 2002, p. 340). The firm's ability to sense opportunities and threats can also be facilitated if it explicitly or implicitly employs a systematic and analytical decision making framework to assist in prioritising innovation (Teece 2007, p 1323) at the level required to achieve environmental fitness. The COSBU's move from ad hoc to strategic entrepreneurship illustrates this disciplined approach to strategic entrepreneurship.

Another point of difference between the case data and the literature is the application of the measure "risk taking propensity". Weerawardena's measures implicitly support the view that the higher the risk the greater the entrepreneurial intensity

(items 5, 7, 10, p. 427). For example, "a strong tendency for high risk investments (with chances for very high rates of return)" is a factor which contributes significantly to a high entrepreneurial intensity.

The positive cases suggest that while risk taking is important it must be related to management's perceptions of the environmental change taking place, and be designed to shift resources from areas of low productivity and yield to areas of higher productivity and yield (Drucker 1985, p. 25). It is not simply about having a high tolerance for risk per se. In addition, the risk of not taking any action also needs to be considered as the failure by the COFBU to take action may have resulted in the closure of the business.

In the dynamic capabilities framework the entrepreneur/manager's role in the modern corporation is not necessarily an individual but a function which is part Schumpeterian (the entrepreneur introduces novelty and seeks new combinations of resources), part evolutionary (the entrepreneur endeavors to promote and shape innovation learning) and part Porterian (as the entrepreneur seeks to achieve strategic fit with its internally controlled assets and those of its alliance partners) (Augier and Teece 2009, pp. 417, 418). While recognising that entrepreneurship is multi-disciplinary and a complex domain of human practice with few or no enduring rules or solutions (O'Connor et al., 2007), this research has provided an increased understanding of the role of management and entrepreneurship in achieving enhanced business performance. It has also stressed the need for the entrepreneurial strategic vision to be a "defining mind-set shared by the organisation's top managers" (Ireland et al., 2009, p. 40).

5.4.3 The Breadth of Innovation Intensity

The traditional focus of innovation has been on a firm's products, processes, management or marketing approach. As has been demonstrated in sections 5.3.1.1 and 5.3.2.2, Weerawardena's innovation and entrepreneurial intensity measures were developed in a manufacturing and metal products environment. In this environment, where the market and technology is stable, the internally focused definition of

innovation intensity is appropriate in order to minimise the development costs of dynamic capabilities (Zahra et al., 2006, p. 942). While this research supports Weerawardena's definition of innovation intensity, the definition has been extended from the internal focus to include external factors such as the firm's business model, strategic alliances and its ecosystem. Accordingly, from the case analysis commercial success was as dependent on management, entrepreneurship and business model design and implementation as it was on technological innovation.

This broadening of the definition of innovation intensity expands the search horizon for opportunities available to firms to achieve environmental fitness from within the firm to include innovation opportunities of the firm's architecture, its business model or its ecosystem. As the selection/design of business models is a key micro-foundation of dynamic capabilities, management's role is, particularly in rapidly changing environments, to systematically deconstruct existing business models and to evaluate each element with an idea toward refinement or replacement, and to design the new integrated business model having regard to the anticipated business/customer environment and the trajectory of technological development in the industry.

The COFBU case study illustrates, in a positive manner, the increased breadth of innovation intensity and its management's willingness to seek innovation beyond its organisational and learning boundaries. While it implemented innovation within the firm's boundaries (processes, structure, culture), it also looked beyond its boundaries to find a new business model in through-life support. By contrast, the COTBU illustrates the constraints of a low innovation intensity (limited primarily to adaptive technical innovation) and the failure to design and implement an effective business model.

In today's global economy, strategic managers must behave in an entrepreneurial manner as the intensity of the firm's innovation performance will determine whether or not it continues to retain a competitive advantage. While success may lie with innovation of the firm's products, process or management behaviour, in dynamic markets managers must be prepared to examine the sustainability of the firm's

business model and appropriate take steps to refresh, rejuvenate or even retire the model. The anticipation of an exogenous shock may also lead to innovation within the firm's ecosystem as the firm seeks to achieve a sustainable competitive advantage.

5.4.4 The Importance of Managerial Perception and Capability Intensity

When environmental changes occur or are anticipated, managers must interpret those changes and decide upon a course of action, including the decision whether or not to change the resource base. The degree of alignment between management's perception of the environment and the actual change will impact upon the success of the dynamic capabilities selected to bring congruence between the firm and its environment.

The importance of managerial perception of the nature and degree of environmental change has been identified as a key success factor determinant for dynamic capabilities (Ambrosini et al., 2009, p. S13). The role of managers in designing and guiding strategic and organisational change is influenced by their perception and interpretation of the external environment and, accordingly, they must be able to "*accurately* sense changes in their competitive environment, including potential shifts in technology, competition, customers, and regulation" (Harreld et al., 2007, p. 24, emphasis added). One reason why managers may misperceive or misinterpret environmental signals is because their "bounded rationality" emanating from "their history, their expectations, and the probabilistic judgments that they make when scanning the organisational context will have an impact on the way they manage the firm's portfolio of resources" (Moliterno and Wiersema 2007, p. 1081). If managers misperceive the impact of environmental changes they may develop inappropriate capabilities (Adner and Helfat 2003, p. 1020; Ambrosini and Bowman 2009, p. 39, 41; Ambrosini et al., 2009, p. S22).

