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Organisational Learning and Dynamic Capabilities: A Case Study

BY

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ABSTRACT

Dynamic capabilities can help a firm to interpret and respond to an environment of rapid technological change. Although there is broad research consensus that they are higher order capabilities comprising routines, their nature and how they develop remains open to debate. A view of dynamic capabilities as capacities, which can shape and reshape and configure and reconfigure ordinary capabilities so as to remain competitive, is taken to examine how dynamic capabilities develop through learning.

An emerging theme in the strategy literature is that managerial cognition may be important, even central, to the development of capabilities. In line with this theme, models are proposed on how managers learn to learn and how technological and organisational sensemaking practices can facilitate cognition. In addition, characteristics of two types of learning, expert and entrepreneurial, are proposed to explain how managers learn and recognise opportunities. The distinct learning patterns relate to content-oriented and process-oriented views of strategy respectively. Further, suggestions are made on how entrepreneurial learning in particular, may be beneficial in a highly dynamic environment.

A process oriented, case study is conducted of three securities custodians facing an environment of increasing dynamism, competitiveness, and interconnectedness due to information technology developments in financial markets. The findings are shown to support the claim that managerial theories on learning are required to develop and sustain dynamic capabilities. In addition, the findings provide evidence that these theories may form through two learning patterns, depending on how managers frame problems and recognise opportunities. An important contribution of this study is the analytical framework of dynamic capability learning that was developed during the case analysis. The framework enables organisational learning experiences relating to dynamic capability development to be captured. The thesis concludes with implications for both managers and scholars.

DECLARATION

I declare that this thesis is my own work. It is submitted in partial fulfilment of the requirements for the degree of Doctor of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

The name and signature of the student and the date should follow the declaration.

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CONTENTS

1	CHAPTER: INTRODUCTION.....	1
2	CHAPTER: CONCEPTUAL ANALYSIS	12
2.1	<i>Organisational learning</i>	13
2.1.1	<i>Individual learning and cognition</i>	14
2.1.2	<i>Managerial cognition and dynamic capability development</i>	19
2.1.3	<i>Facilitating organisational learning</i>	28
2.2	<i>Dynamic capabilities.....</i>	40
2.2.1	<i>Nature of dynamic capabilities</i>	40
2.2.2	<i>Development of dynamic capabilities: Evolutionary perspective.....</i>	45
2.2.3	<i>Development of dynamic capabilities: Evolutionary with design perspective.....</i>	50
2.3	<i>Entrepreneurship</i>	57
3	CHAPTER: METHODS	66
3.1	<i>Case setting.....</i>	66
3.1.1	<i>Description.....</i>	66
3.1.2	<i>Case setting suitability</i>	70
3.2	<i>Data collection.....</i>	71
3.2.1	<i>Challenges.....</i>	72
3.2.2	<i>Approach</i>	72
3.3	<i>Data analysis</i>	75
3.3.1	<i>Challenges.....</i>	75
3.3.2	<i>Approach</i>	78
4	CHAPTER: CASE NARRATIVES.....	85
4.1	<i>Organisation A</i>	85
4.1.1	<i>Market planning</i>	85
4.1.2	<i>Equities dematerialisation</i>	89
4.1.3	<i>Market evolution</i>	95
4.1.4	<i>Outlook</i>	102
4.2	<i>Organisation B</i>	110
4.2.1	<i>Market planning</i>	110

4.2.2	<i>Equities dematerialisation</i>	113
4.2.3	<i>Market evolution</i>	118
4.2.4	<i>Outlook</i>	125
4.3	Organisation C	134
4.3.1	<i>Market planning</i>	134
4.3.2	<i>Equities dematerialisation</i>	139
4.3.3	<i>Market evolution</i>	146
4.3.4	<i>Outlook</i>	154
5	CHAPTER: WITHIN CASE ANALYSES	165
5.1	Organisation A	165
5.1.1	<i>Product investment</i>	165
5.1.2	<i>Project management</i>	166
5.1.3	<i>Market collaboration</i>	169
5.1.4	<i>Technical development</i>	171
5.1.5	<i>Operations</i>	173
5.2	Organisation B	174
5.2.1	<i>Product Investment</i>	174
5.2.2	<i>Project management</i>	176
5.2.3	<i>Market collaboration</i>	179
5.2.4	<i>Technical development</i>	181
5.2.5	<i>Operations</i>	183
5.3	Organisation C	186
5.3.1	<i>Product Investment</i>	186
5.3.2	<i>Project management</i>	189
5.3.3	<i>Market collaboration</i>	191
5.3.4	<i>Technical development</i>	193
5.3.5	<i>Operations</i>	197
6	CHAPTER: CROSS CASE ANALYSIS	200
6.1	Technological problem solving strategies	200
6.1.1	<i>Product investment</i>	201
6.1.2	<i>Market collaboration</i>	203
6.1.3	<i>Technical development</i>	206
6.1.4	<i>Operations</i>	208
6.2	Organisational problem solving strategies	211
6.2.1	<i>Product investment</i>	211
6.2.2	<i>Project management teams</i>	215

6.2.3	<i>Project management process</i>	218
6.2.4	<i>Market collaboration</i>	220
6.2.5	<i>Technical development</i>	223
6.2.6	<i>Operations</i>	225
7	CHAPTER: DISCUSSION	228
7.1	<i>Managerial theories on learning</i>	228
7.1.1	<i>Nature of dynamic capabilities</i>	230
7.1.2	<i>Learning to learn</i>	233
7.1.3	<i>Sensemaking practices</i>	235
7.2	<i>Learning patterns</i>	240
7.2.1	<i>Expert honing</i>	241
7.2.2	<i>Expert aligning</i>	244
7.2.3	<i>Entrepreneurial shaping</i>	248
7.2.4	<i>Entrepreneurial configuring</i>	250
7.2.5	<i>Expert learning and entrepreneurial learning</i>	252
7.2.6	<i>Entrepreneurial learning in a dynamic environment</i>	260
8	CHAPTER: CONCLUSION	263
9	REFERENCES	268

LIST OF FIGURES

Figure 3.1	<i>Global Custodian</i> cross-border client ratings.....	69
Figure 3.2	<i>Global Custodian</i> domestic client ratings.....	69
Figure 7.1	Learning to learn	233
Figure 7.2	Facilitating cognition in terms of technological sensemaking.....	238
Figure 7.3	Facilitating cognition in terms of organisational sensemaking	239
Figure 7.4	Dynamic capability learning framework	240
Figure 7.5	Expert learning pattern.....	242
Figure 7.6	Entrepreneurial learning pattern.....	248

LIST OF TABLES

Table 3.1	Cross case analysis table components	82
Table 6.1	Learning about the changing market	202
Table 6.2	Learning about major market initiative requirements	204
Table 6.3	Learning about business initiative requirements	206
Table 6.4	Learning about business processes	210
Table 6.5	Learning about market models and business models	212
Table 6.6	Learning about project management teams	216
Table 6.7	Learning about the project management process	218
Table 6.8	Learning about the market collaboration process	221
Table 6.9	Learning about custody system technology	223
Table 6.10	Learning about the business value of investment in innovation	226
Table 7.1	Comparison of expert learning and entrepreneurial learning characteristics	252

LIST OF ABBREVIATIONS

CEO	Chief Executive Officer
CSD	Central Securities Depository
G30	Group of Thirty
IP	Intellectual Property
IT	Information Technology
PC	Personal Computer
RBV	Resource Based View
SOR	Securities Ownership Register
T3	Trade date plus three business days
T5	Trade date plus five business days
VRIN	Valuable Rare Inimitable Nonsubstitutable
Y2K	Year 2000

LIST OF APPENDICES

Appendix	Description
A	Letter of introduction & Informed consent of organisation
B	Research confidentiality agreement
C	Case setting
D	Interview correspondence
E	Interview guidelines
F	Interview transcripts and notes
G	Respondent job history
H	Transcript coding
I	Narrative coding
J	Analytical templates
K	Within case analysis Stage 1, Part A
L	Within case analysis Stage 1, Part B

1 CHAPTER: INTRODUCTION

Dynamic capabilities are important because they enable a firm to interpret and respond to changing environmental conditions both in the short and long run. Indeed, a firm's success in rapidly changing, competitive environments depends on its intangible assets, which in turn, depends on its dynamic capabilities (Teece, 2007). Dynamic capabilities can help a firm match and even create market change (Eisenhardt & Martin, 2000) as well as adapt to and shape market change (Teece, 2007). In essence, an organisation's dynamic capabilities refer to "the capacity to sense and seize opportunities, and then transform and reconfigure as competitive forces dictate" (Teece, 2009, p. 200).

Yet, there are challenges to understanding the concept. The dynamic capabilities research field is suggested to be in early stages of development, and to be complex and rapidly changing (Di Stefano, Peteraf, & Verona, 2010). Part of the strategy domain, its aims are ambitious: to understand how an organisation can achieve and sustain a competitive advantage in the face of environmental change (Teece, Pisano, & Shuen, 1997). The concept is described as 'elusive' (Bingham & Eisenhardt, 2011), not least because it is intangible, complex, and multi-level, encompassing both managerial and organisational dynamic capabilities. Not surprisingly, the nature and consequences of dynamic capabilities are debated (Di Stefano et al., 2010; Easterby-Smith, Lyles, & Peteraf, 2009; Helfat & Peteraf, 2009).

Despite the field's broad appeal which may derive from economic thinking and its link with firm performance (Helfat et al., 2007, Chapter 3), there is little research on how dynamic capabilities develop. One reason may be because their nature is debated. There are two broad perspectives in dynamic capabilities on how they develop; each emphasising different aspects of their nature. Common to both perspectives is a view that dynamic capabilities develop through learning. The focus of this study is on how they develop through learning.

First, in an evolutionary perspective, dynamic capabilities are higher order capabilities, governing the rate of change of ordinary capabilities (Collis, 1994; Winter, 2003), those that enable a firm to make a living. As capabilities they

comprise high level routines oriented towards specific objectives (Winter, 2000) and rely on patterned activity (Winter, 2003). Thus, as routines they embody learning. Research on dynamic capability evolution emphasises the selection of routines in a dynamic environment. For example, their evolution can be facilitated by deliberate learning mechanisms that help make knowledge explicit and facilitate the selection stage in a knowledge evolution cycle (Zollo & Winter, 2002). Although there is empirical support for the argument, for example in bank acquisition integration (Zollo & Singh, 2004), and in alliance cooperation (Kale & Singh, 2007), dynamic capability learning is suggested to be a subtle matter (Winter, 2003) and open to debate and scholarly enquiry (Romme, Zollo, & Berends, 2010).

The second perspective, 'evolution with design', is consistent with the evolutionary perspective and in addition, highlights the design role of managers. By implication, dynamic capability learning also involves 'evolution with design'. In this view, managers play a distinctive role which involves sensing opportunities and making investment choices as well as orchestrating nontradable assets, such as knowledge assets, into value yielding combinations (Teece, 2009). Further, there is an entrepreneurial element that involves shaping and not just adapting to the environment (Teece, 2007). The definition of dynamic capabilities used in this study is drawn from this perspective, and highlights the entrepreneurial element: dynamic capabilities refer to the capacity of business enterprises to shape, reshape, configure, and reconfigure assets so as to respond to changing technologies and markets and remain profitable (Teece, 2009). The term 'capacity' indicates a minimal ability (Helfat & Peteraf, 2009), suggesting that it embodies past learning. In this sense, a dynamic capability is underpinned by processes and other resources (Teece, 2007) which can be used to achieve its objectives. It can be seen as accumulated knowledge that can be brought to bear on a particular situation. There is little empirical research on managerial design in dynamic capability development. An example is in new business commercialisation in an information technology firm (O'Reilly, Harreld, & Tushman, 2009).

A third perspective is drawn from the organisational learning and organisational knowledge literatures and relates to development of a 'learning capability'. As higher order capabilities, dynamic capabilities can be seen as learning or innovation capabilities. There is a deep link between dynamic capabilities and

organisational process research which is under appreciated, and broadening the disciplinary base can lead to insights on dynamic capabilities that have received inadequate attention (Helfat et al., 2007, Chapter 3). Like the dynamic capabilities concept, the organisational learning concept is intangible and complex, making it difficult to measure and analyse. Crossan, Lane, and White (1999) provide an influential framework of the organisational learning process spanning multiple levels of analysis, including individual, group, and organisation, that can be used to examine its dynamic nature (Easterby-Smith, Crossan, & Nicolini, 2000). In the framework, organisational learning occurs when actions are routinised, embedding learning into the organisation. Notably, the authors identify two tensions in the process that involve assimilating new learning. These tensions involve interpreting and integrating new learning, and the effect of existing routines on the development of new ideas. Overcoming these tensions can facilitate dynamic capability learning. For example, the authors suggest experimentation to develop a common understanding enabling coordinated action, and enacting new processes outside the current institutional order to enable development of new ideas.

In terms of knowledge development, these tensions concern integrating and coordinating new knowledge into the knowledge base, and the effect the knowledge base has on the development of new ideas. Overcoming them can facilitate development of a learning capability, such as 'absorptive capacity' (Cohen & Levinthal, 1990) and 'combinative capabilities' (Kogut & Zander, 1992). Like dynamic capabilities, these learning capabilities are complex and multi-level, and they assimilate new knowledge into an organisation. Arguments pertaining to their development can be similarly applied to dynamic capability development. For example, absorptive capacity develops based on prior related knowledge and its development can be facilitated by increasing an organisation's knowledge base breadth, depth, and specificity (Cohen & Levinthal, 1990). In another example, knowledge advances by recombinations based on how it is organised and its development can be facilitated by organising principles that reduce its complexity, such as by nesting and modularising it (Kogut & Zander, 1992). In the latter example, integrating a new technology requires not only learning how the technology works but also how it may transform the way work is done (Edmondson, 2003). There is some empirical support for the arguments relating to the development of capabilities based on a new technology; for example, in an

electronic mail service (e.g. Crossan & Berdrow, 2003) and in biotechnology research (Pisano, 2000).

Taken together the research shows that there are multiple perspectives relating to dynamic capability learning. An evolutionary perspective emphasises deliberate learning mechanisms that help make knowledge more explicit; an 'evolutionary with design' perspective emphasises an entrepreneurial role of managers; and a 'learning capability' perspective emphasises ways to facilitate the interpretation of new information, as well as conditions in an organisation's knowledge base that can facilitate integration of new knowledge. It highlights an opportunity for empirical research on the learning processes underpinning dynamic capability development.

Research Aim

The aim of this research is to better understand how dynamic capabilities develop through learning. More specifically, it aims to shed light on the learning processes underpinning dynamic capability development. More broadly, it aims to extend existing theory and develop new theory.

An understanding of how dynamic capabilities develop through learning can contribute to the development of the research field. It can help to better understand the nature and representation of dynamic capabilities, as well as their consequences and usefulness in a dynamic environment. At some point, basic issues need to be resolved in order for research in this area to advance (Di Stefano et al., 2010). In particular, a focus on strategy process can clarify the dynamic interrelationships among actions taken, and outcomes achieved to help address some of the unresolved issues in the dynamic capabilities domain, given that the dynamic capabilities concept is content oriented (Helfat et al., 2007, Chapter 3). A process oriented approach is consistent with the definition of dynamic capabilities used in the study which emphasises shaping and reshaping, and configuring and reconfiguring. In addition, an understanding of how dynamic capabilities develop can provide insight into how they can be sustained. In highly dynamic environments, they are more fragile and can easily dissipate (Eisenhardt & Martin, 2000).

More broadly, an understanding of how dynamic capabilities develop through learning can contribute to strategy and capability development research. There is little research detailing how capabilities are developed and the question remains largely unanswered (Bingham & Eisenhardt, 2011). It can also contribute to organisational learning research on organisational capabilities. In particular, a greater understanding of how dynamic capabilities develop through organisational learning is needed (Argote, 2011). Further, there is a growing interest in the use of qualitative data in organisational learning (Easterby-Smith, Crossan, & Nicolini, 2000) and the use of a finer-grained approach to characterising organisational experience (Argote, 2011).

Importantly, an understanding of how dynamic capabilities arise and change has practical use in a knowledge economy. Managers can, for example, foster conditions as well as guide and design practices that can lead to their development. In this way, organisations can better interpret new technologies and respond more appropriately to changing environmental conditions. Studies have shown that managerial agency is important in developing capabilities. For example, Adner and Helfat (2003) found that managerial decisions on corporate downsizing affected profitability over time in airline firms facing regulatory changes; and Kaplan (2008a) found that changes in managerial attention affected investment patterns in communication technology in firms facing a fibre-optic revolution. In environments of increasing dynamism and competitiveness, such as global financial markets, information and know-how have taken on greater significance. Markets have been created for intermediate products and connected information systems have led to the development of new products by integrating previously fragmented flows of data and allowing more timely monitoring of both products and markets (Teece, 1998).

The study includes both a substantial theoretical component as well as an extensive empirical component. The approach to each component is outlined.

Empirical approach

The aim of the empirical exercise is theory building and elaboration. A process oriented, case study approach is taken. Case studies can be especially helpful in the early stages of research in an area (Helfat & Peteraf, 2009) when little is

known about the phenomenon or when there are multiple perspectives (Eisenhardt, 1989a), such as with dynamic capability learning.

A multiple case research design is used to examine process data in three organisations. Multiple cases typically result in more robust, generalisable, and testable theory than single cases because propositions are more deeply grounded in varied empirical evidence (Eisenhardt & Graebner, 2007). The case setting is the fast paced financial markets industry where dynamic capabilities are likely to be developed. Technological innovation involving various information system development initiatives is examined in three securities custodians operating in a market which evolved to become highly dynamic.

Evolution of the market took place within a relatively short time period, of about 10 years, making it a suitable setting to study dynamic capability learning. The cases selected were the three custodians in the market deemed most likely to develop them. During that time, the custodians underwent a similar and interconnected journey because they developed technological links to a platform organisation at an early stage in one of two major market initiatives jointly undertaken. Thus, comparative data could be collected across the organisations. Both retrospective and real-time data were collected, primarily through interviews. Retrospective case studies enable identification of patterns that indicate dynamic processes (Leonard-Barton, 1990). In addition, real-time data collected at the same time, at the end of the study period, provided a more detailed perspective of evolving patterns.

Literature relating to the previously mentioned multiple perspectives on dynamic capability learning provided initial guidance to the data analysis. The findings were more fully expounded and elaborated by reviewing and analysing additional literature. When the research question is broad and open-ended, analytical methods that allow data to shape the researcher's developing understanding of the phenomenon are required (Edmondson & McManus, 2007).