While the literature has focused considerable attention on the formation of dynamic capabilities, the capability intensity level selected in the formation process (regenerative, renewing or incremental (Ambrosini et al., 2009, p. S10) also needs to

be considered. An appropriate dynamic capability can be identified for formation but if the capability intensity level is inappropriate then the case analysis suggests it is likely to fail. The cross-case analysis suggests that there is a correlation between the degree of accuracy of a manager's perception of the variance in the environment (between the actual and perceived) and the level of capability intensity selected. The COFBU and COSBU's management both correctly recognised that there was a high degree of environmental variance between its former and new environments. Accordingly, the management selected a regenerative capability intensity to achieve new change capabilities.

Conversely, the COTBU was a newly formed business unit. However, its starting point reflected the paths of the CO – the supply of high value infrastructure products to the government high level security sector (GHLSS). Its new environment, while partly embracing this market, also extended to the GHLSS in the US and other countries, as well as the commercial high level security sector (CHLSS). Its challenge was to develop change routines in and for an environment in which it had limited or no experience. The degree of variance between its parent's business paths and its new environment was very high. However, the COTBU's management perceived that the variance was low. The difference between the actual (very high) and perceived (low), resulted in the COTBU deciding to renew its GHLSS capability rather than seeking a fundamental reconstruction of its change capabilities.

This research has emphasised the importance of managerial perception and validates the views of Adner and Helfat (2003) and Ambrosini and Bowman (2009) in relation to this issue. While these authors have highlighted the impact of managerial perception this research has contributed to theory and practice by focusing attention on the gap in perception between the actual environmental change and management's perception of that change, and the impact of the gap on both the nature and capability intensity of the dynamic capabilities deployed to impact the firm's resources.

In summary, the key contributions of this dissertation to theory are the development of a comprehensive innovation capability framework that managers can employ

within their organisations, and which places a primary focus on the organisational precondition of strategic entrepreneurship (and in particular, the constructs of discipline and intentionality) and the expansion of the definition of innovation intensity.

5.5 Implications for Management Practice

5.5.1 Introduction

The case analysis has placed strategic entrepreneurship at the centre of strategic management and in the building of an OIC. More importantly, it provides guidance to managers in defining the firm's competitive arena and ecosystem and the trajectory of its future evolution through the co-ordination and assembly of disparate and usually cospecialised elements.

5.5.2 The Importance of Understanding Path Dependencies

The dynamic capabilities framework recognises that the firm is shaped but not necessarily constrained by its past. Accordingly, one of the key implications for practice arising from the case analysis is the need for managers to make explicit the path dependencies, and information, belief and behaviour barriers to innovation within their firms, particularly where past learning inhibits or excludes new learning. By identifying path dependencies and understanding their impact upon the intended future direction of the firm in its quest for environment congruence, managers can make a significant difference to achieving and retaining competitive advantage through its investment choices and priorities, and through implementing strategies for unlearning. The application of these capabilities is in itself an important class of dynamic capabilities which "emerges around a manager's ability to override certain 'dysfunctional' features of established decision rules and resource allocation processes" (Teece 2007, p. 1327)

The key barriers to innovation which emerged from the analysis include:

(a) the need for organisations to be aware that its strengths and capabilities can simultaneously be weaknesses and, accordingly, that core capabilities can

become core rigidities in the absence of dynamism in the maintenance, development and continuous enhancement of that capability;

(b) the inertia or complacency in relation to the subtle transformation of a core capability to a core rigidity generally results from belief system barriers, where there is a gap between theories in use and espoused theories, or from information barriers, where information is excluded from consideration due to pre-existing biases or mental models;

(c) organisational behavioural barriers which manifest themselves in defensive routines which are triggered by the possibility of embarrassment or threat resulting in the entrenchment of a culture where failure is unacceptable, inflexibility is embedded and errors not discussed without blame or criticism.

5.5.3 The Importance of Generative Learning and Unlearning

The case analysis reinforced the importance of having an effective organisational learning capability to identify new knowledge and new sources of knowledge and, most importantly, to challenge mental models and information barriers (cf. Mazzarol et al., 2009 p. 338 where the emphasis is on thinking skills to challenge "strategic myopia"). The emphasis from the case analysis was upon generative learning and unlearning (i.e. changing the way we do things) as central to the dynamic capability formation and renewal process. The COFBU and COSBU business units recognised that their learning was a path dependent process in which what they learnt depended on the knowledge they possessed, and both business units developed mechanisms to provide a culture in which challenging the status quo was accepted as a norm. Generative learning and unlearning enabled the COFBU and COSBU to recognise their dysfunctional routines and prevent strategic blindspots (Teece and Pisano, 1994 p. 545).

As has been stated in sections 4.6.3.2 and 5.3.1.2, different methods of fostering and promoting generative learning were developed by the COFBU and COSBU and these provided options as to how managers can develop generative learning within their firms at both an organisational and individual level. A change in organisational structure (project/domain matrix) reinforced the generative learning paradigm within

the COFBU and provided the framework for knowledge sharing and questioning of the status quo. This finding is consistent with that of Jarratt (2009) who confirmed the importance of formal and informal structures in supporting learning and the application of new knowledge.

This change in formal and informal structures was achieved in the COSBU through its collegiate culture and recruitment strategies and its focus on solving difficult technical problems. These organisational changes facilitated knowledge sharing and problem solving and generated patterns of interactions that represented successful solutions to particular problems. Through this disciplined approach new knowledge was then embedded into the innovation management system, added to innovation experience and stored in the innovation memory.