The objective of the analysis is to develop process theory. A process theory argues for patterned sequences of events (Abbott, 1990). It explains how change occurs over time, based on a sequence of events (Van de Ven, 2007). Events in process research can be likened to constructs in variance research, and incidents, operational empirical observations, to variables (Van de Ven, 2007). Propositions

help to explain patterns, sequences of events showing cause-effect relationships. Process research aims to find similar patterns across cases. The analysis focused on tracing learning events at multiple levels of analysis, ranging from descriptive events to more abstract interpretations of specific learning that took place. The minimum event sequence is on the deepest explanatory level, the level of generating mechanisms (Pentland, 1999).

Two research strategies were combined in a novel analytical approach: building theory from cases and analysing process data. Building theory from cases is primarily a positivist approach (Eisenhardt & Graebner, 2007). A positivist approach aims to find general patterns or causal relationships that are consistent across multiple settings and involves comparison of propositions and alternative explanations (Lin, 1998). Theory building from cases aims to reconcile evidence across cases and types of data, as well as between cases and literature, increasing the likelihood of creative reframing (Eisenhardt, 1989a). The emergent theory is developed by identifying patterns of relationships among constructs within and across cases as well as their underlying rationale (Eisenhardt & Graebner, 2007).

A multiple case embedded design allowed replication logic to be applied at each unit of analysis: organisation and innovation process. Replication of a pattern across cases helps perceive patterns and eliminate chance associations because individual cases can be used for independent corroboration of propositions (Eisenhardt, 1991). Within each organisation, the learning processes, each relating to a particular innovation problem to solve, were part of a particular innovation business function, such as product investment and project management. The cross case analysis enabled comparison of three organisations and 10 innovation processes, resulting in 29 problem solving strategies and their associated developmental approaches. Each strategy related to a particular organisation and innovation process. Note that one of the 10 innovation processes was not apparent in one organisation.

More an interpretivist approach was taken to analysing process data. An interpretivist approach aims to understand the meaning of general concepts in their specific operation and provides an explanation of causal mechanisms; the reasons underlying the causal relationships (Lin, 1998). The analysis aimed to go beyond finding learning patterns to interpret their meaning in terms of

characteristics. It focused on interpreting managers' reasoning behind their innovation approach, what they learnt as a result, and how they reinforced or adjusted their approach. It involved constructing event sequences based on available information, entailing a creative contribution to observation. It was broadly interpretive in the sense that, in each case, there was missing and incomplete data, relevant and irrelevant data, which had to be sorted and grouped into sets of events. The analysis involved selecting which data to include and in which order, the latter not always being obvious.

Combining both positivist and interpretivist approaches creates more clarity about mechanism and relationship and helps to correct for biases; in particular, an interpretivist complement to positivist research prevents results from being technically correct but too removed from the context to produce an accurate picture (Lin, 1998). The analysis aimed to find learning patterns based on causal relationships as well as to interpret their meaning by identifying underlying causal mechanisms or pattern characteristics. The causal mechanisms, in turn, helped to refine and validate causal relationships found in the learning patterns.

The novel analytical approach involved constructing pattern templates, structured sequences of generic learning events, at each level of analysis: case narratives, within case analyses, and cross case analysis. Not all events occurred within each case and the incidents relating to an event was idiosyncratic to each organisation. Because the aim was to derive pattern templates, comparison across cases occurred to some extent at each level of analysis. An iterative analysis was performed using the comparative method to reveal common learning patterns. The meaning of an event, what is significant about the way it unfolds, becomes clearer when it is compared with another event (Weick, 2007). The analysis involved developing a hypothesis of a pattern, in the form of a template, based on available information and then testing it across the relevant problem solving approaches using replication logic. The aim was to find patterns that accounted for the range of learning incidents found and to develop plausible explanations for the patterns.

The empirical methods are elaborated in Chapter 3, including the case setting, data collection, and data analysis. Challenges encountered, and how they were addressed, are highlighted. The findings of the case narratives, within case

analyses, and cross case analysis are presented in Chapters Four, Five, and Six respectively.

Theoretical approach

The theoretical approach aims to identify key concepts and ideas in three main research fields: organisational learning, dynamic capabilities, and entrepreneurship. These concepts and ideas provide a broad basis for understanding dynamic capability learning and extending theory development. Although intertwined with the empirical approach, the literature review and analysis is presented in the traditional order in Chapter Two. Literature providing insight into dynamic capability learning is both reviewed as well as analysed to help explain the learning patterns found; hence, the chapter heading 'Conceptual Analysis'.

Each of the three main research fields includes multiple perspectives relating to dynamic capability learning. Of the previously mentioned perspectives, organisational learning research includes the 'learning capability' perspective and dynamic capabilities research includes the evolutionary and the 'evolutionary with design' perspectives. Notably, the empirical analysis revealed common learning patterns relating to development of managerial cognition, prompting the addition of entrepreneurship research and most of the organisational learning research. Managerial cognition refers to managerial beliefs and mental models that provide a basis for decision making (Adner & Helfat, 2003) and problem solving.

Organisational learning literature focuses on learning processes that give rise to managerial cognition. Crossan et al.'s (1999) multi-level organisational learning process framework is used as a framework to integrate the literature at multiple levels of analysis, including individual, group, and organisation. Individual learning and cognition are included at the individual level of analysis. Managerial learning and cognition are included at the group and organisational levels of analysis. Research on facilitating organisational learning relates to overcoming tensions in learning and knowledge development in terms of assimilating new learning and new knowledge.

Dynamic capabilities research focuses on managerial agency in dynamic capability learning. It includes the nature of dynamic capabilities and the

evolutionary and the 'evolutionary with design' perspectives relating to dynamic capability learning. Entrepreneurship literature focuses on the recognition of opportunities. A view is taken of entrepreneurship as a learning process. Discovery and enactment of opportunities as well as causal and effectual reasoning are covered.

Contributions

Organisational approaches to solving innovation problems were analysed. The analysis revealed common learning patterns pertaining to managerial theories on learning as well as to the learning processes that led to development of the theories.

The main claim is that managerial theories on learning are required to build and sustain dynamic capabilities. These theories form part of managerial cognition. Supporting evidence sheds light on the nature of dynamic capabilities as reflected in the managerial theories on ways of learning. To support the claim, existing theory is extended to propose models on how managers learn to learn, and on how sensemaking practices can facilitate cognition. Models are proposed on both technological and organisational sensemaking practices.

A further claim is that the managerial theories can form through two types of learning, expert and entrepreneurial. Notably, a contribution of this study is an analytical framework on dynamic capability learning that was developed during the case analysis. The framework enables data to be analysed in terms of four learning patterns: expert honing and aligning, and entrepreneurial shaping and configuring. Distinctive characteristics of expert learning and entrepreneurial learning are proposed to help explain how managers learn and recognise opportunities. Finally, suggestions are made as to how entrepreneurial learning may be beneficial in a highly dynamic environment.

The study makes two other contributions. First, it makes an empirical contribution. The setting and analysis provides unique management insight into a highly specialised area of financial markets seldom seen. It also makes a methodological contribution. The novel analytical approach employed in the process oriented case analysis combines two research strategies. The strategies serve as complements

to strengthen the arguments made, enhancing both the generality and accuracy of the resulting theory.

The discussion in Chapter Seven links back to the concepts and ideas presented in Chapter Two. Based on evidence presented in the findings, it aims to enhance and extend the base of existing theory. Chapter Eight concludes with a summary of the contributions and implications for managers and scholars.

2 CHAPTER: CONCEPTUAL ANALYSIS

This chapter reviews and partly analyses multiple perspectives relating to organisational learning and dynamic capability development. It attempts to draw together some of the main ideas from the research fields of organisational learning, dynamic capabilities, and entrepreneurship, constituting the three parts of the chapter. The chapter focuses on managerial learning and cognition, as well as the managerial and entrepreneurial role inherent in dynamic capabilities.

The literature is organised as follows. Organisational learning literature focuses on learning processes that give rise to managerial cognition. It includes related strategy and organisational knowledge literature. Crossan et al.'s (1999) multi-level organisational learning process framework is used as a framework to integrate the literature at multiple levels of analysis, including individual, group, and organisation. The first section, individual learning and cognition, is at the individual level of analysis and includes problem sensing and solving. The second section, managerial learning and cognition, is at the group and organisational levels of analysis. It covers the development of managerial cognition through routines, to capabilities and dynamic capabilities. Finally, the third section, facilitating organisational learning, relates to overcoming tensions in learning and knowledge development in terms of assimilating new learning and new knowledge.

Dynamic capabilities research focuses on managerial agency in dynamic capability learning. The first section, nature of dynamic capabilities, highlights areas of consensus and debate. The second and third sections elaborate on the evolutionary and the 'evolutionary with design' perspectives relating to dynamic capability learning. The latter perspective points to the role of managers and entrepreneurs, and motivates the third part in this chapter to help explain the learning patterns found.

Entrepreneurship literature focuses on the recognition of opportunities. A view is taken of entrepreneurship as a learning process. Discovery and enactment of opportunities as well as causal and effectual reasoning are covered.

2.1 Organisational learning

Organisational learning research relevant to the development of dynamic capabilities is elaborated in the following three sections. The first section covers learning and cognition at the individual level of analysis. The second section considers the development of managerial cognition and capabilities. The focus in the third section is on the feedback loop of organisational learning and the impact of the knowledge repository on learning; specifically, how learning can be facilitated. Particular attention is paid to learning in a dynamic environment.

In reviewing the broad field of organisational learning, researchers have tended to focus on areas of consensus and on current and emerging debates. One area of consensus is that there are various levels of analysis, including individual and organisational levels (Easterby-Smith, et al., 2000). Learning occurs through individuals (Argote, 2011; Walsh & Ungson, 1991). Organisational memory, interpretations of an organisation's past experience that can be usefully applied to the future, can be stored within individuals, collectively among individuals, and in structures, processes, and systems (Walsh & Ungson, 1991). In turn, these interpretations play a role in individual and organisational learning. Although individuals are an important source of organisational knowledge (Walsh & Ungson, 1991), organisational learning requires knowledge to be embedded in a supra-individual repository (Argote, 2011). The latter point suggests a distinction between organisational learning and organisational memory.

There is no accepted theory of organisational learning (Crossan, et al., 1999; Crossan, Maurer, & White, 2011). However, Crossan et al.'s, (1999) influential 4I framework can be used to examine the dynamic nature of learning across multiple levels of analysis (Easterby-Smith et al., 2000), providing a process perspective. The framework consists of four processes – intuiting, interpreting, integrating, and institutionalising – which account for the 4Is. In the framework, organisational learning is a recursive process and includes both a feed-forward loop from intuiting at an individual level, through the group level to institutionalising at the organisational level of analysis, as well as a feedback loop between levels. Each of the four processes is covered in more detail in the following sections. Notably, organisational learning is seen to occur when learning is institutionalised, which involves routinising actions and embedding learning into the organisation. Institutionalisation is suggested to enable systematic exploitation of learning.

Crossan et al. (2011) point out that in the 4I framework, organisational learning is viewed as not just collective cognition or behaviour, but rather learning captured and institutionalised. They emphasise that the intent of framework is to distinguish these as content and process. In this sense, organisational learning goes beyond integrating learning in social cognition to also include routinised behaviour.

2.1.1 Individual learning and cognition

Individuals play an important role in organisational learning because they acquire knowledge through learning. Only individuals have the cognitive capability to understand cause-effect relationships and link stimuli with response information (Walsh & Ungson, 1991). This section outlines the nature of individual cognition, and individual learning in terms of problem sensing or sensemaking and problem solving. It focuses on the cognitive processes involved in learning and the associated outcomes.

Nature of individual cognition

Individual cognition refers to individual beliefs and mental models that guide problem solving and decision making. Beliefs or mental models are also referred to as cognitive representations, cognitive schema, cognitive structures, and knowledge structures. In his seminal review of managerial and organisational cognition, Walsh (1995) refers to a knowledge structure as a mental template consisting of organised knowledge about an information domain that individuals impose on the domain to give it form and meaning. He points out that, according to schematic information processing theory, individuals create knowledge structures to simplify complex environments and screen out irrelevant information.

Heuristics refer to relatively simple cognitive structures, while those of experts are complex. Expertise is acquired through experiential learning and relies on pattern recognition (Hodgkinson, et al., 2008). Experts have developed a large number of patterns held in long term memory (Chase & Simon, 1973 in Hodgkinson et al., 2008). The complex, domain relevant schemas of experts develop through explicit learning, involving deliberate practice and relevant feedback from the environment, as well as implicit learning, involving focused attention on the stimulus environment (Dane & Pratt, 2007).

Problem sensing or sensemaking

Problem sensing is a prerequisite of problem solving. Two influential theories on problem sensing (Kiesler & Sproull, 1982; Weick, 2006) suggest that it occurs in two distinct ways. Firstly, Kiesler and Sproull (1982) highlight problems in effective managerial problem sensing from a social cognitive perspective. They refer to problem sensing as a process of noticing, interpreting, and incorporating. More specifically, problem sensing involves noticing stimuli, interpreting them by constructing or assigning meaning, and incorporating interpreted stimuli by remembering or retaining them and associating them with other cognitions. Notably, noticing of potentially problematic stimuli is identified to be based on aspiration level triggers, points at which circumstance fall below a satisfactory level, or detection error triggers. Drawing from research, the authors note that even though stimuli associated with aspiration level triggers provide relatively strong signals, managers can fail to notice or misinterpret them; whereas, problems relating to detection errors triggers go unnoticed because the signals provided by available information are relatively weak and can be obscured by other information. They argue that cognitive processes can lead to ineffective problem sensing in experiential learning and planning activities, including over generalisation, attribution errors, ignoring unexpected stimuli, and under or over-interpreting stimuli. Conditions of increasing speed and range of information are argued to lead to information overload, for example, as well as provide greater opportunity for erroneous causal explanation. The research suggests that the way potentially problematic stimuli are noticed, based on two types of triggers, may influence the problem sensing process. It also suggests that conditions pertaining to a dynamic environment can heighten cognitive bias.

Secondly, Weick (2006) argues that the distinction between imagination and fancy has critical implications in terms of learning and knowledge. He argues that the type of knowing resulting from sensemaking depends on whether the frame used to read an observed fact or stimulus is based on imagination or fancy. A frame based on imagination is argued to generate a world not previously thought of. The world is described as a cluster of multiple points formed around one point, or as compound associations of simultaneity that enable ideas to grow exponentially. The frame is argued to be a postulated rule that is created through a process similar to abduction but relies on experiential knowledge. Abduction is noted to involve imagining reality by beginning with a tangible clue and then discovering or

inventing a reality in which the clue is meaningful. Imagination conceives a whole design at once which it then completes and gives body to by particular association based on one organising principle of specific parts (Engell, 1981 in Weick, 2006). Reading driven by imagination is argued to lead to stimulus driven cognitive processing and perceptually-based knowing, where rules are synthesised into conjectures.

In contrast, Weick (2006) argues that a frame based on fancy is a previously used frame that generates a familiar and remembered world. The world is described as one point linked with another or as simple associations of adjacency. Fancy involves recombining elements found in reality to invent novel and unreal elements. Frames based on fancy are argued to lead to schema driven cognitive processing and categorically-based knowing. The quality of links preserved between conceptions and their origins is argued to determine whether fancy or imagination will dominate the problem solving process, and in turn, whether cognitive processing will be stimulus driven or schema driven. Notably, perception-based knowing is suggested to be required to detect anomalies and conjure their meaning. The research suggests that constructive and matching approaches to sensemaking relate to whether frames based on imagination or fancy respectively, are used to read stimuli.

Problem solving

Research suggests that there are two types of learning outcomes to the problem solving process: intuition and insight. These outcomes are related to the cognitive information processing system used in the learning approach, experiential and rational respectively. The main difference between these two approaches seems to be whether the process is nonconscious or conscious. According to dual process theories in social cognition, Hodgkinson et al. (2008) describe the experiential processing system as nonconscious, contextually dependent, associative, implicit in nature, and affect charged. The rational processing system is described as conscious, context independent, analytic, rule-based, explicit in nature, and relatively affect free. Further, they note that the intuitive system, which relates to experiential processing, is typically referred to as reflexive, and the analytic system as reflective. Rational processing is also referred to as deliberate learning (e.g. Zollo & Winter, 2002), and intuition and heuristic processes as less deliberate cognitive forms (Hodgkinson & Healey, 2011).

The problem solving process leading to an intuition is fast, occurring almost at once (Hodgkinson et al., 2008). Dane and Pratt (2007) define intuitions as “affectively charged judgments that arise through rapid, nonconscious, and holistic associations” (p.40). They emphasise that intuition can help managers make fast and accurate decisions. However, managers are not consciously aware of the problem solving process (Hodgkinson et al., 2008), and they are therefore unable to consciously account for the underlying rationale of a judgment (Dane & Pratt, 2007), or explain the associated logic. In this sense, Crossan et al. (1999) describe the result of an intuition as “an inexplicable sense of the possible, of what might be done” (p. 527). In the 4I framework, an intuition is reflected by improvisational or spontaneous action. Imagery, such as visions and metaphors are suggested to help in interpreting an intuition.

Intuition requires a gradual process of experiential learning to develop tacit knowledge which is difficult to articulate (Hodgkinson et al., 2008). Dane and Pratt (2007) argue that complex and domain relevant schemas of experts are required for effective intuitive judgments. Heuristics and simple cognitive schemas are argued to be inadequate to process complex environmental stimuli and may be inappropriately applied across domains. They suggest that intuition is suited to unstructured decision making under conditions of environmental uncertainty when there are likely to be a number of alternative solutions. The sophisticated cognitive structures of experts are suggested to enable them to make holistic associations on solving ill-defined problems and to integrate disparate components of a problem with relative ease. Drawing from research (e.g. Klein, 1998 in Hodgkinson et al., 2008), Hodgkinson et al. (2008) point out that experienced decision makers can project the present into the future and make useful predictions. An expert’s intuitive ability is noted to be derived from a capacity to recognise salient environmental signals and match these to commonly occurring patterns. They note that based on experience, critical patterns that indicate the likely dynamics of a situation are recognised and mental simulations are conducted to rapidly evaluate alternatives and select an appropriate course of action.