Generative learning was also fostered through boundary spanning behaviours and co-ordinated search routines where the focus was on identifying complementary knowledge sources external to the firm. These included research partners, universities and the RO. The COSBU case analysis emphasises that while understanding *how* individuals and firms learn is important, *what* they learn is equally important. Managers must develop intentional and systematic generative search routines based on product/solution and capability gaps within the firm to maximise the acquisition, integration and exploitation of new knowledge from beyond its learning and organisational boundaries.

5.5.4 Strategies for Increasing Absorptive Capacity

Absorptive capacity is the "ability of a firm to *recognise* the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal 1990, p. 128 emphasis added). A question which arises from this definition is, When does the recognition of the knowledge value takes place and what is involved in the process of recognition? Is the value proactively recognised and identified *before* the new information is acquired? Is the value of information recognised *systematically* through an organisational routine of knowledge identification and evaluation or does recognition occur *serendipitously*? Both the COFBU and COSBU proactively

identified valuable knowledge that was not within their current knowledge base and deliberately and strategically sought to acquire that knowledge (hence the linkage between strategic entrepreneurship and innovation absorptive capacity). This early recognition of the potential value of new knowledge and of potential alliance partners who possessed such knowledge was an important factor in accelerating their knowledge acquisition and integration, and therefore, the development of their respective OICs.

The case analysis also provides guidance for managers in relation to the external knowledge acquisition strategies that are available to them. Section 4.6.7 highlights the options available to firms seeking to expand their organisational knowledge and absorptive capacity. Consistent with van den Bosch (2003, p. 43), the case analysis demonstrated that a firm can elect to firstly, increase its knowledge *breadth* by acquiring knowledge related to its existing knowledge base but outside its current learning boundary, secondly, it can increase the *depth* of its knowledge base by acquiring more of the same knowledge it currently holds, or thirdly, increase the breadth *and* depth of its knowledge base. The question as to which of these absorptive capacity strategies to adopt will depend on the dynamism in the firm's market, the likelihood of exogenous shocks and their anticipated impact on the firm, as well as management's perceptions of the firm's environment and the impact of any environmental changes.

5.5.5 The Importance of Coherence

The way in which a firm coordinates and integrates mutually consistent and supportive resources and assets within the firm and between the firm and its ecosystem determines the level of coherence between those routines. Through the intentionality and discipline of strategic entrepreneurship, the firm leverages its "architectural knowledge or knowledge about the ways in which the components are integrated and linked together into a coherent whole" (Henderson and Clark, 1990, p. 11). The architecture of system components may provide insight into the ways in which OICs differ from each other and provide a source of competitive advantage as

partial imitation of a successful model may yield zero benefits (Teece et al., 1997, p. 519; Henderson and Clark, 1990, p. 11).

The case analysis, particularly the COFBU and COSBU case studies, support the view that an essential element to prevent imitation is the level of coherence between the processes and routines, as both business units, in their own ways, were focused on developing disciplined frameworks for innovation, behaviour and learning. Learning was a critical objective as organisational learning was the product of synergies among the management innovation practices and routines.

5.5.6 Understanding Capability Life Cycles

The concept of capability life cycle provides strategic managers with a common language and way of thinking about the evolution of capabilities as well as recognisable life cycle stages as they seek to increase their resource and capability heterogeneity (Helfat and Peteraf 2003, p. 998). Consistent with the RBV, the intentionality and discipline constructs of strategic entrepreneurship demonstrate the need for strategic managers to understand the stage of the life cycle of their capabilities, the capability options arising from the existing capabilities and, where transformation is to take place, the intended development path trajectory of those dynamic capabilities.

By understanding the life cycle of capabilities and their evolution over time managers are better able to identify capability options and identify those which may best suit environmental triggers. Failure to understand the evolutionary process of resources and capabilities will limit management's ability to "answer questions about competitive advantage and disadvantage over time based on capabilities and resources" (Helfat and Peteraf 2003, p. 1008). Depending upon the nature of environmental factors, the selection of the renewal, redeployment or recombination branches may lead to a substantial alteration to the original dynamic capability, particularly if multiple episodes of branching along different renewal, redeployment or recombination paths are involved (Helfat and Peteraf 2003, p. 1008).

The COFBU provides a research-based case study of the way in which management evaluated its capability options and identified a dynamic capability development path and trajectory. It provides evidence and management insights into the founding and development stages of the capability life cycle. With the retirement of its aircraft manufacturing capability, the COFBU decided that its future lay in through-life support. To accelerate its capability development in this related knowledge domain it developed strategic alliances with overseas aerospace OEMs to accelerate its capability development with this acceleration represented by the steepness of the curve in Figure 4.1. Key insights from this case study include the need for management proactiveness in anticipating exogenous "shocks" before they occur, the need for management to proactively retire a capability, the importance of identifying the capability development trajectory and identifying ways to increase the steepness of the capability curve (i.e. its speed of capability development).

5.5.7 Boundaryless Innovation

Another major path dependency is the architecture and structure of the firm with silos common between business units, functions and projects. The case analysis provides guidance for managers in building an OIC as awareness of the location and permeability of the firm's internal boundaries can provide opportunity for restructure in order to increase knowledge sharing and collaboration. The COFBU provides an example of how generative learning and increased innovation memory and experience can result from a restructure of the firm. This case study also demonstrates that open innovation takes place beyond the internal boundaries and extends externally to the boundary of the firm's ecosystem and also to its learning boundaries. It also provides examples of both outside-in and inside-out open innovation (Chesbrough and Garman 2009, p. 70). See Figures 4.2 and 4.11.

5.5.8 Dynamic Capabilities and Competitive Advantage

This research has confirmed management is not constrained by a prescribed innovation capability framework. The case analysis demonstrated that there are multiple ways in which an OIC can flourish through establishing preconditions that support their development and then building the core components of the framework.

The preconditions and core framework of an OIC will be shaped by the paths and positions of the firm, the accuracy of its managements perception of the environment in which it operates and managerial actions taken in relation to those path dependencies and to environmental changes. Most importantly, the analysis demonstrates that while history matters, historical paths can be changed by disciplined and intentional entrepreneurial action.

Managers need to remember that the development and implementation of a dynamic capability does not necessarily lead to competitive advantage. The dynamic capability literature supports the view that "there are more or less effective ways to execute particular dynamic capabilities" (Eisenhardt and Martin 2000, p. 1108) with the result that a firm can either achieve sustainable or temporary competitive advantage, competitive parity or failure (Ambrosini and Bowman 2009, p. 38). The COTBU's initial activities in regard to dynamic capability formation were unsuccessful and its management was forced, through this lack of success, to recalibrate those capabilities. Accordingly, the COTBU case study supports the views that "dynamic capabilities may not necessarily have the intended effect or a positive outcome" (Ambrosini and Bowman 2009, p. 35) and that a change to the resource base "implies only that the organisation is doing something different, but not necessarily better, than before" (Helfat et al., 2007, p. 5). The case data suggests that an OIC will flourish where management attention has first been directed towards developing preconditions that guide and sustain an OIC.

In summary, the key contributions of this research to practice include the imperative for management to understand the nature of the firm's path dependencies and their impact upon organisational change, the imperative for generative learning to challenging the status quo and the firm's mental models, the criticality of the preconditions supporting OIC sustainability and the accuracy of management's perceptions of the firm's environment and the impact upon innovation capability development. One other primary contribution is the emphasis upon coherency of the way the components are integrated and linked together to form the OIC.

5.6 Limitations

This research, like all research, suffers from some limitations. Firstly, it has investigated a single CO with its own peculiar characteristics, diverse business contexts and three embedded units each with differing paths, positions and processes. The business context included the CO's broad industrial diversification and its endeavours to capitalise on its acquisitions by expanding into new markets as well as its transition from a single project GHLSS technology contractor to a broader supplier of products and services to both the high level security sector and the commercial sector. In addition, there are the idiosyncratic business contexts of each business units. Accordingly, the OIC, preconditions, components and their respective relationships derived from the single case, despite the cautious and prudent approach to the research methodology, raise questions in regard to the generalisability of the findings.

Secondly, as the analysis is based on data from one firm, the ability to make inter-firm comparisons is limited. The diversity of the business units of the CO provided a limited basis for comparison between firms in other industries. Accordingly, as dynamic capabilities are context-dependent, it is not clear to what extent the results are generalisable across firms and industries as some of the dynamic effect captured in this study could be lost in a non-IT solutions environments.

A third limitation is that the primary industry focus of the research was on IT solutions firms operating in the GHLSS with a limited focus on the CHLSS. While this research employed a holistic approach within the IT solutions environment there may be other factors which impact the formation and development of an OIC. As the OIC preconditions and components arose out of each business unit's economic and commercial environment and context, differing environments and contexts may resulting in the identification of a different OIC framework or a similar framework comprised of different preconditions and components.

Fourthly, as the qualitative research was conducted over several months it did not provide opportunity to gain an understanding of the competitive advantage created

over time or the challenges faced by the business units is sustaining any advantage that was created. Ideally, a longitudinal study over at least several years supported by suitable quantitative research would provide deeper and more robust insights into the innovation capability formation process and any evolutions over time in the models developed. Studies of this nature would increase the generalisability of the findings.

A final limitation may be the employment of the researcher by the CO. While this employment assisted in the research and facilitated access to interviewees and confidential information, there is the possibility that the researcher's experience within the CO may have influenced the selection of interviewees or led to a less objective analysis of the cases. As Popper observed all observations are "theory-impregnated" by the life experiences, dispositions and education of the researcher (1972, pp. 71, 72). For this researcher those life experiences, dispositions and education included the researcher's employment by the CO, his experience in working in several parts of the CO and understanding of the operation of the CO. In addition, the fact that the researcher was known to many of the interviewees may have affected their response in some way.

5.7 Further Research

One major opportunity for future research is the conduct of longitudinal studies to better understand the preconditions, components and constructs of the case derived OIC to further open the organisational innovation black box. Several related research questions could also shed light on the OIC. These questions include: Is there a correlation between strength of strategic entrepreneurship precondition and the strength of the organisational learning capability and the strength of the other OIC components? Is it the strength of the strategic entrepreneurship and the strength of the organisational learning capability that is correlated to a corresponding strength in the other OIC components?