In contrast to an intuition, an insight involves a long time period before arising as a sudden understanding of a problem or problem solving strategy (Hodgkinson et al., 2008). Dane and Pratt (2007) characterise the problem solving process

leading to an insight, to be slow and effortful by comparison, and often the result of a lengthy process of deliberation. They point out that an insight entails a conscious awareness of logical connections supporting a particular idea. Further, they point out that research has shown rational analysis is more appropriate than intuition for tasks involving definitive criteria. Analytical procedures are suited to structured decision making. In addition, the rational processing system can be developed relatively quickly (Hodgkinson et al., 2008).

In the 4I framework, Crossan et al. (1999) distinguish entrepreneurial intuition as future possibility oriented, from expert intuition which is suggested to be past pattern oriented. Crossan et al.'s (2011) point that intuiting as developed in the 4I framework is about the potential to envision and create unrealised possibilities suggests that it relates to entrepreneurial intuition. Their further point that a true intuitive insight cannot be driven by rationale and is outside current mental models suggests that expert intuition, as it is referred to in the 4I framework, more closely resembles expert insight.

Organisational problem solving in a dynamic environment is typically characterised by poorly structured or ill-defined problems. Research comparing experts to novices has shown that experts spend more time on defining a problem; they focus on the main parameters of a problem; and they are able to use their specialist knowledge. For example, Day and Lord (1992) found that experts categorised a problem more readily and used more underlying meaningful features, not just superficial problem features. The tendency to quickly focus on more meaningful attributes is suggested to be due to recognition processes and idiosyncratic knowledge structures. In addition, Sanchez-Manzanares, Rico, and Gil (2008) found that experts spent more time on representing a problem and justifying solutions, consistent with past research. Time spent on identifying design constraints is suggested to help reduce the number of potential solutions. They also show that experts were able to apply specialist knowledge more extensively and to tailor it flexibly to particular solutions. The results suggest that experts use their specialist knowledge to engage in more targeted problem solving.

2.1.2 Managerial cognition and dynamic capability development

Managerial cognition can be seen as an essential element of capability development (e.g. Tripsas & Gavetti, 2000). Hence, how managerial cognition develops, is likely to be important to dynamic capability development. This section covers the nature of social cognition, particularly managerial cognition, and the development of managerial cognition as it relates to dynamic capability development. Capabilities and dynamic capabilities are referred to in this section and are more fully defined in the dynamic capabilities part of this chapter.

Nature of social and managerial cognition

Research suggests that social cognition is a coherent cognitive representation or structure that is distinct from individual cognitive representations. In particular, managerial cognition is suggested to guide organisational problem solving and decision making. Several terms are used to refer to managerial cognition in the literature, including dominant logic (Bettis & Prahalad, 1995; Prahalad & Bettis, 1986), culture (Walsh & Ungson, 1991), collective mind (Weick & Roberts, 1993), and managerial cognition (Adner & Helfat, 2003). See Walsh (1995) for a review. Dominant logic refers to a conceptualisation of the business stored as a shared cognitive map or set of schemas among the dominant group of managers, and expressed in learnt problem solving behaviour (Prahalad & Bettis, 1986). Culture refers to a coherent organisational interpretation of problems and solutions, stored at a supra-individual level, which can facilitate problem solving, shape desired behaviours, and entrench certain beliefs (Walsh & Ungson, 1991). To explain organisational performance in situations requiring high reliability, Weick and Roberts (1993) develop the concept of collective mind as a distinct, higher order pattern of interrelated activities. Walsh (1995) defines a knowledge structure as “a mental template consisting of organised knowledge about an information environment that enables interpretation and action in that environment” (p. 286). An organisational knowledge structure is emphasised to be more than an aggregate or a congregate of individual cognitive processes. Adner and Helfat (2003) simply refer to managerial cognition as managerial beliefs and mental models that provide a basis for decision making.

Developing social cognition in routines

Social cognition develops through action (Weick & Roberts, 1993) and sharing interpretations of past actions as they relate to problems and solutions (Walsh & Ungson, 1991). In this respect, organisational learning can be broadly defined as a change in the organisation's knowledge that occurs as a function of experience (Argote, 2011). Levitt and March (1988) refer to organisational learning as routine-based, history dependent, and target oriented. The development of routines is seen to involve encoding inferences from past experience into routines that guide behaviour. There is some debate however, on the extent to which organisational learning can be seen as constituting both action and interpretation, or social constructionist and cognitive processes (Easterby-Smith et al., 2000).

Information about a past decision may be consciously or automatically retrieved from cultural schema (Walsh & Ungson, 1991). In particular, procedural memory or memory for know-how is relatively automatic and inarticulate and includes both cognitive and motor activities (Cohen & Bacdayan, 1994). Weick and Roberts (1993) conceptualise mind as action that constructs mental processes rather than mental processes that construct action. They argue that a collective mind is developed through ongoing and dense interrelations, where individuals cooperate in a social system. A well developed mind is suggested to manifest as a loosely coupled system of multiple actors. Such a system suggests a routine. A routine is a repeatable, recognisable pattern of action, involving multiple participants and interdependent actions (Feldman & Pentland, 2003).

Similarly, Cohen and Bacdayan (1994) argue that the development of routines through learning is dynamic, deeply embedded in a group context, and leads to partially nonconscious skilled performances. Their argument is also based on empirical work. By conducting experiments, they found that introducing novelty into the task of a routine greatly slowed down task performance but time delays had little impact. They argue that individuals store their part of routines in procedural memory and novel changes require slower declarative processing. Routines are suggested to be stored as distributed procedural memories, highlighting their distinctive nature.

More recently, Feldman and Pentland (2003) argue that a routine has two aspects: an ostensive aspect that embodies an abstract summary of a routine and

guides performances, and a performative aspect that embodies specific performances. Further, the authors argue that a recursive relationship between the two aspects leads to endogenous change, where performances create and recreate the ostensive aspect, and the ostensive aspect enables and constrains the performances. In this way, a routine is identified to evolve as variations in performance that are recognisable as legitimate instances of the routine are created and selectively retained in the ostensive aspect.

Thus, social cognition can be seen as part of the ostensive aspect of a routine. Consistent with dual process theories of social cognition, it enables both experiential and rational processing. It also embodies both procedural and declarative knowledge that may be stored tacitly or explicitly. Similar to individual cognition, it embodies both conscious and nonconscious associations. Social cognition plays a critical role in guiding the performance of routines, and in turn, variation that takes place in performances informs social cognition.

Developing managerial cognition in capabilities

The term 'capabilities' generally refers to 'ordinary capabilities'. These capabilities help a firm make a living (see next part on dynamic capabilities). Because capabilities are high level routines or collections of routines (Winter, 2000), they are likely to reflect higher levels of learning. Different levels of learning relate to the extent of cognitive development; higher level learning involves the development of complex rules and associations regarding new actions, such as central norms and frames of reference that guide decision making (Fiol & Lyles, 1985). For example, Prahalad and Bettis (1986) suggest that dominant logic embodies a meta-learning required to simultaneously conceptualise multiple, different types of businesses. It embodies a set of heuristics that simplifies and speeds decision making and enables an organisation to anticipate the environment (Bettis & Prahalad, 1995).

The endogenous nature of change in routines is instructive to how higher levels of learning embodied in the social cognitive element of capabilities might develop. Empirical work suggests that action and experience gained in a new environment shapes beliefs, which in turn, help develop new capabilities. For example, in a search model on novel domains, Gavetti (2005) shows that more adapted actions provide better information about the nature of a strategic problem than do less

adapted ones. He argues that strategic beliefs that guide local search in the new environment are influenced by the choice of cognitive representations of events. The choice of event representation is argued to be particularly relevant in entering a new market because it imprints capability development. A 'paradox of newness' is suggested where novel domains are more likely to have inappropriate strategic beliefs chosen for them, yet probably require more deliberate attention. For example, when entering a new market, Benner and Tripsas (2012) found that firms from the same prior affiliated industry showed similar behaviour in introducing product features, suggesting that they shared similar beliefs about the features; however, as experience was gained in a particular feature, the influence of the prior industry decreased. Together, the research suggests that the development of managerial cognition in capabilities might be helped by more adapted actions in entering a new market and may be reflected by more deliberate attention to the new environment.

In another example, as firms gained process experience in internationalisation, Bingham and Eisenhardt (2011) found that they learnt portfolios of heuristics or simple rules to effectively capture opportunities. Interestingly, the structure of heuristics was found to be common across firms but idiosyncratic in details to each firm. They also found that the heuristics were developed through an iterative process, and that they became more sophisticated and abstract. In addition, the developmental order of types of heuristics was found to be similar to the development of expertise in individuals. The research suggests that the development of managerial cognition in capabilities may be reflected by more abstract and sophisticated heuristics or simple theories relating to the new environment, as well as by increased proficiency in the environment.

Action and gaining experience that leads to new learning and the development of more complex managerial mental models and theories may be accomplished through experimental or exploratory learning as well as exploitative learning. In highly competitive environments, March (1991) argues that adaptive processes tend to replace exploitation of known alternatives for the exploration of unknown ones to improve performance. He introduces the concepts of exploration and exploitation in organisational learning: exploration involves experimentation with new alternatives, and exploitation refines and extends existing capabilities, technologies, and models. Increases in performance variance are suggested to compensate for decreases in average performance or performance reliability. By

doing something differently, an organisation may compensate for less reliable performance. However, Levinthal and March (1993) argue that organisational learning leads to difficulties in sustaining adequate exploration due to three forms of myopia: the tendency to focus on the short run at the expense of the long run, the tendency to favour local effects, and the tendency to overlook failure and emphasise success. These tendencies seem to be due to satisficing behaviour. Satisficing behaviour is an underlying assumption of evolutionary and adaptive processes (Helfat & Peteraf, 2009). According to Gavetti, Greve, Levinthal, and Ocasio (2012), satisficing behaviour involves choosing the first alternative that is expected to be satisfactory, where 'satisfactory' depends on the aspiration level. They note that failure to achieve a satisfactory outcome triggers a problemistic search which stops when an alternative is expected to be satisfactory.

Developing managerial cognition in dynamic capabilities

In an environment of increasing competition and dynamism, Levitt and March (1988) argue that organisations learn to learn because competence in learning tends to accumulate and drive slower learners to other procedures. Learning how to learn is argued to require creating variation in learning and selecting appropriate ways to learn, where learning is itself a technology. However, they point out that learning from experience is complicated because the past does not necessarily predict the future and can lead to superstitious learning, competency traps, and erroneous inferences. They argue that learning to learn requires experimentation in the learning process, which is likely to benefit from slow adaptation, imprecise response to experience, and abrupt changes. In other words, learning to learn requires exploration in learning technologies, which may also suffer from limitations due to myopia (Levinthal & March, 1993).

Developing competence in learning involves developing mental models and simple theories on learning, as suggested by Bogner and Barr (2000). In hypercompetitive environments, they argue that adaptive sensemaking practices are required to interpret the environment and may enable firms to keep pace with environmental change. Prolonged use of adaptive sensemaking practices is argued to lead to the development of organisational and industry frameworks where process is emphasised over content. Common cognitive frameworks are argued to emerge across firms whereby a pattern of rapid and anticipatory actions is seen as successful because it enables proactive moves in the environment.

They suggest that shared understandings among managers are based on strategic processes, rather than on stable patterns of competitive content, because content oriented beliefs can become rapidly outdated. In this sense, industry recipes are suggested to be based on the 'hows' of strategies rather than on the 'whats'. Shared beliefs based on competitive content, such as organisational goals and visions, are suggested to remain general enough to guide action with new technological standards serving as a focal point for their development. Thus, similar to the findings of Bingham and Eisenhardt (2011) relating to the development of managerial cognition in new capabilities, Bogner and Barr (2000) argue that a common structure in managerial understandings or simple theories emerges across firms. However, the simple theories are focused more on how to learn and interpret the environment than on what strategic action is required.

Changing managerial cognition – strategic renewal or reorientation

In an environment of rapid technological change, a change in managerial cognition as it relates to capabilities may be required to respond appropriately to new environmental conditions. Referring to dominant logic as a filter that focuses organisational attention, Bettis and Prahalad (1995) argue that it enables an adaptive capability, provided the underlying logic does not need to change. They argue that it provides a 'local optimum' not a 'global' one, and needs to be unlearned and replaced by a new dominant logic for an organisation to change and adapt. Changing a dominant logic is suggested to be more challenging the longer it has been in place.

Empirical research supports the difficulty of changing managerial cognition and suggests that more complex belief structures can help. For example, Inkpen and Crossan (1995) show that managerial beliefs related to an unwillingness to unlearn past practices inhibit learning in a joint venture. They suggest that a firm's ability to absorb new skills requires a sufficiently complex belief system with which to notice and appreciate differences between firms in a joint venture. In particular, assimilating new technologies may require changes to managerial beliefs that underlie an organisation's business model. For example, imaging capability development at Polaroid was directed by managerial beliefs about technological breakthroughs, and subsequently constrained by managerial beliefs about its business model (Tripsas & Gavetti, 2000).

Unlearning or changing managerial cognition can involve learning a more elaborate response repertoire where a routine is remembered together with its facilitating conditions, much like the application of lessons learnt (Argote, 1999). It might also involve retroactive interference, the forgetting that occurs when new learning restrains the recall of old learning (Walsh & Ungson, 1991). In their theory of changes in organisational knowledge structures, Lyles and Schwenk (1992) argue that organisational debate and alternative view points come about in the peripheral features, which focus on interpreting the environment, rather than in the core set of beliefs and goals. Hence, more complex, loosely coupled knowledge structures are argued to facilitate organisational change and adaptation. Together, the research is consistent with Bogner and Barr's (2000) view of developing more process oriented managerial mental models and beliefs or theories that allow greater flexibility to change and adapt.

Changing managerial cognition can be likened to 'double-loop learning' (Argyris, 1976; Argyris & Schön, 1996) which accounts for its difficulty. Argyris (1976) identifies a single-loop learning model which represents finding the most satisfactory solution consistent with governing values and beliefs in order to achieve goals. He proposes a double-loop learning model which aims to maximise contributions so that a synthesis can be developed from the widest possible exploration of alternatives in order to produce the position that is based on the most complete and valid information. A double-loop learning model is argued to result in increased decision making effectiveness due to the monitoring of decisions, and the probability that errors and failures would be communicated openly, enabling learning from the feedback.

More recently, Argyris and Schön (1996) refer to single-loop learning and double-loop learning more as a result than an approach. According to them, single-loop and double-loop learning can be likened to low level and high level learning or paradigm constrained and paradigm breaking learning, respectively. They refer to single-loop learning as learning that takes place within existing systems of values and the action frames in which the values are embedded, while double-loop learning involves changes in values and frames and calls for reflective enquiry that goes across incongruent frames. Put differently, they refer to single-loop learning as linking errors detected to strategies and aspirations and modifying the strategies and aspirations to maintain performance; while double-loop learning

involves linking errors detected to strategies and aspirations, as well as to the values and norms that define performance, resulting in a change to the values and norms, as well as to the strategies and aspirations. Together, the research suggests that a maximising approach to learning is more likely to achieve double-loop learning than the satisficing approach assumed in an evolutionary perspective, because satisficing might not result in sufficient exploration.

Empirical work supports the idea that strategic renewal or reorientation requires double-loop learning that results in a change in managerial cognition as it relates to capabilities. Barr, Stimpert, and Huff (1992) illustrate the pattern of learning in the strategic renewal of a railroad company. They found that high level learning occurred after a series of incremental changes involving a lengthy unlearning process and an ongoing learning process, during which time concepts became more general and new concepts were added. The shift in strategic thinking was found to be directly linked to strategic actions and intentions. They suggest that renewal involves not just noticing environmental changes, but being able to link them to strategy and to modify the relationship over time. Managerial beliefs are suggested to affect the attention paid to environmental changes, their interpretation and their incorporation in solutions to perceived problems. Their findings are emphasised to provide support to a mutually reinforcing relationship between mental models and action.

More recently, in airline firms facing regulatory changes, Adner and Helfat (2003) found that only managerial decisions on corporate downsizing impacted business profitability over time. They introduce the concept of dynamic managerial capabilities to help explain differences in managerial decisions and firm performance in the context of a changing environment. Dynamic managerial capabilities are argued to reflect three components: managerial cognition, individual knowledge and skills, and managerial social capital or network linkages to access information. These three components can be seen as managerial cognition, individual cognition, and an ability to access distributed knowledge sources, such as information systems or other individuals.

Similarly, Kaplan (2008a) found that changes in CEO (Chief Executive Officer) attention affected investment patterns in communication technology firms facing a fiber-optic revolution. In particular, CEO attention to a new technology had greatest impact when organisational reorientation was required. Managerial

cognition is suggested to compensate when organisational capabilities related to the technology do not exist and investment incentives are low. She argues that in such instances, managerial cognition can be considered to be a dynamic managerial capability that can reorient an organisation to take advantage of a new opportunity.

In terms of equating managerial cognition to a dynamic managerial capability (Kaplan, 2008a), a dynamic managerial capability might rely on managerial cognition, constructed by individual cognition, in circumstances where experience in the form of social capital might not be available or accessible. In such circumstances, managerial cognition that is embedded in problem solving and decision making capabilities plays a critical role. It helps to explain why Adner and Helfat (2003) found that only decisions on corporate downsizing were significant in leading to differences in firm performance.

However, developing dynamic capabilities requires that an organisation achieve not only one strategic renewal; it further requires strategic renewal on an ongoing or repeatable basis in response to rapid technological change. It requires learning how to change managerial cognition on a repeatable basis. Argyris and Schön's, (1996) research suggests that it requires changing managerial cognition as it relates to learning as well as to capabilities. They argue that double-loop learning that discovers and modifies the learning system that conditions prevailing patterns of organisational enquiry is critical, because an organisation's learning system enables it to learn how to learn and enhances its capability for both single and double-loop learning. Learning how to learn may involve single-loop learning within the existing learning system or paradigm of learning, or it may involve double-loop learning which changes the learning system.

Thus, developing dynamic capabilities that enable strategic renewal on an ongoing basis may require exploration in learning and double-loop learning in respect of learning how to learn and of operating. Such dynamic capabilities are likely to be reflected by sophisticated and abstract managerial theories on learning.

2.1.3 Facilitating organisational learning

Organisational learning in the context of a more dynamic environment is likely to be more difficult because tasks are more interdependent. In addition, the state of knowledge is not well developed (Pisano, 1994), is largely context dependent (Argote, 1999), and might become rapidly outdated. Returning to the 4I framework, Crossan et al. (1999) highlight two tensions in organisational learning that involve the assimilation of new learning. The first tension is moving from interpreting to integrating in the feed forward loop. It involves developing a common understanding among managers and taking coordinated action, reflected by coherent action. The second tension, in the feedback loop, is moving from institutionalising to intuiting. It concerns the development of new ideas and insights which may conflict with the existing institutional order. These tensions may be overcome to some extent by facilitating learning. This section discusses research on learning strategies and mindfulness in organisations to facilitate individual and group interpretation of a changing environment, as well as knowledge development frameworks to facilitate the integration and coordination of new knowledge required for competitiveness. In both cases, institutionalised learning in the form of routines, capabilities, structures, processes, practices, and systems can be a means of facilitation.

Learning strategies

A common understanding required for coherent action is developed through interpretation of the environment. In their seminal article, Daft and Weick (1984) refer to interpretation as a process of sharing observations and discussion to reduce equivocality or the extent to which data are unclear. They identify interpretation modes or learning strategies based on managers' beliefs about the environment. A competitive environment is argued to lead to more active strategies because of new problems and a perceived need to develop new opportunities. In these circumstances, an organisation is argued to engage in either an enacting mode or a discovery mode of interpretation, depending on the extent to which managers believe the environment is analysable. These modes can be related to experiential and rational search strategies respectively.

An interesting series of articles reflects a debate on the effectiveness of some variants of experiential and rational search strategies under complex

environmental conditions. Based on a simulation model that compares cognitive (rational choice) and experiential (local incremental) search processes, Gavetti and Levinthal (2000), found that cognitive representations guided and constrained experiential learning, especially in more complex fitness landscapes. They highlight a trade-off where changing cognitive representations can help adaptation by directing attention to different environmental aspects, but current performance suffers due to a loss in tacit knowledge. In a similar model, Gavetti, Levinthal, and Rivkin (2005) compare analogical reasoning to local incremental search processes, where analogical reasoning enables the transfer of experience from one setting to another in an attempt to bridge cognitive and experiential search processes. In complex and ambiguous environments, analogical reasoning was found to lead to greatest long run advantage over local incremental search, argued to be because the environments cannot be easily decomposed to enable parallel search. Notably, performance using analogical reasoning was found to benefit from increasing breadth and depth of experience, only if a manager had a good representation based on prior experience, and did not vary with depth beyond a modest level. They suggest that analogical reasoning is useful in transferring experience when a manager's prior experience allows a rich appreciation of a strategic problem (Gavetti et al., 2005).

Interestingly, Farjoun (2008) extends Gavetti et al.'s (2005) analysis to argue that the environment can be partially constructed in novel and complex settings. He distinguishes constructionist logic from matching logic in strategy, arguing that they lie on a continuum, depending on environmental requirements. More specifically, constructionist logic envisions different industry futures and experiments to construct them, aiming to obtain a long run fit with an evolving environment; while, matching logic applies familiar solutions based on firm experience or those of other firms in related contexts. Constructionist logic is seen to be suitable when familiar solutions are absent or less relevant. The author argues that approaches using constructionist logic include: analogical reasoning based on more abstract analogies, which can involve a leap to build on a firm's history and generate unique and novel solutions; and mental experimentation closely related to abduction. Abduction is referred to as a process whereby managers "start with some tangible clue and then discover or construct a world in which it is meaningful" (p. 1010). The essential difference emphasised between the two approaches is that constructionist logic requires managers to imagine divergent representations of future contexts; whereas, analogical reasoning

employed as a matching approach, requires managers to use broad experience to find the best match with their representation of the key parameters of the current context.

In their response to Farjoun (2008), Gavetti, Levinthal, and Rivkin (2008) argue that constructionist logic can be included in the bridging role of analogical reasoning. They suggest that a more complete array of modes of cognition can be classified, based on projection (including rational choice), associative reasoning (including analogical reasoning), and feedback-based learning (including local incremental search). The debate suggests that analogical reasoning can be an effective learning strategy in a dynamic environment. It may be based on matching or constructionist logic, depending on the degree of abstraction of analogies used (Farjoun, 2008), which in turn, depends to some extent on the availability of familiar solutions. Other constructionist approaches may also be effective, such as mental experimentation similar to abduction. The debate is less clear on how these strategies align with rational and experiential search processes.

Notably, empirical findings on product development in the context of a fast moving, uncertain environment support the effectiveness of an experiential strategy involving improvisational tactics, rather than a more planned approach. An experiential strategy was found to rely on real-time information (Eisenhardt, 1989; Eisenhardt & Tabrizi, 1995), and a hands-on approach (Eisenhardt & Tabrizi, 1995), as well as advice from more experienced managers (Eisenhardt, 1989). Learning is suggested to be accelerated by the use of efficient problem solving strategies to maximise information and analysis, given time constraints (Eisenhardt, 1989), as well as iteration and testing, and motivation through frequent milestones and focus (Eisenhardt & Tabrizi, 1995).

Similar to an experiential strategy, empirical work on improvisation suggests that it requires prior learning as well as real-time information and feedback from the environment. Improvisation in teams was found to require a high level of feedback (Moorman & Miner, 1998), such as real-time information and communication among team members (Vera & Crossan, 2005). In their study on improvisation in new product development, Miner, Bassoff, and Moorman (2001) found that improvisation was based on prior learning, but real-time experience informed the design of actions as they were executed. They also found that improvisational

episodes involved intense attention to a particular context; they emerged under external time pressure to solve problems or address opportunities with the intention of handling unexpected events; and they were common but often ephemeral.

Notably, improvisation is suggested to provide a promising lens for investigating entrepreneurial processes because it involves responding to sudden opportunities rather than preplanning (Miner et al., 2001). Improvisation is characterised as mixing together both precomposed and spontaneous actions (Weick, 1998), “the deliberate and substantive fusion of the design and execution of a novel production” (Miner et al., 2001, p. 314), and “the creative and spontaneous process of trying to achieve an objective in a new way” (Vera & Crossan, 2005, p. 205). According to Weick (1998), improvisation is sensitive to originating conditions and guided by past experience; it involves retrospective sensemaking, or acting in order to think, and leads to the retrospective creation of form, similar to an emergent structure that is built by whatever is at hand and can be shaped in relation to what has gone before. More specifically, Miner et al. (2001) argue that improvisation is an emergent behaviour involving unplanned, novel, and orderly actions that are designed and enacted at the same level of analysis, rather than an emergent outcome of low level actions of which the improvisers are unaware. Because improvisation was found to occur at multiple levels of analysis, they point out that, at a strategic level, it is more likely to cause harmful effects in a tightly coupled context due to strong interactions, rather than in a loosely coupled context.

In his influential article, Weick (1998) argues that improvisation lies on a continuum of cognitive processing effort involving progressive demands on imagination and concentration, ranging from interpretation, to embellishment, to variation or reassembly, and finally to improvisation. Interestingly, he likens the spectrum from interpretation to improvisation, to the spectrum from incremental to transformational change. In terms of a dynamic environment, upper limits to improvisation are suggested to be based on the rate of change of the environment, whereby increased pace may shrink the time available for adaptive improvisation and encourage organisations to revert to old ideas. Weick’s (1998) continuum of cognitive processing effort can be compared with Henderson and Clark’s (1990) innovation framework of incremental, modular, architectural, and radical innovation. In their innovation framework, architectural and radical

innovation can be related to more process oriented change, and modular and radical innovation to more content oriented change. Together, the frameworks suggest that improvisation involves both substantial process and content oriented change. The relationship of improvisation to transformational change and its substantial demands on imagination and concentration (Weick, 1998) suggests that improvisation involves constructionist logic.

In summary, in the context of a rapidly changing environment, managers may engage in more experiential or more rational learning strategies depending on the extent to which they believe the environment is analysable (Daft & Weick, 1984). Analogical reasoning may be a useful learning strategy provided a manager's prior experience allows a rich appreciation of a strategic problem (Gavetti et al., 2005). It may involve matching or constructionist logic depending on the degree of abstraction of analogies used (Farjoun, 2008), which in turn, depends to some extent on the availability of familiar solutions. Empirical findings (e.g. Eisenhardt, 1989; Eisenhardt & Tabrizi, 1995) suggest that an experiential strategy involving improvisational tactics is more effective in a dynamic environment than a planned approach, and relies on real-time information as well as prior experience. Similarly, improvisation was found to rely on prior learning and real-time experience (Miner et al., 2001). Improvisation's substantial demands on imagination and concentration relating to transformational change (Weick, 1998) suggest that it provides insight into constructionist logic. The research highlights the importance of managers' prior experience and expertise in interpreting a complex environment.

Mindfulness in organisations

There appears to be two related but different views of mindfulness in organisations in the literature. These are less conceptual and conceptual information processing views of mindfulness (Weick & Sutcliffe, 2006). They relate to less conscious and conscious cognitive processes, which in turn, relate to experiential and rational processing systems in individuals. In the conceptual view, mindfulness involves encoding environmental events and responding to them by using existing or recombined routines (Levinthal & Rerup, 2006). More specifically, the application of prior experience entails discriminating between previous and current conditions and adapting by generalising prior experience and

applying it from one setting to another (Rerup, 2005). In this view, prior experience is matched to the current situation.

Weick and Sutcliffe (2006) expand on Levinthal and Rerup's (2006) view of mindfulness, which they refer to as conceptual, to one of less conceptual information processing. In the less conceptual view, reliable perception-based knowledge is assumed to be required for effective collective action, and mindfulness helps direct perception or the focus of attention. They argue that the focus of attention is less conceptual or influenced by existing concepts and is required to enrich distinctions in cognitive structures. They suggest that non-judgmental, stimulus-driven observations directly perceived can then be encoded and extended beyond the current situation. Mindfulness is seen to be a cognitive process whereby an intended object is remembered in the present. In their view, mindfulness can discipline attention by improving its quality in terms of stability and vividness. Similarly, Dane and Pratt (2007) suggest that mindfulness of an environment can facilitate implicit learning, because it can help enrich cognitive complexity and domain relevance. They further suggest that it involves alertness and the viewing of problems from multiple perspectives. This view of mindfulness involves paying more attention to, and becoming more aware of, the environment.

Research suggests that mindfulness can be improved by organisational processes that enable reliability. The aim of reliable performance is to learn how to avoid errors or preempt incipient errors (Weick, 2002). The quality of attention can be improved by focusing on reliability to help frame for more vivid attention, and organising for reliability to enable more stable attention (Weick & Sutcliffe, 2006). Processes that focus on reliability include: searching backward for the root cause of a problem and developing and testing hypotheses conceptually before acting to get a sense of consequences (Weick, 2002); handling ambiguous feedback to capture unexpected events for analysis and directing attention to what really matters (Levinthal & Rerup, 2006); and error correction and attention to detail (Weick & Sutcliffe, 2006). Processes that organise for reliability include: loosely coupling systems and deferring decisions to experts who can focus (Weick & Sutcliffe, 2006). In addition, involving experts in decision making in situations of high complexity, enables the transfer of tacit knowledge (Grant, 1996b).

Empirical research on novel projects, such as implementing an innovative technology, suggests that the way a project is framed can facilitate or inhibit

learning and collaboration. Framing refers to creating meaning that is not a necessary or factual aspect of a situation, which helps to direct attention to features of the object of interest in a subtle way (Edmondson, 2003). Frames found to facilitate learning include: the scope of issues rather than their specific content (Fiol, 1994), and a tacit project goal of learning rather than one of performance (Edmondson, 2003). In contrast, repeated shifts around two dominant frames were found to inhibit attempts to reach agreement (Davidson, 2002). In an analysis of investment decisions made under uncertainty, Kaplan (2008b) shows that predominant frames result from a process of meaning construction where meaning is negotiated over time. She argues that strategic response is constructed through resolving framing conflicts, because framing affects how actors perceive the possibilities for creative action. Together, the research suggests that a shared understanding of a broad frame enables collective action.

Further research suggests that framing can be helped by sensemaking devices, such as storytelling and metaphors (Davidson, 2002), and the use of analogies (Crossan & Berdrow, 2003). In particular, analytical techniques, such as scenario planning, can facilitate problem solving in an uncertain environment. Schoemaker (1993) argues that because scenarios aim to bound rather than predict the future, they can help build consensus around multiple viewpoints. Scenario planning is argued to stretch and focus managers' thinking by providing a conceptual framework that allows pattern recognition. Its psychological effects are suggested to include framing and overcoming some cognitive biases. The benefits of scenario planning are suggested to include: the provision of an opportunity for cognitive rehearsal for coping with high uncertainty (Kiesler & Sproull, 1982), and the preparation of managers' minds to make decisions more rapidly (Kaplan & Beinhocker, 2003). However, research has shown that envisaging future threats in a vivid manner can cause stress in managers and lead them to adopt dysfunctional coping strategies (Hodgkinson & Healey, 2011). The latter point emphasises that framing affects how actors perceive possibilities for action (Kaplan, 2008b).

Empirical research also supports organising for more stable attention through loosely coupled structures to facilitate mindfulness. For example, in their investigation of strategic renewal involving a technology transition, Crossan and Berdrow (2003) found that buffering devices enabled new routines to be

developed without the encumbrance of existing routines. Devices included decoupling conflicting decisions, and instituting separate structures to focus on experimental activities without the encumbrance of existing processes. These devices are suggested to enable the integration and absorption of new knowledge which conflicts with existing organisational structures and processes.

In summary, organisational processes that can improve mindfulness involve improving the quality of attention, by framing for more vivid attention and organising for reliability to enable more stable attention (Weick & Sutcliffe, 2006). Processes that help to frame for more vivid attention include a focus on reliability (Weick & Sutcliffe, 2006), directing attention to what really matters (Levinthal & Rerup, 2006), and sensemaking devices, such as the use of analogies and scenario planning, to frame innovation projects and investment decisions. Similarly, processes and structures that are loosely coupled can enable more stable attention.

Knowledge development frameworks

In a dynamic environment, an organisation needs to acquire new knowledge in order to remain competitive. A knowledge-based perspective helps to shed light on the 'institutionalisation of learning' (Crossan et al., 1999) or the integration and coordination of knowledge in routines. Concepts concerning the development of new knowledge relate to learning capabilities and to dynamic capabilities. For example, absorptive capacity refers to "the ability of a firm to recognise the value of new external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p.128), and a combinative capability enables current and acquired knowledge to be synthesised and applied (Kogut & Zander, 1992).

Both of these concepts are multi-level with knowledge residing at the individual, group, and organisation levels. Kogut and Zander (1992) argue that knowledge advances by "recombinations because a firm's capabilities cannot be separated from how it is organised" (p. 392). In their view, a firm's knowledge base consists of technologies as well as organising principles or the firm's relational structure. Based on this view, a firm's knowledge base can be seen as being made up of technological assets and organisational assets, or technologies and ways to organise them. In this light, the implementation of an innovative technology is suggested to be particularly challenging because it requires not only learning how

the technology works, but also how it may transform the way work is done (Edmondson, 2003). In short, it requires learning the new technology as well as learning how it can be organised in the knowledge base.

Research on the development paths of absorptive capacity and process knowledge suggests organisational processes which can facilitate the learning of a new technology. Cohen and Levinthal (1990) characterise the development path of absorptive capacity as path dependent and domain specific based on its cumulative nature and the possession of related knowledge. In environments of rapid technological change, they argue that firms with higher levels of absorptive capacity are more proactive because absorptive capacity affects a firm's learning incentives, and in turn, its aspirations, leading to self-reinforcing cycles of innovation. They suggest that absorptive capacity development can be facilitated by increasing a firm's prior knowledge, for example through research and operational activities, and by increasing the network of individual absorptive capacities, for example, through a broad range of 'gatekeepers' and 'boundary spanners' who are able to determine the implications of new information. In a similar vein, Jaikumur and Bohn (1992) argue that the development path of process knowledge occurs in successive stages based on the discovery of primary and then secondary variables. In a changing environment, they emphasise the importance of operational feedback to identify secondary process variables with more subtle effects on performance. A dynamic approach involving root cause analysis of unexpected events is suggested to help discover process variables, in contrast to a static approach that focuses on work-around or patch solutions. Together, the research suggests that the development of basic knowledge concerning primary variables can facilitate the absorption of related knowledge.

Examples of empirical work on technological innovation illustrate the development of new knowledge based on prior related knowledge. By developing a model to retrospectively track the coevolution of knowledge, capabilities, and products over time, Helfat and Raubitschek (2000) found that three companies facing rapid technological change were able to use related product knowledge to address an emerging technology. For example, one company was able to apply technological knowledge learnt in a failed initiative to a new initiative, and another company was able to identify a threat posed by a new technology by being in a related product market. In addition, Leiponen and Helfat (2010) found that firms can improve the

probability of innovation success by broadening innovation objectives and particularly, knowledge sources. They suggest that a breadth of knowledge sources, implied by broad objectives, helps to overcome cognitive bias associated with the tendency for narrow search, and that more knowledge complements may improve success. The latter point suggests that knowledge breadth increases the chances of knowledge overlap with prior related knowledge.

Further research suggests that path breaking change may be required in a dynamic environment and focuses on a more dynamic, process oriented view of knowledge related to the way it is organised. Notably, Kogut and Zander (1992) argue that path dependence advances the basis of the current technology and way of doing things because proximate technologies do not require a change in the organising principles. In a dynamic environment, they point out that new knowledge often requires exploratory learning to discover how it can be organised. The growth and competitiveness of the firm is argued to require both organising principles and a way of communicating that enable knowledge to be orchestrated. In this respect, they suggest that organising principles, such as an ordered system, which reduces the system's complexity and communication costs; and nested and modularised knowledge, which implies that only the interface requirements of a module need to be understood in order to use it. They also suggest that communication can be helped by codification and simplification. The implication is that in a dynamic environment, investment in a new technology might require a new basis of organising, which can be facilitated by a loosely coupled system.

In addition, in a review of the absorptive capacity literature, Lane, Koka, and Pathak (2006) argue that absorptive capacity research is limited by an assumption of absorptive capacity as knowledge content. Cohen and Levinthal's (1990) view of absorptive capacity is suggested to represent single-loop learning. They suggest that a view of absorptive capacity as a dynamic capability directs attention to organisational structures and processes that influence learning. Accordingly, they extend the concept of absorptive capacity to include exploratory, transformative, and exploitative learning. Their reference to transformative learning suggests the inclusion of double-loop learning; however, it does not seem to be clearly elaborated or distinguished from exploratory learning. They also highlight the structural aspect of a similarity of learning relationships between

learning partners, as a characteristic of new external knowledge that influences its ease of absorption, to add to Cohen and Levinthal's (1990) characteristics.