While Teece et al. (1997) and Eisenhardt and Martin (2000) make no clear distinction between capabilities performed at corporate rather than business unit level, the business unit may have dynamic capabilities which could be enhanced by different

capabilities applied at the corporate level (Bowman and Ambrosini 2003, p. 293) and presumably could also be constrained by those capabilities as well. "Because of causal ambiguity we cannot be certain that particular activities that the centre engages in will result in the creation of true resources that pass the VRIN[8] tests" and this leads to "a possible blurring between (strategic business unit) level competitive strategy issues, and corporate level strategy" (Bowman and Ambrosini 2003, p. 293). Accordingly, one research opportunity is to examine the nature of the relationship and interaction between corporate and business unit dynamic capability development in respect of the creation of new rent generating resources. While there has been a significant level of firm-level dynamic capability research there has been no research on the way corporate level dynamic capabilities impact on firm performance and the development and effectiveness of dynamic capabilities at the business unit level.

The concept of the learning boundary and its impact on organisational learning and, consequently, innovation, is well known (Slater and Narver 1995). This case analysis raises questions in regard to how best a firm can identify the nature of the recognised and unrecognised constraints which constitute its learning boundary, the nature of and the positioning of the learning boundary and how far a firm needs to go beyond the learning boundary in order to secure the knowledge it seeks to acquire and develop. A related issue, of particular relevance to the innovation absorptive capacity, is identifying the strategies for facilitating the permeability of the boundary with trusted partners in order to maximise its augmented resources.

The composition of components and attributes of an OIC depend on the nature of the environmental changes (magnitude of difference between the current and anticipated environment both actual and perceived) and the nature of the change required to bring congruence with the environment. Further research needs to be conducted on managerial perception and the manner in which the accuracy of the management's perception of its environment impacts upon the selection and development of an OIC.

[8] Valuable, Rare, Imperfectly Imitable, Non-substitutable (Barney 1991)

Research could also be conducted to develop measures to quantify the existence and strength of the preconditions, components and constructs of the OIC and the nature of their relationships to each other. This analysis could also be extended to measuring the strength of the OIC itself.

The focus of this research has been conducted at the firm level. Penrose emphasises the importance of the individual and states that "experience produces increased knowledge about things and contributes to 'objective' knowledge in so far as it results can be transmitted to others. But experience itself can never be transmitted; it produces a change – frequently a subtle change – in individuals and cannot be separated from them" (2009, p. 48). Accordingly, further research could be considered into whether learning and entrepreneurial behaviours are truly firm level constructs or whether it is an individual that influences the character and culture of the organisation. This research could also consider questions around how and why individuals interact with the firm to shape an OIC.

The final research opportunity is consistent with that identified by Ireland et al. - to verify the "presence *and* strength of an entrepreneurial strategic vision as a defining mind-set shared by the organisation's top managers" (2009, p. 40, emphasis added). While this research has identified the importance and existence of that vision, it has not addressed in any quantitative manner the strength of that vision.

5.8 Conclusion

Innovation is regarded as the principal source of sustainable competitive advantage (McKinsey 2010; Hunt and Davis 2008; Teece 1998, pp. 55-60; Leonard and Sensiper, 1998, p. 112; Teece et al., 1997, p. 515), yet many firms approach innovation haphazardly and without discipline, expecting another serendipitous Newtonian apple to fall from the sky. These organisations appear poorly equipped to implement a comprehensive innovation strategy as they focus only on incremental innovation and are "genetically programmed to preserve the status quo" (Stringer 2000, p. 71).

Applying the dynamic capabilities framework this research has answered the call for fine-grained qualitative case studies to look at the detail of *how* dynamic capabilities are deployed to better understand how these capabilities work in practice and whether and how they might differ across firms (Ambrosini and Bowman 2009, p. 46). The analysis of three embedded business units in the one case organisation has provided a capability framework for strategic managers to build, systematise and replicate within their organisations. It provides guidance to managers as they manage the component capabilities of the OIC framework, together with their linkages and interdependencies, to transform the firm's existing resource base to enable the firm to sustain or enhance its competitive advantage" (Ambrosini and Bowman 2009, p. 35).

The analysis found that a different OIC existed in the COFBU and COSBU, and that a third model was beginning to emerge in the COTBU. Although each OIC framework had different components and different constructs supporting those components, common elements in each framework were identified. The cross-case analysis enabled a case derived OIC to be developed comprising three preconditions – an organisational learning capability, strategic entrepreneurship and an alliance building capability – and four components - innovation infrastructure and OIC renewal, an integrative innovation absorptive capacity, an innovation culture and organisational innovation intensity.

Of these preconditions and components, strategic entrepreneurship was the most prominent as it provided the linkage to all of the OIC components. Through its proactiveness and intentionality, and, in association with the alliance building capability, it provided the focus on externally focused innovation learning, the integration and exploitation of that learning and the impetus for broadening the innovation intensity beyond the boundaries of the firm and into its external environment and ecosystem. Through its entrepreneurial discipline, its innovation infrastructure is developed and renewed. Underpinning all of these relationships is the focus on cultural change to provide the facilitative leadership to foster innovation, the right environment for collaboration and knowledge sharing and the psychological

safety to fail without blame. This culture also provides the foundation for questioning the status quo and existing mental models.

In summary, this research is part of the increasing momentum in understanding the "how" of dynamic capabilities (Helfat and Maritan 2007, p. 37) by providing theory that is interesting and testable (Eisenhardt and Graebner 2007, p. 26). It provides learning for management on how dynamic capabilities originate, how firms built and deployed their OIC and how distinctive processes support the creation, modification, reconfiguration and augmentation of firm resources to achieve competitive advantage. Most importantly, it has provided a framework for an OIC which can be applied in practice.