Together, the research suggests that advancing the basis of the current technology can be related to single-loop learning. In this sense, organising principles (Kogut & Zander, 1992) that are part of managerial cognition can be compared with the governing values and beliefs in order to achieve goals (Argyris, 1976), and the systems of values and the action frames in which the values are embedded (Argyris & Schön, 1996). Double loop learning leading to a change in managerial cognition or paradigm breaking change enables a new basis of organising to be instituted. The new basis of organising may include path dependent or path breaking change depending on the degree of process oriented change in the system. Exploratory learning may be required to find a way of organising so that a new technology can be integrated and coordinated within the knowledge base.

Empirical work relating to the development of innovation capabilities in an environment of technological change illustrates effective practices in organising product development (Brown & Eisenhardt, 1997) and the suitability of learning strategies and patterns in the development of knowledge (Pisano, 1994, 1996, 2000). In a fast moving, competitive environment, Brown and Eisenhardt (1997) found three organisational practices that enabled multiple product innovation: project semi-structures, where organisational features were prescribed in project execution but not in project design; simultaneous attention and linkage between present and future projects; and growth through a series of sequenced steps from a current to a future focus. The three practices are argued to form a core innovation capability, enabling continuous change in a fast paced environment.

An interesting series of articles examines the development of new capabilities associated with an emerging technological environment. The learning approaches of 'by doing' and 'before doing' can be related to experiential and rational learning strategies. Pisano (1994, 1996) investigates the creation of new organisational capabilities through organisational learning by comparing process development projects in two different technological environments; one characterised by well developed and the other by less developed knowledge. Pisano (1994) found that an emphasis on a 'before doing' learning approach was better suited to a well developed knowledge environment, but not to a less developed one. The most

rapid learning approach to implement an organisational innovation is suggested to rely on the structure of the knowledge characterising the specific organisational technology. In a further investigation, Pisano (1996) found that the 'by doing' learning approach was required for efficient development in a less developed technology environment, but was not so important in a well developed one. Learning 'by doing' is suggested to not be so important for a mature technology because developers can anticipate and respond to operators' concerns, without doing their work; in contrast to an emerging technology.

Building on the earlier studies, Pisano (2000) further examines the development of new capabilities in the less developed knowledge environment. He found that the organisation that seemed to most accelerate its pace on development projects deepened its knowledge base in a way that helped developers to better understand causal relationships and hence, anticipate problems. More specifically, the organisation built basic capabilities enabling it to leverage generic knowledge and to more easily absorb new knowledge; and it emphasised problem solving to understand cause-effect relationships at a basic level and invested in analytical techniques to provide more accurate experimental feedback. In addition, close interaction between developers and operators enabled developers to better understand operational problems. The organisation is suggested to have learnt how to learn across projects and accumulate firm specific knowledge. Together, the research illustrates the development of managerial cognition or theories related to how a new technology works. It suggests that an experiential approach is required to help understand the structure of a new technology. It also illustrates the development of process knowledge in successive stages (Jaikumur & Bohn, 1992), as referred to by the author.

The integration and coordination of a new technology in routines in a firm's knowledge base seems to rely on how it is first integrated and represented in managerial cognition. Thus, the development of managerial cognition is integral to the development of dynamic capabilities. The next part of this chapter briefly reviews research on dynamic capabilities in order to shed light on their development from a learning perspective.

2.2 Dynamic capabilities

The factors that cause organisational capabilities to be a central factor in considering the profitability of firms and, indeed, the performance of the broader economy, also result in the need for humility in articulating appropriate organisational designs for their incubation. We are making progress, however, in articulating the logical foundations underlying organisational capabilities and this emerging logic holds some promises for these challenges of design. (Levinthal, 2000, p. 376)

2.2.1 Nature of dynamic capabilities

How dynamic capabilities develop depends to a large extent on what they are; their nature and how they are defined. Recent reviews note that the research field is in an early stage of development, with some debate around the nature and consequences of dynamic capabilities (Di Stefano et al., 2010; Easterby-Smith et al., 2009; Helfat & Peteraf, 2009). This section outlines the theoretical foundations of dynamic capabilities, and highlights areas of consensus and debate in the research field.

Theoretical foundations

Dynamic capabilities research aims to understand how firms can achieve and sustain a competitive advantage in the context of a dynamic environment (Helfat & Peteraf, 2009; Teece, 2009). More specifically, the 'dynamic capabilities framework' aims to explain the sources of sustainable competitive advantage (Teece, 2007). Its broad appeal may derive from economic thinking and its link with firm performance (Helfat et al., 2007, Chapter 3). It is an extension of the resource-based view (RBV) of the firm (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2009; Teece, 2007) that is particularly applicable to a rapidly changing environment. The RBV can be described as a theoretical framework of strategy that views a firm as a bundle of resources and focuses on its internal organisation (Eisenhardt & Martin, 2000). In the RBV, a firm's strategy is constrained by, and dependent on, its unique bundle of tangible and intangible resources; its intangible assets in particular, can be a source of sustainable competitive advantage (Collis, 1991), especially when there are complementarities between assets (Eisenhardt & Martin, 2000).

There are two major theoretical foundations to dynamic capabilities research as well as two theories of entrepreneurship. Behavioural theory (Cyert & March, 1963 in Helfat & Peteraf, 2009) focuses on organisational routines, processes, learning, and growth, as well as managerial decision making (Helfat & Peteraf, 2009). From a learning perspective, its relevance is a firm's adaptive ability (Teece, 2009). In particular, Gavetti et al. (2012) note that there are three aspects of behavioural theory that are relevant to developing cognition: satisficing behaviour, dependent on aspiration level, rather than maximising behaviour; problemistic search due to a failure to achieve satisfactory outcomes leading to a refinement of expectations; and rule-based behaviour which avoids foresight by using experience. They point to the role of expectations in terms of anticipation and deliberation, central to strategy work, and note that cognitive representation is an important aspect.

The second major theoretical foundation is evolutionary economics (Nelson & Winter, 1982) which itself is rooted in behavioural theory. Evolutionary economics concerns an external selection environment due to competition, as well as internal selection of routines in the traditional evolutionary cycle of variation, selection and retention. Knowledge is stored in routines, and learning is an adaptive process, where search routines aim to improve operating routines. The evolutionary focus invites attention to routines and path dependence (Helfat & Peteraf, 2009).

In terms of entrepreneurship, the dynamic capabilities framework (Teece, 2007) is based on both Kirznerian (Kirzner, 1973 in Teece, 2007) and Schumpeterian (Schumpeter, 1934 in Teece, 2007) theories of entrepreneurship. In the Kirznerian view, Teece (2007) notes that entrepreneurs with differential access to existing information can recognise opportunities and then work to restore equilibria; whereas in the Schumpeterian view, entrepreneurs can disrupt equilibria by creating opportunities with new knowledge. The dynamic capabilities framework (Teece, 2007) puts forward a neo-Schumpeterian theory of the firm based on the nature of the innovation process.

Areas of consensus and debate

A broad area of research consensus is that dynamic capabilities are higher order capabilities. A capability enables a particular high level function of a firm to be systematically and reliably performed. In essence, capabilities rely on patterned

activity (Winter, 2003). They comprise high level routines oriented towards specific objectives (Winter, 2000). Routines indicate behaviour that is learnt, highly patterned, somewhat repetitious, and relies partly on tacit knowledge (Winter, 2003).

Dynamic capabilities govern the rate of change of ordinary capabilities (Collis, 1994; Winter, 2003). They are first order capabilities in a capability hierarchy where ordinary capabilities are zero order (Winter, 2003). Long term investment is required in order to sustain the patterned activity, given that change can alternatively be made by means of ad hoc problem solving (Winter, 2003).

Second order capabilities are suggested by Collis (1994) to be a function of managers that “comprises the more metaphysical strategic insights that enable firms to recognise the intrinsic value of other resources or to develop novel strategies before [ahead of] competitors” (p. 145). He argues that higher order capabilities, of the ‘learning to learn’ variety, can help overcome the path dependence associated with the development of the original, lower order capabilities. Extending his argument, he notes that there is always a logically prior explanation for the origin of any capability and competitive advantage in the form of a higher order capability. Referring to this argument, Winter (2003) adds the provision that investment in higher order capabilities is warranted, given the nature of environmental change. Thus, provided that investment in second order capabilities or capabilities to learn dynamic capabilities is warranted in the context of the environment, such managerial insights are likely to be a source of dynamic capability development.

Three areas of debate in the literature about the nature of dynamic capabilities are: whether they are capacities or processes, the extent to which they may include best practices, and the extent to which they necessarily confer competitive advantage. The debate concerns the nature and definition of dynamic capabilities and their consequences (Easterby-Smith et al., 2009). These areas of debate are highlighted in a brief overview of influential definitions, including the three foundational definitions most identified with the concept - those of Teece et al., (1997), Eisenhardt and Martin (2000), and Zollo and Winter (2002) (Di Stefano et al., 2010).

Recent research suggests that dynamic capabilities are capacities distinct from processes. However, the foundational definitions differ on this aspect. In their seminal paper, Teece et al. (1997) refer to dynamic capabilities as “the firm’s ability ... to address rapidly changing environments” (p.516) and argue that competitive advantage is a function of a firm’s distinctive processes, as well as its asset position and potential evolutionary paths. In a modified conception of dynamic capabilities, Eisenhardt and Martin (2000) refer to them as the “firm’s processes that use resources to match and even create market change” (p. 1107). They argue that dynamic capabilities are specific and identifiable processes, such as product development. Notably, Helfat et al. (2007) draw on the three foundational definitions to define a dynamic capability as “the capacity of an organisation to purposefully create, extend, or modify its resource base” (p. 1). In this definition, the word ‘capacity’ is noted to indicate a minimal ability (Helfat & Peteraf, 2009), suggesting that it embodies past learning. Later research clarifies that processes are the underpinnings of dynamic capabilities (Teece, 2007), and they are the means by which dynamic capabilities are developed and used (Helfat et al., 2007, Chapter 3).

A related debate is the extent to which dynamic capabilities comprise best practices. Eisenhardt and Martin (2000) argue that dynamic capabilities are idiosyncratic in their details, but specific dynamic capabilities have common features across firms, known as ‘best practice’. As a result, they are implied to be equifinal with multiple paths to the same dynamic capabilities. Teece (2007) further elaborates that dynamic capabilities are unlikely to be constituted solely by adopting best practice, because widely adopted best practices cannot alone enable an organisation to achieve a competitive advantage. However, he notes that a firm’s success in dynamic markets depends on activities such as upgrading best practices.

The third debate, which remains open, is the extent to which dynamic capabilities necessarily confer competitive advantage (Helfat & Peteraf, 2009). There is a research consensus that dynamic capabilities are purposeful (Helfat et al., 2007) and show intent (Helfat & Peteraf, 2009). The earlier definition of Teece et al. (1997) has been suggested to involve a tautological link that was expressly addressed by the later foundational definitions. Eisenhardt and Martin (2000) argue that the value of dynamic capabilities lies in the resource configurations created, rather than in dynamic capabilities themselves, consistent with their

equifinal nature. In a view of dynamic capabilities based on search routines, Zollo and Winter (2002) refer to them as constituting “the firm’s systematic methods for modifying operating routines” (p. 340). The authors argue that dynamic capabilities help improve operational effectiveness but do not necessarily serve strategic purposes. However, Teece (2007) argues that a firm’s success in rapidly changing, competitive environments depends on its intangible assets, which in turn, depends on its dynamic capabilities. In this sense, he extends Helfat et al.’s (2007) definition slightly to note that dynamic capabilities “can be harnessed to continuously create, extend, upgrade, protect, and keep relevant the enterprise’s unique asset base” (p. 1319).

Taken together, the above research suggests that dynamic capabilities are capacities implying that they embody knowledge that can be enacted. The embodied knowledge forms the ‘ostensive aspect’ (Feldman & Pentland, 2003) of capabilities and includes managerial cognition. A capacity reflects a more dynamic view than a process. It can employ several processes and other resources, which can be interchanged in order to achieve its objectives. High level dynamic capabilities embody a strategic intent aimed at contributing towards a competitive advantage in a dynamic environment. In addition, dynamic capabilities can be developed by adopting best practices but not entirely so. Helfat et al. (2007, Chapter 3) note that the dynamic capabilities concept is content oriented. They suggest that a focus on strategy process facilitates answering ‘how’ questions in more fine-grained detail. For this reason, here “dynamic capabilities refer to the particular (nonimitability) capacity business enterprises possess to shape, reshape, configure, and reconfigure assets so as to respond to changing technologies and markets and escape the zero-profit condition” (Teece, 2009, p. 87). This definition emphasises that responding to a dynamic environment involves shaping and configuring assets.

Fitness

As result of the debate about the consequences of dynamic capabilities, Helfat et al. (2007) do not refer to firm performance or competitive advantage in their definition and propose two performance measures. Evolutionary fitness or external fitness relates to how competitive a firm is in the context of its external selection environment. The growth of an organisation indicates the extent of its evolutionary fitness (Helfat et al., 2007). The evolutionary fitness of a capability

refers to how well it enables a firm to remain competitive. The second measure, technical fitness or internal fitness, introduced by Helfat et al. (2007), is a measure of how proficient a capability is in performing its function. Teece (2007) introduces a third measure of entrepreneurial fitness, which relates to how well dynamic capabilities help achieve evolutionary fitness by shaping the environment and not just by adapting to it. He points out that the “element of dynamic capabilities that involves shaping (and not just adapting to) the environment is entrepreneurial in nature” (p.1321) and suggests that entrepreneurial fitness should have equal standing with evolutionary fitness. Dynamic capabilities are argued to help sustain evolutionary fitness by helping a firm to earn Schumpeterian rents based on new combinations, or Kirznerian rents related to restoring market equilibrium.

2.2.2 Development of dynamic capabilities: Evolutionary perspective

There is a research consensus that dynamic capabilities evolve through learning (e.g. Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003; Teece et al., 1997; Zollo & Winter, 2002). This section outlines the satisficing nature of capability learning, the effect of market dynamism on dynamic capability evolution, and a knowledge evolution cycle that explains how dynamic capabilities evolve.

Capability learning

The evolution of capabilities is suggested to follow satisficing logic and be path dependent. Drawing on previous empirical research, Winter (2000) argues that capability development follows satisficing logic. This logic involves developing a satisfactory process to meet performance needs which can later be improved upon. However, satisficing logic is noted to not necessarily apply to the more ‘subtle’ matter of dynamic capability learning. Satisficing logic is guided by performance aspirations which direct learning efforts. He develops a satisficing framework of capability learning with three categories of contextual factors which act as learning incentives by influencing performance aspirations. These include: needs, targets and goals, which generally have a strengthening effect; learning costs, which tend have a weakening effect; and experience and data, which also have a strengthening effect on performance aspirations. He points out that strengthening influences can be institutionalised to result in continuous improvement; for example, by benchmarking practices. Helfat and Peteraf (2003) describe the stages of capability evolution and evolutionary trajectories in a

capability lifecycle. The lifecycle also applies to dynamic capabilities. Sources of heterogeneity in a strongly path dependent process are argued to lie in the prior experience of the formation team and the selection of paths. They point out that dynamic capabilities can facilitate the branching of other capabilities, such as by replication or renewal, but do not explain how this might occur. The above research suggests that evolutionary processes of capability learning are strongly path dependent, affected by choices made, and tend to follow satisficing logic. Notably, it leaves open the possibility that a maximising logic might also apply in dynamic capability learning.

Effect of market dynamism on dynamic capability evolution

The effect of market dynamism on the evolution of dynamic capabilities is highlighted by Eisenhardt and Martin (2000). The authors argue that dynamic capabilities evolve through learning. The learning is guided by learning mechanisms and entails a shift in evolutionary emphasis from variation to selection as market dynamism increases. More specifically, the emphasis shifts from creating small variations in experience, to deciding which of the many experiences to select and retain. In environments where change is more predictable and linear, dynamic capabilities are argued to rely more on existing knowledge; whereas, in more highly dynamic environments, where change is non-linear and less predictable, they rely more on creating situation specific knowledge. Similarly, learning strategies are noted to change from detailed, analytic, sequential problem-solving to experiential actions that facilitate rapid learning and provide access to real-time information in order to inform intuition about the market. The authors note that dynamic capabilities, which they regard as processes, also move from stable to more fragile processes, which can easily dissipate due to their improvisational nature, and they may take the form of simple rules. Based on this argument, they refer to dynamic capabilities as both matching and creating market change. In a highly dynamic market, where the duration of a current advantage is unpredictable, a firm is argued to compete by creating a series of temporary advantages. Hence, they suggest that a path breaking strategic logic of change or opportunity is required to supplement the path dependent strategic logic of leverage in the RBV.

Knowledge evolution cycle

The knowledge evolution cycle proposed by Zollo and Winter (2002) is consistent with a view that exploration in organisational learning is required to develop new operating routines, as well as an evolutionary emphasis on selection in a highly dynamic market. It is one of the first direct attempts to explain how dynamic capabilities and operating routines are formed and evolve. Based on a conception of dynamic capabilities as systematic and persistent methods for modifying operating routines, the authors suggest that learning itself can reflect a dynamic capability. The knowledge evolution cycle proposed, involves the phases of exploration and exploitation in organisational learning (March, 1991). It also includes the four stages of: variation and selection (exploration phase), and replication and retention (exploitation phase). The replication stage is added to the traditional evolutionary cycle because an organisation can replicate and leverage knowledge from one market setting to another. Based on two observations about the cycle, the authors propose that dynamic capabilities emerge from the coevolution of tacit experience accumulation processes, as well as explicit knowledge articulation and codification activities involving greater cognitive effort. Firstly, a recursive and co-evolutionary relationship can exist between the phases of exploration and exploitation; for example, adaptive variation associated with exploitation may trigger generative variation associated with exploration. Secondly, knowledge passes from its most explicit at the internal selection stage of exploration to its most tacit at the retention stage of exploitation.

Notably, Zollo and Winter (2002) argue that the evolution of dynamic capabilities can be facilitated by deliberate learning mechanisms designed to make knowledge more explicit under certain conditions. In particular, knowledge articulation and codification are argued to be relatively more effective than experience accumulation, when the strategic task of dynamic capabilities is performed infrequently and presents with new features on each performance. Strategic tasks include reorganisation, acquisition integration, and alliance cooperation. Similarly, deliberate learning mechanisms are argued to be relatively more effective when there is a high degree of causal ambiguity and uncertainty in the environment. Further, they suggest that the creative processes of articulation and codification may be more beneficial in improving the causal understanding of managers than the resulting outputs.

The knowledge evolution cycle (Zollo & Winter, 2002) extends Winter and Szulanski's (2000) theory of replication to apply to dynamic capability evolution more generally. In their theory of replication, Winter and Szulanski (2001) argue that the development of a replication capability, a dynamic capability to effect large-scale replication, involves exploration and exploitation to discover and leverage knowledge respectively. They suggest that knowledge that can be leveraged includes key business model attributes, replication know-how, and appropriate replication settings. These knowledge aspects relate to more generic knowledge that has broad scope application.

In turn, Winter and Szulanski (2001) draw from Szulanski's (2000) case study of replication at Banc One, a super-regional bank. Szulanski (2000) found that Banc One developed a conception of its core business model in system and procedure templates, which it then transferred to other sites in a series of acquisitions. Knowledge of the core business model was found to evolve through an iterative process, resulting in increasingly sophisticated templates that enabled the bank to increase its scope of replication. As interdependencies between different application areas were recognised, they were articulated and formalised in a conversion management process. The author suggests that an organisation may evolve the capability to effect large-scale replication by learning through repetition to leverage productive routines. The study also illustrates the effect of learning incentives in directing learning efforts (Winter, 2000). Learning incentives included a need to solve problems arising out of a lack of uniformity and a goal to find commonality among products and systems.

Several research findings support the knowledge evolution cycle (Zollo & Winter, 2002) both directly (Kale & Singh, 2007; Romme, Zollo, & Berends, 2010; Zollo & Singh, 2004) and indirectly (Parada, Alemany, & Planellas, 2009). Zollo and Singh (2004) compare the effectiveness of knowledge codification to acquisition experience accumulation in developing an acquisition integration capability in bank mergers. They found that codifying lessons learnt in the integration approach was important in predicting acquisition performance, and the benefits appeared to exceed the costs in more complex integrations. In particular, they suggest that the level of tacit understanding developed by managers in articulating and codifying lessons learnt might be more beneficial than the use of the resulting outputs in supporting coordination and implementation. Kale and Singh (2007) found that an alliance learning process involving deliberate attempts to learn, accumulate, and

leverage alliance management know-how, was positively related to alliance success. They suggest that the alliance learning process itself is a potential dynamic capability, because it improves partnering skills and contributes towards alliance success.

In a simulation study, Romme et al. (2010) focus on environmental conditions under which investments in deliberate learning are worthwhile. They found that there was no linear relationship between experience accumulation, deliberate learning, and dynamic capability evolution. At high levels of environmental dynamism though, they found that knowledge codification had limited use but knowledge articulation was useful. The positive effects of higher causal knowledge associated with knowledge codification are argued to be offset by the negative inertial effects of the institutionalised artifacts. Their findings also support Eisenhardt and Martin's (2000) argument on the effect of market dynamism on dynamic capability evolution, in that the relative effectiveness of the type of deliberate learning strategy changes in moving from moderate to high levels of environmental dynamism.

Finally, Parada et al.'s (2009) case study of growth by acquisition at Banco Santander, provides indirect support of the knowledge evolution cycle (Zollo & Winter, 2002). Similar to Szulanski's (2000) study of replication, the authors found that the Spanish bank was able to develop and refine the core features of its business model which it leveraged in multiple settings. Over time, it was found to be able to distinguish between more generic knowledge in its business model and specific knowledge that required local adaptation, and to combine knowledge acquired in new markets with its existing corporate capabilities to build new capabilities. The latter finding illustrates a co-evolutionary relationship between exploitation and exploration in the knowledge evolution cycle (Zollo & Winter, 2002). In addition, the authors note the importance of an entrepreneurial role in identifying new market opportunities and enabling fast integration before inertia sets in.

Taken together, the above findings suggest that deliberate learning methods can facilitate dynamic capability evolution by helping to improve the causal understanding of managers. In particular, knowledge articulation rather than knowledge codification may be useful at high levels of environmental dynamism.

The findings also suggest that experience accumulation, tacit knowledge, and experiential learning are important.

2.2.3 Development of dynamic capabilities: Evolutionary with design perspective

The perspective of dynamic capabilities as 'evolution with design' focuses on the design role of managers in strategy processes aimed at developing ordinary capabilities. The design role is in addition to the evolutionary perspective above. In this view, dynamic capabilities are underpinned by strategy processes. The view is part of the dynamic capabilities framework (Teece, 2007; Teece et al., 1997). The framework emphasises the design role of managers as agents who can effectuate change in an environment of rapid technological change or one that is highly dynamic in terms of changing technologies. The framework does not directly address the development of dynamic capabilities; however, the managerial learning required to fulfil the design role is relevant. In addition, by implication, the development or learning of dynamic capabilities also involves evolution with design. This section elaborates on the framework in terms of what is meant by 'evolution with design', the managerial role of selection and orchestration, the entrepreneurial role of managers, managerial learning, and research on asset orchestration, including reconfiguration.

Evolution with design

'Evolution with design' refers to an organisation being part of its own history, as well as to a managerial role of shaping outcomes – evolutionary processes with intentional design (Teece, 2009). It is aligned with a view of strategy processes as helping an organisation to both adapt to the environment and shape it. The managerial role is suggested to regulate the evolutionary process (Augier & Teece, 2009). The design role of managers is emphasised both in the functions of dynamic capabilities and in their shaping nature. In essence, the functions of dynamic capabilities are sensing and seizing opportunities, and when necessary, reconfiguring assets to stay agile. Teece (2007) argues that these three capacities, which constitute dynamic capabilities, enable an organisation to innovate to first achieve competitive advantage and then sustain it in the face of a changing environment. Sensing involves discovering and creating commercialisation opportunities; seizing involves making investment decisions in

development and commercialisation activities; and maintaining competitiveness involves managing threats and can include transformational activities such as reconfiguration. The shaping nature of dynamic capabilities includes shaping, reshaping, configuring and reconfiguring assets so as to respond to changing technologies (Teece, 2009).

Managerial role of selection and orchestration

The managerial role is elaborated by Teece (2009). He suggests that a view of dynamic capabilities mainly as high level routines (Winter, 2003) implies that the role of managers is to select new routines. However, the dynamic capabilities framework suggests a broader role, which also involves selecting and orchestrating assets prior to routinisation. The broader role seems to be related to the framework's concern with both technological and organisational change. The authors argue that the market role enables rapid adaptation of actively traded assets in thick markets and it is the firm's role to coordinate and adapt non-traded or thinly-traded assets, such as knowledge assets. The firm's role is argued to go beyond coordination and adaptation to involve proactive search and selection, as well as asset alignment. In particular, the distinctive role of managers is seen to involve sensing opportunities and making investing choices (selecting) as well as orchestrating nontradable assets into value yielding combinations. The managerial challenge of organising assets involves working out "how best to employ the firm's existing assets, and how to reconfigure and augment those assets and tie them together in a viable business model to help augment the value proposition being brought to customers" (p.100). In this way, the managerial role supports sensing and seizing opportunities, and maintaining competitiveness, including reconfiguring assets.

Orchestration involves organising new technologies in such a way that enables integration and coordination with existing technologies. From an organisational learning perspective, it involves integrating new knowledge into the knowledge base and coordinating its use in routines. The three organisational and managerial processes underpinning dynamic capabilities referred to by Teece et al. (1997) - coordination/ integrating, learning, and reconfiguring - are asset orchestration processes (Teece, 2007). The central coordination task of managers involves assembling and reassembling typically idiosyncratic firm assets (Helfat et al., 2007, Chapter 2).

An important aspect of orchestration is achieving new combinations and co-alignment of assets (Helfat et al., 2007, Chapter 2) as well as alignment and realignment of assets with the environment, required for competitive advantage (Teece et al., 1997). In particular, complementary assets, including co-specialised assets, are important in creating and protecting value (Helfat et al., 2007, Chapter 2). Complementarities relate to 'strategic fit' between activities, where the whole matters more than any individual part (Porter, 1996). Complementary assets tend to align with one another, work in unison and not detract value from each other. They can also be a source of competitive advantage, because alignment between these assets makes them difficult to copy, especially where there are contextual dependencies. Helfat et al. (2007, Chapter 2) suggests that the evolutionary fitness of a firm is endogenous to its technical fitness. Managers are suggested to shape the environment to firm advantage by employing technically proficient asset orchestration capabilities, leading to evolutionary fitness.

The managerial role in the dynamic capabilities framework goes beyond an evolutionary emphasis on selection to also include orchestration. It can be seen as not only selecting relevant technologies but also orchestrating them in the organisation's asset base. In terms of developing dynamic capabilities, the managerial role can be seen as selecting and orchestrating learning technologies, in order to select and orchestrate operational technologies.

Entrepreneurial role of managers

The entrepreneurial role of managers in the dynamic capabilities framework is suggested to both accelerate path dependencies by promoting and shaping learning, as well as to introduce path breaking change in the Schumpeterian sense of disrupting market equilibria. More specifically, Teece (2009) points out that the entrepreneurial role of managers can be cooperatively performed by a number of individuals, and not just by an individual. He suggests that the role is closer to Schumpeter's entrepreneur, than to Kirzner's, and largely depends on how managers identify and pursue opportunities. Entrepreneurs "sense new opportunities and lead the organisation forward to seize them" (p.105). The role is suggested to be important in selecting assets and assembling complementary assets, as well as in shaping learning processes. In this respect, two aspects of the role are identified. The Schumpeterian aspect involves introducing novelty and

looking for new combinations to create value. The evolutionary aspect involves promoting and shaping learning.

Referring to the functions of dynamic capabilities - sensing and seizing opportunities, as well as reconfiguring and transforming assets, Teece (2009) argues that they require intensely entrepreneurial managers. For example, sensing is argued to involve search activities to explore market and technology possibilities, and to require an understanding of the implications of information. Managerial judgment in terms of seizing opportunities is argued to take on greater significance in circumstances where future returns to investments are uncertain and cannot easily be determined by analytic tools. Sustained growth is argued to require the ability to recombine and reconfigure assets as markets and technologies change. In particular, augmenting the asset base over time is argued to lead to the requirement of reconfiguring assets to help maintain alignment with the environment, as well as to overcome unfavourable path dependencies. In short, Teece (2007) points out that entrepreneurial management is not about analysing and optimising, but more about sensing and understanding opportunities, getting things started, and finding new and better ways to assemble things. Because of environmental uncertainty and the need to respond to environmental events, he argues that managers “must make informed conjectures about the path ahead” (p.1323) in terms of ‘sensing’ and ‘seizing’.

Managerial learning

The managerial learning required to fulfil the design role is directly relevant to the development of dynamic capabilities. Teece (2007) suggests that, because best practices are widely diffused, knowledge about how subsystems are related and interact together is important for competitive advantage. He argues that understanding the processes and structures that underpin dynamic capabilities is firm specific, and requires an in-depth knowledge of the firm and its environment. He suggests that analytical systems and techniques, such as scenario planning, can help overcome cognitive limitations and framing biases in learning, that lead to local adaptation and alignment with the existing knowledge base respectively.

Most research in the strategy field focuses on rational decision making and problem solving. More recently, Hodgkinson and Healey (2011) argue that the development and maintenance of dynamic capabilities requires firms to harness

managers' reflexive and reflective abilities, and to use both their implicit and explicit knowledge. Reflexive processes, including intuitive and heuristic processes, are noted to enable fast information processing of environmental trends to arrive at affective judgments on opportunities and threats. Referring to the 'dynamic capabilities framework' (Teece, 2007), they suggest ways in which intuitive processes can be harnessed to help develop and maintain sensing, seizing, and reconfiguring capabilities. The domain specific nature of intuition is suggested to help managers learn cues that enable them to recognise environmental trends and identify irregularities in terms of 'sensing'. In terms of 'seizing', modification of the basic tools of strategising to integrate both rational and affective decision making is suggested. These tools help to overcome learning biases; for example, joint decision making and scenario planning. Finally, firm identity is suggested to be a trap that constrains adaptive capacity in terms of 'reconfiguring' and identity transition may be required.

Asset orchestration

A common theme suggested by research is that asset orchestration involves aligning complementary assets to obtain synergies in value, while separating different sets of complementary assets and managing them through loosely coupled interfaces. Loose coupling can enable strategic flexibility and network effects, as well as help leverage existing assets. Asset orchestration which enables flexible response to environmental events can involve both spatial (e.g. Brown, Durchslag, & Hagel, 2002) and temporal (e.g. Grant & Baden-Fuller, 2004; O'Reilly et al., 2009; O'Reilly & Tushman, 2008) coordination of economic activity.

Spatial coordination of economic activity can occur across a production process. For example, Brown et al. (2002) argue that process orchestration based on loosely coupled processes enables innovation and specialisation. Their argument is illustrated by Li Fung, a private label clothing manufacturer able to respond flexibly to unforeseen market events by reconfiguring its production network of goods across various suppliers in different countries. Similarly, temporal coordination of economic activity through the use of strategic alliances can facilitate a technological transition. For example, Grant and Baden-Fuller (2004) argue that strategic alliances tend to occur in sectors where there is incongruency between the scope of knowledge required for a firm's products and the wider application of that knowledge. Eastman Kodak's use of strategic alliances to

transition from chemical to imaging technology is highlighted. The alliances are noted to have enabled the company to take out options to mitigate uncertainty about future technological directions and obtain speed-to-market benefits.

Ambidexterity is a form of temporal coordination of new business development. O'Reilly and Tushman (2008) argue that ambidexterity is a specific capability embodied in managers' learning and is expressed in their ability to reconfigure assets in a repeatable way. Ambidexterity is described as pursuing both emerging and mature market strategies at the same time. The authors suggest that it helps to overcome inertia and path dependencies by building new businesses that are integrated with existing ones. Ambidexterity is argued to require separate sub-units due to the different mindsets required for exploration of an emerging business and exploitation of a mature one, which can lead to cognitive complexity. In addition, it is argued that the interfaces between the sub-units are clearly defined and managed in order to leverage existing assets and manage the associated strategic trade-offs. In a related study, O'Reilly et al. (2009) found that the explicit design of a process to help commercialise new business opportunities, enabled IBM to orchestrate assets across three stages of temporal development. They suggest that IBM developed dynamic capabilities in the form of ambidexterity to enable simultaneous exploration of new businesses and exploitation of mature ones.

The above research suggests that the type of knowledge required by managers to assemble and orchestrate assets and facilitate learning includes: deep knowledge of the production network (Brown et al., 2002); a realisation that the firm's products have broad-scope knowledge requirements, but much of that knowledge is not product-specific and can have wider application (Grant & Baden-Fuller, 2004); strategic clarity to justify exploration and long term commitments to specialised resources; and explicit learning of the underlying processes in order to be repeatable (O'Reilly & Tushman, 2008), based on identification of the main cause of problems impeding growth and a realisation that the business can be divided into three developmental time horizons (O'Reilly et al., 2009). More generally, it suggests that managers understand how complementary assets can be grouped together to solve problems and the coordination required across these groups.

Research suggests that reconfiguration, a particular type of asset orchestration, is a challenging task. Reconfiguration can be likened to double-loop learning because it involves changes in the way assets are organised rather than in the assets themselves. It involves changes to the basis of organising. The challenging nature of the task can be related to that of architectural innovation, which involves changes to linkages between components, rather than to the components themselves (Henderson & Clark, 1990). The difficulties associated with product architectural innovation lie in identifying architectural knowledge which is found in problem-solving strategies, communication channels, and information filters (Henderson & Clark, 1990). Further, the difficulties in creating dynamic capabilities are associated with integrating knowledge, due to a trade-off between flexibility and efficiency (Grant, 1996a). In addition, the complexity in repackaging a firm's set of capabilities relates to the degree to which they are tightly coupled, because both spatial and temporal complementarities may change, resulting in a highly combinatorial problem (Levinthal, 2000). Taken together, the above research suggests that explicit managerial learning about product architectural changes, loose coupling to manage the trade-off between flexibility and efficiency, and a loosely coupled organisation, may facilitate reconfiguration.

MacCormack and Iansiti's (2009) case study of Microsoft Corporation provides a good example of both asset orchestration and the entrepreneurial role, as well as the evolution of dynamic capabilities. It illustrates managers' explicit learning of the critical resources or underlying processes and structures that dynamic capabilities leverage in order to respond to rapid technological change. The authors found that the critical resources that dynamic capabilities leveraged to orchestrate software components enabled the firm to coordinate its response to two major technological transitions. These resources were identified to be the software componentisation process and model, as well as the processes to evolve components. In particular, the component model was found to embody generic knowledge that could be leveraged. Further, the authors note that the evolution of resources was guided by an early broad vision which influenced decisions weighing long term capability development versus short term capability performance. The vision was noted to later be adapted in response to new opportunities sensed. The study suggests that Microsoft first assembled the critical resources and then reconfigured them to respond to technological change. An entrepreneurial role in determining a broad vision, and later sensing that it needed to be adapted, was central to the evolution of the resources.

2.3 Entrepreneurship

The identification of business opportunities is an important aspect of strategic management and part of the strategy processes underpinning dynamic capabilities. However, conceptual frameworks explaining performance advantage are insufficient to explain entrepreneurial performance, because a performance advantage may not make up for the opportunity cost of other alternatives associated with pursuing a business opportunity (Shane & Venkataraman, 2000). This section applies a learning perspective to entrepreneurship as a process. It outlines conceptual views of the processes associated with opportunity discovery and opportunity enactment, including pattern recognition, as well as causal and effectual reasoning.

Entrepreneurial process - learning perspective

An area of debate in the entrepreneurial field is whether opportunities exist and are discovered, or whether they are enacted and made. Somewhat surprisingly, the debate seems to be more about an exclusive 'or' relationship rather than the possibility of two distinct types of opportunities, Kirznerian and Schumpeterian respectively. The exclusivity focus could be related to a typical view of an entrepreneur as a type of person. In a seminal article however, Shane and Venkataraman (2000) argue that entrepreneurship is a process rather than a type of person. Their view of entrepreneurship as a process involves the discovery and exploitation of opportunities and seems to apply to both the Kirznerian and Schumpeterian views of entrepreneurship. In this sense, they describe the Kirznerian view as a way in which temporal and spatial inefficiencies in an economy are discovered and reduced (Kirzner, 1997 in Shane & Venkataraman, 2000). The Schumpeterian view is described as product and process innovation, where the generative source of the change process is entrepreneurially-driven (Schumpeter, 1934 in Shane & Venkataraman, 2000). They highlight the transitory nature of the process; that it can be undertaken by an individual or a group; and that it depends on people having different beliefs about the value of resources. However, little advance in terms of the entrepreneurial process in organisations seems to have been made, and little seems to be known about the impact of contextual influences on the process (Shane, 2012).