Appendix

Semi-structured Interview Template

Date of Interview	
Place of Interview	
Interviewee's Name	
Interviewee's job title	
Interviewee's BU	
Time in current role	
Previous roles within BU	
Previous roles within Case Organisation	
Reporting lines	
Industry background	
Qualifications	
Role in the innovation process	

1 Tell me how innovation happens in your BU

2a Tell me about an innovation success story in your BU
2b What were the reasons for the success?
2c What about another success story?

3a What about a story where the innovation wasn't a success?
3b What were the reasons for the failure?
3c If there has been a failure, what happens next?

4 What stimulates innovation in your BU?

5 Do you have an innovation process?
How has your BU's innovation process changed over time?
If there has been a change, what were the drivers for the change and how have they been successful?

6 What impact does the structure of your organization have on your ability to be successful at innovation consistently?

7 Does your organisational culture support or hinder innovation?

8 What barriers to innovation do you encounter?

Table 5.1 Comparison between Case Descriptors and Innovation Capability Literature – OIC Preconditions

Preconditions	Case Descriptors	Literature	Impact on Literature
Strategic entrepreneur-ship		Entrepreneurial managers can sense and even help shape the future, address path dependency barriers and augment knowledge assets to establish new resources (Teece 2007, p. 1346) .	Extend
Innovativeness, Proactiveness, Risk taking propensity	The COFBU and COSBU proactively surveyed their environment, identified threats and took anticipatory steps to transition to a new business model in through-life support (COFBU) and to the addition of sales to the CHLSS (COSBU).	Conceptualised in terms of innovativeness, proactiveness and risk taking propensity (Weerawardena 2003, p. 410. Focus on looking outward and forward (Cope 2005, p. 379).	Support
Business model design and ecosystem shaping	Evident in the selection and implementation of the COFBU's differentiated and hard to imitate through-life support business model.	Managers shape competition, ecosystem and marketplace outcomes through innovation, entrepreneurship, and semi-continuous asset orchestration and business reconfiguration (Teece 2007, pp. 1325, 1344, 1345). The business model guides the acquisition and allocation of resources and specifies the ensemble of routines needed for value creation for customers and value capture for the firm and its investors (Garnsey et al., 2008, p. 222).	Support
Entrepreneurial discipline	COSBU – demonstrated by its move from ad hoc to strategic entrepreneurship. Established an innovation management system to provide a strategic and disciplined methodology for ideation, capability and knowledge acquisition and prioritisation of innovation.	"Discipline of entrepreneurship" (Drucker 1985, p. 19). The business strategy provides focus and a filter for all enterprise decision making (Teece 2007, p. 1326).	Support
Entrepreneurial intentionality	Both the COFBU and COSBU took purposeful steps to analyse the likely exogenous "shock". COFBU - focus on boundary spanning behaviours to acquire, integrate and exploit external knowledge, resulting in the new business model. COSBU - Strategic Technology Roadmap dictated which capabilities and products to develop and projects to target.	Definitions: • Focus on *purposeful* creation, extension, and modification of firm's resource base" (Helfat et al., 2007, p. 7) • Emphasis on the ability to reconfigure a firm's resources and routines *in the manner envisioned* and deemed appropriate by the firm's management (Zahra et al., 2006, p. 924).	Support

Preconditions	Case Descriptors	Literature	Impact on Literature
Comments	The research was supportive of the elements of the strategic entrepreneurship precondition which had been identified previously in the literature. However, this dissertation has brought them together for the first time and provided a framework for strategic entrepreneurship. Of particular importance, this research has highlighted the role of strategic entrepreneurship in stimulating the development/renewal of linked organisational preconditions (i.e. an organisational learning capability and an alliance building capability) critical to developing an organisation-wide innovation capability.		
Organisational learning capability	The case analysis reinforced the importance of organisational learning in a positive sense (COFBU and COSBU) and in negative sense (COTBU).	Organisational learning plays an inherent role in competition as it is endogenous to the firm and as such provides the basis for firms to learn about marketplaces, clients and competitors and, themselves (Hunt 1999, p. 148).	Extend
Adaptive learning	All business units displayed evidence of adaptive learning although for the COTBU the learning occurred generally in response to a business crisis.	Capable of facilitating incremental innovation (Baker and Sinkula 1999a, p. 412). Occurs within a set of recognised and unrecognised organisational constraints (Wang 2008, p. 638).	Support
Generative learning	COSBU - staff passionate about challenging "old assumptions" leading to a reputation for solving difficult problems (SBU1). COFBU - change in organisational structure (matrix/domain) reinforced the generative learning paradigm and provided the structural framework for knowledge sharing and questioning of the status quo.	Involves challenging paradigms, perceptual filters and fundamental beliefs and practices that define a firm's innovation processes (Baker and Sinkula 1999a, pp. 412, 413; Baker and Sinkula 1999b, p. 296; Kang et al., 2007; Morgan and Berthon 2008, p. 1330). Frame-breaking; more likely to lead to competitive advantage than adaptive learning (Slater and Narver 1995, p. 64). Occurs when core firm competencies are unlearned and new competencies are explored in a proactive sense (Morgan and Berthon 2008, p. 1331).	Extend
Unlearning	as above	Past learning inhibits new learning (Sinkula 2002, p. 256). The firm's unlearning context is a crucial determinant for absorptive capacity (Cepeda-Carrion et al., 2010). Unlearn existing capabilities learn new ones (Morgan and Berthon 2008, p. 1332)	Extend
Comments	Organisational learning capability has been extended primarily though the identification of the different strategies employed by two of the business units to achieve the same path dependency breaking outcomes through generative learning and unlearning. While the COSBU achieved this objective through its collegiate culture where staff were passionate about challenging "old assumptions" and unwillingness to accept the status quo, the COFBU achieved the same generative learning paradigm through a change in organisational structure (project/domain matrix) as this provided the framework for knowledge sharing and questioning of the status quo.		