Interestingly, Dutta and Crossan (2005) argue that the different views of entrepreneurial opportunities, as existing or enacted, can be reconciled by seeing the phenomenon as a learning process. They use the 4I organisational learning framework (Crossan et al., 1999) to illustrate the two views of entrepreneurial opportunities as a learning process, by relating them to individual intuition and then extending them to individual interpretation and group and organisational learning. In the 4I framework, entrepreneurial intuition is future possibility oriented; whereas, expert intuition may be past pattern oriented. The authors relate expert intuition to the Kirznerian view of entrepreneurial opportunities and associate it with the process of discovery. The emphasis in the Kirznerian view is noted to be pattern recognition based on an individual's alertness and prior knowledge. Opportunities are noted to arise through knowledge and information gaps. Similarly, the authors align entrepreneurial intuition with the Schumpeterian view of entrepreneurial opportunities and associate it with the process of enactment. The Schumpeterian view is described as involving innovation and transformation in the economy, which is initiated based on an intuition of an emerging future. Opportunities are noted to be created by taking advantage of technological change.

However, they also suggest that the subjective nature of the Kirznerian view may involve opportunity enactment due to an interpretation of the context and idiosyncratic knowledge available about it. In this sense, they argue that the Kirznerian view involves both expert and entrepreneurial intuition. Entrepreneurial intuition is argued to rely on a creative capacity to both recognise gaps and to identify possibilities. As previously noted, Crossan et al.'s, (2011) clarification that a true intuitive insight cannot be driven by rationale and is outside current mental models, suggests that what is referred to as expert 'intuition' can rather be seen as insight. The implication is that the Kirznerian view is based on expert insight rather than intuition and may therefore only be associated with the discovery process.

More recently, the research focus has shifted to an entrepreneurial method as a distinct method of problem solving (Sarasvathy & Venkataraman, 2011). Such a method is suggested to be comparable with the scientific method (Venkataraman, Sarasvathy, Dew, & Forster, 2010). Research on the entrepreneurial method is suggested to entail specifying the utility and mechanisms it involves (Sarasvathy &

Venkataraman, 2011), as well as systematically explaining the strategies and principles that enable purposeful ends to be achieved (Venkataraman et al., 2010)

A perspective of entrepreneurship as a learning process suggests two distinct learning or problem solving processes or methods. The Kirznerian view of entrepreneurship relates to opportunity discovery and the Schumpeterian view is associated with opportunity enactment. Drawing from Crossan et al. (1999) and Dutta and Crossan (2005), opportunity discovery can be seen as an expert learning process and opportunity enactment as an entrepreneurial learning process.

Opportunity discovery

Research suggests that the development process associated with opportunity discovery involves recombining resources to create new means-ends relationships. Opportunity discovery requires the identification of new means-ends relationships generated by a particular change (Shane & Venkataraman, 2000). A strategic opportunity discovered is likely to be part of a complex combination of resources used in a different way (Denrell, Fang, & Winter 2003). Shane (2012) argues that because entrepreneurs recombine resources rather than simply arbitrage, their decision-making involves making judgments on the future value of recombined resources. Recombination is suggested to represent a fundamentally new or slightly modified means-ends relationship.

The discovery process is suggested to not be based on an intentional search. In particular, Denrell et al. (2003) argue that the nature of a strategic opportunity implies that the discovery process is likely to be serendipitous. The serendipitous process is described as an unintended consequence of activities with a different purpose, with the opportunity likely to be difficult to recognise and only discovered after some time. The discovery process is argued to deviate from existing practice in order to develop a set of idiosyncratic resources that could be combined with other resources to create value. Rather than be based on a vision, they suggest that the final combination may be foreseen only once many of the required components are available.

The discovery of a particular opportunity is suggested to be based on prior knowledge required to recognise it and the development of cognitive schema

required to evaluate it (Shane & Venkataraman, 2000). Because the process is serendipitous, it requires alertness to recognise the appearance of a new possibility, and flexibility in redirecting efforts, as well as effort and luck (Denrell et al., 2003). The likelihood of exploitation depends on the transferability of prior related experience in order to reduce learning costs (Shane & Venkataraman, 2000). The latter point suggests a satisficing approach, where the reduction of learning costs is a learning incentive.

Research findings support the discovery of opportunities through pattern recognition based on prior knowledge. For example, Shane (2000) found that entrepreneurs discovered opportunities to exploit a technology invention based on their prior knowledge, and Baron and Ensley (2006) found that experienced entrepreneurs thought about the business model associated with an opportunity in more sophisticated and pragmatic ways, than novice entrepreneurs.

Consistent with a Kirznerian view of entrepreneurship, opportunity discovery involves recognising the value of new information based on knowledge already possessed, rather than searching for required knowledge (Shane, 2000). More specifically, Baron and Ensley (2006) suggest that the cognitive frameworks of experienced entrepreneurs are better developed in terms of being more focused and refined, than those of novice entrepreneurs. An entrepreneur's experience is suggested to help 'connect the dots' due to well developed prototypes or templates of 'ideal' opportunities. The prototypes are suggested to help with noticing environmental changes, as well as inhibit the noticing of the changes by directing thinking along well developed lines. Drawing from previous research on expertise, the authors suggest that experienced entrepreneurs are similar to experts in any field in terms of learning to focus attention on the key dimensions of a problem. Taken together, the findings suggest that opportunity discovery involves pattern recognition associated with new information based on domain expertise, rather than as the result of a search.

Opportunity enactment

The development process associated with opportunity enactment appears to be less clear in the literature. An adaptive process seems unlikely (Denrell et al., 2003), especially under environmental conditions of casual complexity and uncertainty where ineffective adaptation is costly in the short run and likely to lead

to poor, long run alternatives, and effective adaptation could place an organisation at a competitive disadvantage (Denrell & March, 2001).

More specifically, Denrell et al., (2003) suggest that if the development of a strategic path breaking opportunity follows an adaptive process similar to that of a path dependent one, it would be unwise. Although an unplanned deviation from established practice is likely, the path breaking nature of the opportunity is argued to require an unusual amount of exploration to assemble several components that individually are seen to be of little value. They point to Denrell and March's, (2001) argument that the conditions motivating such exploration lead to adaptive ineffectiveness or persistence with some of the elements in the short run. Denrell and March (2001) show that the adaptive processes associated with experiential learning and competitive selection are biased against new and risky alternatives. They argue that the likelihood of exploration involving new and risky alternatives is increased by conditions that lead to adaptive ineffectiveness. Conditions identified include inertia and ideology that slow adaptation, and causal complexity and ignorance that tend to result in imprecise adaptation. Persisting with alternatives that show potential but lack experiential evidence in the short run is argued to be costly and also increases the probability of persisting with poor alternatives in the long run. However, environmental conditions that increase the likelihood of successful new and risky alternatives, but where fast, precise learning is favoured are suggested to place an organisation at a competitive disadvantage.

Research suggests that opportunity enactment is a design process, rather than an adaptive one. Design, by its nature, is contingent on available resources. Based on evidence in the literature that strategic path breaking opportunities tend to be context dependent, Denrell et al., (2003) suggest that analysis of internal resources could be part of a successful search for an opportunity. They also point out that this perspective of strategy is consistent with research on effectuation.

The enactment process is suggested to involve transforming resources. Drawing from past research, Venkataraman et al. (2010) argue that opportunities are not just new combinations found, but also transformations that are made. Opportunities are argued to be artifacts made through the interactions of stakeholders, using materials and concepts found. Because of their contingent nature, artifacts are argued to embody a teleological process and are phenomena that can be designed. For example, products and markets are seen to be products

of design. The authors point out that design relates to the choice of boundary values for variables, and control of the design relates to the means to change the boundary values. In this sense, the design of an artifact is argued to involve transforming the materials and concepts found into new possibilities. Transformations, in turn, are suggested to deal with contextual relationships rather than component relationships. The authors note that, "Relationships, not things, are the items of interest... interfaces between parts and wholes being the quintessential phenomena of design" (p 27). Transformations are argued to be distinct from combinations, because all combinations are transformational, but not all transformations are combinatorial. The authors point out that the implication of designed artifacts is that the value of a particular resource becomes contingent on how it is used.

Interestingly, research findings suggest that opportunity recognition, and more generally pattern recognition, may occur in two different ways involving different cognitive processes. In one of the first studies to focus on the cognitive processes involved in opportunity recognition, Grégoire, Barr, and Shepherd (2010) found that entrepreneurs used their prior knowledge of markets to search for opportunities of new technologies. They found that cognitive processes of structural alignment that draw on prior knowledge were used to recognise opportunities based on a search. They point out that their results contrast with the use of cognitive processes based on prototypes or templates of 'ideal' opportunities (Baron & Ensley, 2006), which they suggest, refers more to the evaluation of opportunities. More specifically, the authors found that interpretation of a technology-market match was based mainly on consideration of the alignment of structural relationships, such as technology capabilities and cause-effect relationships involved in satisfying market needs. Superficial features, such as technology components, were found to help guide the search. They point out that aligning structural relationships is cognitively more challenging than aligning superficial features, and that detecting relevant patterns for opportunities is particularly complex in dynamic industries. Further, technology transfer across superficially distant domains is suggested to require deep technical knowledge to help draw structural parallels, when superficial similarities are not known.

Taken together, the research findings (Baron & Ensley, 2006; Grégoire et al., 2010, Shane, 2000) suggest that pattern recognition involving cognitive processes based on the use of prototypes or examples of 'ideal' opportunities may apply

more to the discovery of opportunities which is essentially a serendipitous process. Pattern recognition involving cognitive processes of structural alignment may apply more to the enactment of opportunities which could involve a search to find a technology-market match.

Causal and effectual reasoning

Two distinct reasoning approaches, causation and effectuation, are identified in the literature and may be used to identify opportunities and solve problems. These reasoning approaches are based on different causes of change in phenomena.

Aristotle identified four types of causes of change in phenomena: material, formal, efficient, and final (Sarasvathy, 2001; Van de Ven, 2007). From a process perspective, these causes can be seen as: the material or information used in the process (material cause), the process pattern or plan (formal cause), the means by which the process is performed (efficient cause), and the purpose of the process (final cause). Both final cause and formal cause can be considered 'pull type' causes (Van de Ven, 2007).

Final cause is referred to as effectuation or teleology and the other three causes as causation (Sarasvathy, 2001). Van de Ven and Poole (1995) propose teleology as one of four basic theories of developmental processes in organisations. Based on their description, the essential features of the theory or models can be summarised as follows. The purpose or goal is the final cause for guiding movement of an entity. The entity is assumed to be purposeful and adaptive and constructs an envisioned end state, takes action to reach it, and monitors the progress. Thus, development proceeds through a cycle of goal formulation, implementation, evaluation, and modification of actions or goals based on what was learnt or intended by the entity. The model focuses on the prerequisites for attaining the goal or end state, such as the functions, achievements, or components required for the end state to be realised. In turn, these prerequisites can be used to assess development, which is seen as something that moves the entity toward its final state. Notably, teleology relies on agency, but also recognises constraints imposed by the environment and resources.

Research on effectuation suggests that causal and effectual reasoning approaches are based on distinctly different ways of representing problems. Problem representation seems to be related to the focus of control. More

specifically, effectual reasoning focuses on outcomes that can be controlled and causal reasoning focuses on controlling the risk of an outcome through prediction. For example, Sarasvathy, Simon, and Lave (1998) found that groups of entrepreneurs and bankers perceived and managed risk differently; the entrepreneurs focused on control over outcomes within an acceptable level of risk, while the bankers focused on target outcomes and attempted to control risk. They suggest that entrepreneurs have a distinctly different cognitive approach to constructing a problem space and managing risk.

In a seminal article, Sarasvathy (2001) develops a model of effectuation to show that it inverts causation to indicate a new relationship between means, imagination, and action. She argues that both processes are triggered by the operationalisation of an aspiration or a generalised end goal; the essential difference between the two processes is a choice between means to create a particular effect (causation) or between effects using a particular set of means (effectuation). More specifically, in her effectual model, goal creation is endogenous and contingent; the choice of means embodies within it the selection of ends and leads to a partially constructed environment. In the model, the criteria for selecting between effects are their acceptable risks related to the means, and the focus is on controllable aspects of an unpredictable future. In contrast, causation is argued to be based on more specific aspirations, a goal or decision required, and the focus is on selecting between alternative means, the criteria for which are based on the maximisation of expected returns related to the effect. Causal models are noted to focus on the predictable aspects of an uncertain future, where control depends on prediction. A causal approach is typically referred to as 'goal directed search' (e.g. Denrell & March, 2003).

Taken together, the research suggests that perceptions of control and risk can be related to the way goals are created or determined. More specifically, the focus of control is related to how goals are created. Effectual reasoning involves endogenous goal creation and leads to a partially constructed environment, while causal reasoning involves meeting a required exogenous goal. Thus, a constructive approach to strategy that shapes the environment may involve effectual reasoning, and a positioning approach may involve causal reasoning.

Causal and effectual reasoning can be related to strategy making approaches (e.g. Sarasvathy, Dew, Read, & Wiltbank, 2008; Wiltbank, Dew, Read, &

Sarasvathy 2006). Wiltbank et al. (2006) refer to positioning within an environment that is exogenous to organisational efforts and to constructing within an environment that is endogenous to organisational efforts. They argue that control and prediction are independent in strategy making. However, their two-dimensional framework of strategy making approaches implies that predictive and control oriented approaches are independent of positioning and constructionist approaches. In the framework, only a transformative approach, which is both constructive and control oriented, is identified to be effectual. The implication is that a visionary approach, although seen as constructive, is causal because it is predictive. In their employment of the framework (Wiltbank et al., 2006) to construct alternative histories for the case of Starbucks, Sarasvathy et al. (2008) explain their view of a visionary approach as causal and predictive. They suggest that a visionary strategy leads to a purist institution if rigidly adopted. However, research suggests that a visionary strategy may be flexibly adopted (e.g. MacCormack & Lansiti, 2009), and in this sense, it may be based on effectual rather than causal reasoning.

In sum, effectuation can be associated with the Schumpeterian view of entrepreneurship, involving the enactment of opportunities that can shape environment. Causal reasoning is more closely related with the Kirznerian view of entrepreneurship, where opportunities are discovered and exploited.

3 CHAPTER: METHODS

As previously noted in Chapter 1, a process oriented, case study approach is taken in terms of the empirical exercise. A multiple case design was used involving three organisations. A limited number of cases enables comparison and contrast to either produce similar results (literal replication) or produce contrary results for predictable reasons (theoretical replication) (Yin, 2003). The primary data used in the study comprised retrospective accounts of managers. Multiple respondents were interviewed in each organisation. The study period spanned about ten years from 1997 to 2007. The empirical method is outlined, including the case setting, data collection, and data analysis.

3.1 Case setting

The organisations in the case study were the securities custodian businesses of three banks. More specifically, each one was a unit in a bank that operated as a semi-independent business. The organisations operated in the same market and were interconnected through a platform organisation at an early stage of the study period. Thus, they underwent a similar and interconnected journey in an environment that changed from relatively stable to highly dynamic. The focus of the case study was on the first major technological transition that took place within the study period, the equities dematerialisation, as well as on the current period.

3.1.1 Description

Together, the three securities custodians held a significant and dominant share of the custody market and can be described as 'market players'. During the study period, two technological transitions were jointly undertaken at the industry or market level, referred to as major market initiatives. Market initiatives involved developing information system technology and linking it through a central platform organisation. The custody business involved settling electronic trading transactions in financial securities, such as equity, money market, and bond instruments. For this reason, the industry was referred to as the settlement industry, an essential complement to the securities trading industry.

Equities dematerialisation

A main focus of the case study was on the equities dematerialisation, the first major technological transition, which had a profound impact on the industry. The technological transition of the market involved establishing a central platform organisation, called the Central Securities Depository (CSD), and the various players in the market were referred to as market participants. Although the transition was planned over a long period, it came upon the industry suddenly due to the introduction of electronic trading which led to a significant and substantial growth in trading volumes. The growth in trading volumes quickly led to a situation where the custodians were battling to cope with paper scrip, such as share certificates. To remain in business, the custodians needed to participate in the equities dematerialisation market initiative.

The dematerialisation involved moving from physical paper scrip to electronic data flows. Previously, the custodians had undergone a similar dematerialisation exercise in respect of a smaller part of their business, bonds. In contrast, equities formed the greater part of the core custody business. In addition, and more recently, the industry attempted a third technological transition, that of the money market; a relatively small, yet complex part of the custody business. The initial implementation had recently failed in the market and the initiative was ongoing.

Market evolution

As a result of the equities dematerialisation, the once stable industry became suddenly and increasingly dynamic. Prior to the transition, the custodians operated as relatively independent competitors. During and following the transition, they became market collaborators while remaining competitors, interconnected to the platform organisation as well as to other market participants through links in information system technology. Various information system technology initiatives were undertaken both at a market and a business level to improve competitiveness. The two major transitions and market initiatives covered in the case study period were 'electronic equities' (the equities dematerialisation) and 'electronic money market'.

As a result of the 'electronic equities' initiative or equities dematerialisation, the custodians were re-rated in the market by clients in the main annual market

survey, after at least three years of not being rated. All three custodians managed to attain and sustain to some degree a top-rated status both for domestic and foreign (cross-border) clients as shown Figures 3.1 and 3.2 below. In addition, there were several other market rating surveys which the custodians participated in.

Outlook

The market continued to become increasingly competitive and dynamic. New products were introduced into the custody business, such as derivative products. In addition, the business expanded into additional custody services and custody-related products. Several other market initiatives were contemplated and under discussion in market workshops. For example, two major market initiatives in equities, still the core custody business, were: 'T3 equities' which involved shortening the settlement cycle from five to three days from trade date, and 'SOR equities', which involved establishing a securities ownership register at the CSD.

Market ratings

The market ratings indicate the competitive nature of the business. The ratings applicable to the main annual market survey, published by the *Global Custodian* magazine, are described in more detail. The three custodians were named organisations A, B, and C in the case study. During the study period, one or more was rated by the *Global Custodian* for the period 2001 to 2007. The methodology used by the *Global Custodian* is briefly described as well as the ratings.