Preconditions	Case Descriptors	Literature	Impact on Literature
Alliance building capability			Support
Alliance learning	COFBU - identification, assessment and selection of OEMs was intended to accelerate its external learning focus and guide its learning efforts towards capability sets with immediate payoffs in its innovation performance.	Important strategy for joint capability building and learning ideally to achieve internalisation of some or all of the skills each partner contributes to the alliance (Hamel 1991, p. 84). Also relates to the process of alliance management (Kale and Singh 2007 p. 982).	Support
Strategic alliance partner identification and assessment	Both the COFBU and COSBU recognised that their business environments were dynamic with a consequent turbulent knowledge environment so the focus was on increasing their innovation absorptive capacity by identifying partners to fill their knowledge and capability gaps and accelerate their learning.	In dynamic environments "a firm's knowledge absorption is likely to be focused on exploration and therefore on the scope and flexibility dimension of knowledge absorption" (Van den Bosch et al., 1999, p.553). For this reason, the identification and assessment of compatible and strategically complementary alliance partners is critical.	Support
Creation of idiosyncratic alliance resources and capabilities	Crucial aim of the COFBU's OEM strategy - develop exclusive and idiosyncratic alliance resources and capabilities which augmented the firm's resources.	Firms need to move to systematic investments in the alliance relationship in order to create an idiosyncratic combination of resources and capabilities (Dyer and Kale 2007, p67).	Support

Table 5.2 Comparison between Case Descriptors and Innovation Capability Literature – OIC Components

OIC Components	Case Descriptors	Literature	Impact on Literature
Organisational Innovation Intensity			Extend
Multi innovation focus Product, Managerial, Process and Marketing	In the COSBU, innovation encompassed "the way we do business, and that constantly evolves" (SBU3). COFBU - transformation in business focus, and the mapping and review of all processes to ensure that they aligned with customer and commercial drivers.	Internal innovation primarily focused on products, processes, work organisational systems or marketing systems" (Weerawardena 2003, p. 412).	Support
Strategic innovation: new business model	COFBU – new through-life support business model.	See literature relating to *Strategic Entrepreneurship, Business Model Design and Ecosystem Shaping* (above)	Extend
Comment	The research extended the definition of organisational innovation intensity. The first construct of the capability, multi-innovation focus – product, managerial, process and marketing - is consistent with and supportive of the literature. Through this research the definition has been extended from an internal focus to include external factors such as the firm's business model, strategic alliances and its ecosystem.		

OIC Components	Case Descriptors	Literature	Impact on Literature
Innovation absorptive capacity		The ability to exploit external knowledge is a critical component of innovative capabilities and innovation performance at all levels of a firm (Cohen and Levinthal 1990, p. 128).	Support
Embedded resource sharing external collaboration	COFBU's alliance with OEMs was a mutually beneficial and collaborative learning dyad where partners had similar basic knowledge but different specialised knowledge. When they shared their specialised knowledge they assumed the role as teacher.	Collaboration, openness, inter-partner trust and relationship interconnectedness are key behavioural dimensions that demonstrate that a relational association exists (Jarratt 2004, p. 302; Inkpen 2000, pp. 1026, 1027).	Support
Transformative and exploitative learning	Understanding depth and breadth dimensions provides alternative strategies for transforming a firm's knowledge. COFBU significantly increased the *breadth* of its knowledge while the COSBU primarily increased the *depth* and specialisation of its knowledge.	To be exploited external knowledge must be transformed, assimilated and integrated and then applied in the commercialisation of that knowledge (Lane and Pathak 2006, p. 856). Knowledge has depth and breadth dimensions (van den Bosch et al., 2003, p. 14). An understanding of these dimensions assists in targeting the knowledge to acquire and the exploitation of that knowledge.	Support
Externally focused innovation Learning structures and processes	The COFBU and COSBU both developed structures and processes to capture external innovation knowledge. COSBU – forming relationships with external knowledge providers to gain access to complementary knowledge. The COFBU's Human Factor Domain proactively kept informed of the latest thinking in their domain (members built networks and social capital within the academic community, with complementary partners, and participated in academic forums).	Focus on acquiring knowledge external to the firm (Cohen and Levinthal 1990, p. 128; Lane and Pathak 2006, p. 856) and, therefore, it follows that learning structures and processes, will be externally focused e.g development of routines to capture knowledge from external partners who have knowledge which will increase the breadth or depth of the knowledge held (van den Bosch et al., 2003, p. 14). Essential structures include prior related knowledge such as innovation learning experience and skills, problem solving methods and a shared language as well as internal mechanisms (Cohen and Levinthal 1990, pp. 130, 133, 134).	Support

OIC Components	Case Descriptors	Literature	Impact on Literature
Innovation Infrastructure and OIC Renewal	This capability involves the establishment of the innovation infrastructure and the continued renewal of the OIC.	Focus on renewal leads to proactive innovation and continuous learning designed to anticipate customer needs and necessary structural changes to innovation infrastructure (Hunt 1999, p. 154).	Extend
Innovation experience and memory	COSBU - introduced Cooper's style stage gate process combined with a product portfolio approach to ensure that its innovation management system achieved the intended business outcome. Regular stage gate reviews enhanced the COSBU's innovation memory and provide innovation experiences to inform future decision-making. COFBU - reconfigured organisational structure so that its domain structure overlaid its project structure.	Learning is a process where repetition and experimentation enable tasks to be performed better and quicker (Teece et al., 1997, p. 520). Innovation experience - innovation routines become embedded into formal and informal behavioural routines such as information sharing mechanisms (Moorman and Miner 1997, p. 92). Innovation memory - subset of organisational memory. Consists of mental and structural and institutional artifacts pertaining to innovation and stored for future use (Kruse 2003, p. 334; Stata 1989, p. 64).	Extend
Innovation Management System	COSBU - Innovation Management System included processes to direct internal R and D and select new technologies and capability to complement existing technologies and capabilities, to tap developments in exogenous science, to access supplier and complementor innovation and to identify changing customer needs, and customer innovation. COFBU - project/domain matrix provided vertical/horizontal knowledge sharing. The COSBU achieved the same flexibility objective through its line of business structures, its Strategic Technology Roadmap and collegiate culture.	Need a portfolio management approach with a balanced mix of high to low priority projects, and continuous and discontinuous innovations (Cooper and Edgett 2003). An ecosystem framework to sense market and technological opportunities includes processes to direct internal R and D and select new technologies, processes to tap supplier and complementor innovation, processes to tap developments in exogenous science and technology, and processes to identify target market segments, changing customer needs and customer innovation (Teece 2007, p. 1326).	Extend
Comments	This OIC component has been extended on a similar basis as to the organisational learning capability through the identification of the different strategies employed. The difference in approach between the COFBU and the COSBU demonstrated two options available for firms involved in innovation infrastructure and OIC renewal. While the former's focus was on knowledge sharing, organisational structures and routines, the renewal process for the COSBU focused on increasing the discipline and strategic alignment of its innovation management system.		

OIC Components	Case Descriptors	Literature	Impact on Literature
Innovation culture		Captured through behaviour which challenges established organisational norms (facilitative leadership); behaviour which supports learning and the dissemination of learning (collaboration, Jarratt 2004, p. 302); and an understanding of the fundamental role of risk taking in innovation (tolerance of risk and no blame behaviour) (Weerawardena 2003).	Extend
Facilitative leadership	COFBU – initiated a performance oriented cultural change and introduction of domains to facilitate the transfer, translation and transformation of knowledge across silos. COTBU – tried to create an environment where discussion of innovation is more on the agenda, increase openness of communication, wider sources of ideation, new knowledge sharing routines both within and between functions (TBU4). COSBU – enhanced collegiate culture; failing forward.	Facilitative leadership is essential to create the innovation behaviour change required to perform effectively in complex environments and to "manage the tension between the exploration and exploitation paths to effective learning" (Slater and Narver 1995, pp. 66, 69) and to adopt a generative learning orientation aligned with its strategy and market (Osterberg 2004, p. 146). Facilitative leadership also includes a focus on the development of staff through providing challenging work which stretched their technical, learning and problem solving capabilities and, in doing so, motivated their "people to do more that what is expected of them" and to want to learn and unlearn (Slater and Narver 1995, p. 69).	Support
No blame	COSBU - responsible risk seeking propensity was balanced by the acceptance of failure in innovation (failing forward). The COFBU was also moving to tolerate failure without blame.	A risk taking propensity is an essential part of entrepreneurship in strategic decision making (Weerawadeena 2003, p. 410). Removal of the fear of failure was evident in the best performing innovative organisations (Cooper et al., 2004, p. 37). High tolerance of risk as innovation cannot exist without risk taking. Risk taking occurs through challenging and diverting from the entrenched mental models and from challenging the dominant logic. Learning opportunities arise from experimentation and responsible risk and frame-breaking entrepreneurial activities and this learning informs future product innovations (Slater and Narver 1995, p. 68).	Extend

OIC Components	Case Descriptors	Literature	Impact on Literature
Collaboration	COSBU - collegiate culture and formal informal knowledge sharing routines. COFBU - achieved through structural transformation (domain/project matrix). Externally, both the COFBU and COSBU demonstrated a willingness to collaborate openly with complementary knowledge holders.	Collaboration is essential for knowledge sharing both within and external to the business unit and influences the type and depth of knowledge available from external and complementary partners. Collaborative behaviour includes sharing information and ideas, communication openness and forbearance (Jarratt and O'Neill 2002, p. 25).	Extend
Comments	The extension to innovation culture was primarily driven by the increase in collaboration through alternative strategies. In the COSBU it was achieved through its collegiate culture and formal and informal knowledge sharing routines while in the COFBU increased collaboration was the result of its structural transformation. In addition, while risk taking is widely recognised as imperative to innovation, this research stresses the importance of responsible risk seeking propensity *balanced by* the acceptance of failure in innovation (failing forward).		

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