Since 1989, Hobson and Cayse (2004) note the *Global Custodian* has published an annual survey of agent banks in major markets. The objective is "to measure the quality of the services provided by agent banks in the major securities markets" (p. 190). The authors note that due to the changing nature of the business, the survey process and content can change slightly from year to year, however, they try to ensure a sufficient degree of comparability. The survey results published in the magazine are described as measuring the quality of custody and clearing services provided to two categories of organisational clients: nonaffiliated, cross-border clients and third-party domestic clients. Clients include custodian banks in another market, brokers, and institutional investors. Cross-border clients are described as typically active in multiple markets and using a wide variety of agent banks, and are deemed to be the best-informed and most

sophisticated clients. Domestic clients were introduced for the first time in 2004. A third class of ratings is described as ‘unrated’ where the number of client responses is insufficient to meet the minimum requirement of 15 for a cross-border client rating, and six for a domestic client rating. The survey includes respondent ratings in about 10 different areas of service quality, such as value and commitment, relationship management, reporting, corporate actions, and settlement. The scores are described as weighted on overall responses and also on the weighting of respondents according to their approximate value and volume of business with the provider. Within a client category a custodian can be either ‘top-rated’ or rated ‘commended’. A survey rule prevents a shift from more than one rating a year implying that a bank cannot be top-rated without a commended rating in the prior year (*Global Custodian*, 2006, 2007). The introduction of the domestic client rating in 2004 seems to be an exception to this rule in the case of Organisation B.

Figure 3.1 *Global Custodian* cross-border client ratings

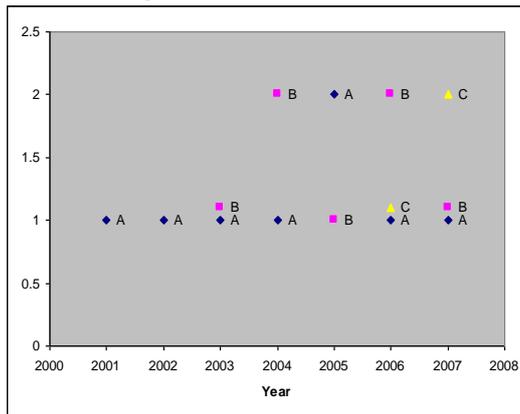
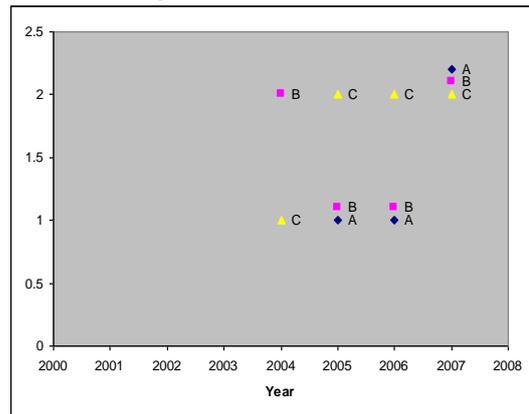


Figure 3.2 *Global Custodian* domestic client ratings



Figures 3.1 and 3.2 show the *Global Custodian* (2002, 2003, 2005, 2006, 2007; Hobson & Cayse, 2004) ratings of the three organisations over the period 2000 to 2007 where a ‘1’ represents a ‘commended’ rating and a ‘2’ represents ‘top-rated’. A number of observations can be made on the client ratings. Organisation A retained an early lead in the cross-border client category in 2001 and 2002, and then was consistently rated ‘commended’ apart from 2005 where it was ‘top-rated’, suggesting rivalry with Organisation B (*Global Custodian*, 2005), ‘top-rated’ in 2004. It was also rated ‘commended’ in the domestic client category for two years before being ‘top-rated’ in 2007 along with the other custodians. Organisation B also maintained an early lead in the cross-border client category being the first to achieve ‘top-rated’ status in 2004, and thereafter fluctuated

between 'commended' and 'top-rated' in both client categories. Organisation C took longer to be rated in the cross-border client category but reflects relatively consistent 'top-ratings' in both categories. The survey rule prevented Organisation C being cross-border 'top-rated' in 2006 (*Global Custodian*, 2006), and in 2004 its domestic 'commended' rating was "on the cusp of top-rated status" (Hobson & Cayse, 2004, p. 215).

Generally, the ratings reflect an increasingly globally competitive market. In 2002, a market turning point is reflected by the comment: "The dark days of the late 1990s, with despondent clients and confused agents, have mostly been laid to rest" (*Global Custodian*, 2002, p. 192). In 2003, the editors' comment on the survey results suggests the year "may be the beginning of a new era ... - the market no longer has the dubious distinction of having the fewest rated agent banks in the survey" (*Global Custodian*, 2003, p. 179). In 2004, Hobson and Cayse note: "The transformation of an overwhelmingly physical market infrastructure into a paperless one ... has given the [local] custodians the opportunity to raise their service standards to international levels" (2004, p. 215). In this respect, the achievement of 'top-rating' status in the cross-border client category can be likened to global competitiveness. Notably, all the custodians had achieved 'top rating' status in the cross-border client category at least once by 2007.

3.1.2 Case setting suitability

The case setting is suitable for investigating dynamic capability learning for several reasons. First, the industry evolved from relatively stable to highly dynamic within a relatively short time period of about 10 years, providing an opportunity to obtain relatively recent retrospective accounts of the evolution from managers that were still in the organisations and experts in the industry. It also provided sufficient time for the organisations to learn to learn and develop dynamic capabilities.

Second, during the study period, two major market initiatives took place. The first one, the equities dematerialisation, enabled market and business growth. The second one, which failed on initial implementation and was ongoing, provided an opportunity for learning. In addition, rapid technological change took place in

terms of information system development leading to an interconnected local and global market. The three organisations were market players and therefore, could shape as well as adapt to the changing environment. As reflected in the market ratings, both the market and the organisations became globally competitive. Thus, the setting was especially suited to investigating dynamic capability learning.

Third, the nature of the first major technological transition which involved the establishment of a platform organisation enabled comparative data to be collected from the organisations because they underwent a similar journey from an early stage. In particular, comparative data from multiple organisations enabled a more complete and accurate interpretation of what happened in the industry by comparing responses across organisations and within organisations.

A drawback of the case setting was that it was a highly specialised industry. To help in ensuring accuracy of data interpretation, various industry documents were obtained and experts consulted on the equities dematerialisation. In addition, the researcher had prior related knowledge and experience of information systems development in the banking industry. Further, the researcher attended an industry compliance training course.

3.2 Data collection

As previously noted, the main data was retrospective accounts of managers. These were obtained primarily through interviews. Their retrospective nature meant that the accounts were subject to recall and could be biased. Several measures were taken to heighten recall and are referred to in the approach. However, the retrospective nature also offered several benefits. The data was relatively easily available and accessible because the managers were selected based on their participation in and knowledge of the equities dematerialisation and subsequent business development. The interview approach also enabled direct capture of the managers' experiences from the managers themselves. In addition, the broad scope of the study period over 10 years enabled focus on significant events, as these events were likely to best be remembered in terms of their vividness at the time. Events such as difficulties faced and how they were overcome, as well as ongoing market problems were examples. The data collection approach and challenges faced are discussed.

3.2.1 Challenges

Challenges faced in collecting data included: the confidential, partial, and incomplete nature of the data; limited time and access to the organisations was provided; and the data was reported in no particular order, based on the recall of one event triggering that of another. Due to the competitiveness and reputation of the industry, a condition of the data collection was that a confidentiality agreement was signed by the researcher with each organisation. The condition entailed that identifying particulars of an organisation and respondents would be removed from the data analysis as far as practical. The data was also partial because not all relevant details were provided; and incomplete because only selected managers were interviewed.

Limited time and access was provided in order to collect data so as not to disrupt business operations in the competitive market. The implication was that the researcher needed to be well prepared and have a basic working knowledge of information systems development, the custody business, and the industry. There was very little time for example, for an explanation of terminology and 'industry speak'.

In addition, the data was reported in no particular order within the broadly defined structure of the workshop and interviews. The loose structure enabled event recall as managers linked them together. However, the implication was that the data had to be sorted into a basic time sequence to start to make sense of it.

3.2.2 Approach

The approach proceeded through the following stages for each organisation: one or more preliminary interviews; interview preparation; focus group interview or workshop with the respondents; and individual interviews with each respondent. Preliminary interviews were held with the head of the business. The business head was informed that the nature of the doctorate research was on organisational learning and organisational capabilities, focusing on the equities dematerialisation that had taken place. The interviews also involved requesting and arranging for the organisation to participate in the research, including signing

a confidentiality agreement. (See letter of introduction and informed consent in Appendix A, and research confidentiality agreement in Appendix B).

Either the business head or a nominated senior manager acted as the research coordinator. The coordinator was asked to select about 10 respondents to participate in the research. The respondents were managers or people with specialised knowledge in the business who had been involved in the equities dematerialisation. In some cases, respondents outside the business but still within the bank were suggested. The coordinator was also asked to provide supporting documents and background information, such as an organisation structure and sample project documentation. The supporting documents helped in preparing for the data collection and in interpreting the data. (See supporting documents in Appendix C). In addition, the preliminary interviews provided an opportunity for data collection in note form. (See interview transcripts and notes in Appendix F).

Interview preparation involved gaining a working knowledge of the business and market. A few industry experts and managers in the two main related organisations, the CSD and the securities exchange, were consulted on the equities dematerialisation, and notes taken of the interviews which provided context. The researcher obtained documents and manuals from the related organisations and attended a basic compliance training course. In addition, related public documents on the equities dematerialisation were accessed through the internet. (See supporting documents in Appendix C).

A workshop was conducted with most or all of the respondents as a group, followed by individual interviews over a time period of about one to two months in total. Prior to the workshop, the research coordinator was informed that the research focus was more specifically on organisational learning and the development of organisational capabilities, and the purpose of the workshop was about the equities dematerialisation and its impact on the business at the time, how the business had since changed, and how it was positioned for the future. (See interview correspondence in Appendix D).

The workshop was about two hours in length and was recorded. In addition, a research assistant took notes on the workshop, which provided additional context. A loose structure was provided by asking respondents to describe their experiences of the equities dematerialisation, the subsequent market evolution,

and where the business was at present including a future outlook. (See interview guidelines in Appendix E). The respondents talked about their experiences. Besides providing data, the workshop served two main purposes. It enabled the group to recall the events that took place and to remind each other of what happened. In this respect, it heightened recall prior to the individual interviews. It also helped to minimise bias as respondents were recalling events that could be validated by others.

Following the workshop the transcript was written up and sent to the business head for verification. (See interview transcripts and notes in Appendix F). To prepare for the individual interviews, the transcript was coded in a data analytic tool (Atlas Ti) using a code for each respondent. The respondent's statements made in the workshop were then grouped together in the order in which they were said and printed on one page. (See transcript coding in Appendix H). In addition, related statements were colour coded. The one page document could be quickly referred to during the interview, given limited time available. Prior to the individual interviews, the respondents were asked to complete a brief job history form indicating their name, and departmental positions over the study time period. (See respondent job history form in Appendix G). The job history form enabled brief background details of the respondent to be captured. The respondents were informed that the interview would clarify their job history and elaborate on points made in the workshop, with further questions on the dematerialisation and current situation from a respondent's standpoint. (See interview correspondence in Appendix D).

The individual interviews were about one hour in length and were also recorded. The interviews took place in a one on one situation, where some respondents were more comfortable in relating their experiences than in a group situation. The interview started with clarification of the respondent's position as described on the job history form, probed on points made in the workshop, and focused largely on the current situation. (See interview guidelines in Appendix E). More attention was given to the current situation in the individual interviews which was easier for an individual to recall, given that the researcher was aware of the context. It provided an opportunity to gather data in a situation where dynamic capabilities had been developed and managers had learnt to learn to some extent. Transcripts were made of the individual interviews and respondents were asked to check them for correctness. (See interview transcripts and notes in Appendix F).

There were 10 respondents in Organisation A, and recorded individual interviews were obtained from all respondents. In Organisation B, there were 12 respondents with recorded interviews. In Organisation C, there were 11 respondents with eight recorded interviews and three interviews where only notes were taken. The total number of respondents in the case study was 33. In addition, a fourth organisation was included in the data collection exercise enabling another workshop and individual recorded interviews with six respondents. However, the organisation was dropped from the case analysis for several reasons: it was relatively much smaller in terms of market share; the equities dematerialisation project team had since left the organisation and members were unavailable; and for practical purposes due the quantity of data obtained. However, data collection from the fourth organisation provided additional information and insight into the nature of the business and the events that had taken place.

3.3 Data analysis

A process oriented analytical approach was taken to the case study in order to answer the research question of ‘how’ dynamic capabilities develop through learning. A process approach explains how a change occurs over time, based on a sequence of events (Van de Ven, 2007). In such an approach, change is conceptualised as a succession of events, stages, cycles, or states in the development of the organisations (Van de Ven & Poole, 2005). Process studies tracking similar processes to those in the case study include studies on: strategic decision making (Mintzberg, Raisinghani, & Théorêt, 1976), innovation (Leonard Barton, 1990), and technology adoption (Langley & Truax, 1994). The data analysis approach and challenges faced are discussed.

3.3.1 Challenges

The three main challenges in the data analysis were: a large quantity of complex data, there appeared to be no single available analytical framework, and as a result, low level data needed to be matched to high level concepts. Each challenge is discussed in more detail as well as the steps taken in overcoming it.

Large quantity of complex data

The interview data resulted in lengthy interview transcripts of three workshops and 33 individual interviews, excluding those of the organisation that was subsequently dropped from the case analysis. In total, it amounted to a large quantity of unstructured data. A key challenge in analysing the process data was “moving from a shapeless data spaghetti toward some kind of theoretical understanding that does not betray the richness, dynamism, and complexity of the data but that is understandable and potentially useful to others” (Langley, 1999, p. 694). The challenge involved reducing the data without losing the subtleties while retaining the critical events in the learning process.

In addition, the data was complex. Qualitative process data on organisations have several characteristics that make them difficult to analyse and manipulate, such as multiple units of analysis with ambiguous boundaries, multiple levels of analysis as context is taken into account, variable temporal embeddedness combining retrospective and current data, and complex interactions such as feedback loops (Langley, 1999). The steps taken to help achieve the challenge are noted in the approach.

No single available analytical framework

A second challenge was that no single available analytical framework was found that could be usefully applied in the analysis. Certain complex phenomena such as strategy formation or learning are difficult to isolate (Langley, 1999) which may have been the reason why no framework was found. Several strategies were applied to analysing the data. First, following Langley and Truax (1994), a retroductive approach was employed. In a retroductive approach “a literature search is undertaken to derive a scheme for categorising and coding events, and categories are adjusted in view of what is workable and informative after trying them out on the data. It permits the theoretically driven scheme to emerge and adapt in response to the exigencies of the data” (Van de Ven, 2007, p. 221, 222).

A selective literature review of dynamic capabilities and organisational learning was conducted to identify three groups of conceptual frameworks to guide the data analysis: evolutionary, evolutionary with design, and learning capability frameworks. The focus of each group as well as certain concepts and mechanisms suggested to facilitate capability development were used to guide the data analysis. The focus of the ‘evolutionary’ group was on improving learning to

facilitate dynamic capability evolution. The deliberate explicit learning mechanisms of knowledge articulation and codification (Zollo & Winter, 2002) were suggested. The focus of the 'evolutionary with design' group was on shaping and reshaping learning and configuring and reconfiguring assets to achieve and maintain a competitive advantage. The concepts of 'asset orchestration' and 'entrepreneurial role' (Teece 2007, 2009) were suggested by this group. The focus of the third group, 'learning capability', was on improving conditions in the knowledge base to facilitate learning. In this group, the 4I organisational learning framework (Crossan et al., 1999) provided a dynamic, multi-level view of the learning process. Concepts and mechanisms to facilitate learning included: increasing knowledge base breadth, depth, and specificity (Cohen & Levinthal, 1990); organising principles (Kogut & Zander, 1992); and knowledge development in stages (Jaikumur & Bohn, 1992).

Second, empirical studies of a process oriented, case study nature involving process capabilities were used to provide analytical guidance. In particular, two studies were especially helpful: Pisano's (2000) study examining the development of new capabilities in a less developed knowledge environment; and Collis's (1991) study which included a resource-based analysis of global competition in the bearings industry.

Third, a basic structure was used to analyse the organisational data. The structure evolved through the progression of the analysis into five business functions that were relevant to technological innovation in the case study: product investment, project management, market collaboration, technical development, and operations. Innovation processes within each business function related to a particular innovation problem to solve, such as determining the direction of the changing market and developing suitable market and business models. The structure enabled similar data to be grouped together and reduced the scope of focus. It also enabled comparative analysis of the associated organisational problem solving approaches across the innovation processes and business functions.

Low level data and high level concepts

A third challenge was matching low level data in transcripts to high level concepts such as 'asset orchestration'. A multi-dimensional approach was taken involving three levels of analysis as well as multiple groupings within each level. These levels and groupings are explained in the approach below.

3.3.2 Approach

The approach involved producing case narratives, within case analyses, and a cross case analysis. The findings resulting from the three analyses are presented in Chapters Four, Five, and Six respectively.

Case narratives

The first level of analysis involved producing a case narrative for each organisation. The narrative method was used to organise the data (Eisenhardt, 1989a; Langley, 1999). The case narratives are a descriptive chronology (Langley, 1999) including the progression or sequence of events (Pentland, 1999).

The narratives were constructed from descriptive codes grouping together respondent statements about similar events that took place within a certain time period. The narratives considerably reduced the amount of data and ordered it into a sensible progression. The interview transcripts were coded using the analytic tool (Atlas Ti) into a time sequence of codes that was comparable across the organisations. The code sequence or narrative template was comparable because the organisations followed a similar journey and undertook the same market initiatives coordinated by the CSD. The codes included: custodian background, market planning, new custody system, dematerialisation development, dematerialisation implementation, changes brought about, ongoing development, money market, recent current development, competitive situation, future outlook. (See transcript coding in Appendix H).

Due to confidentiality concerns, identifying details, such as names, were given generic aliases. The respondents were numbered based on the organisation which they represented; for example, A1, A2, and A3. Where respondents are quoted in the analysis, the convention used is: respondent number; primary document number (transcript); quotation reference number (sequential); and paragraph number. For example, A5 9:5, 17, refers to respondent A5, primary

document number 9, quotation number 5, and paragraph number 17 in the primary document.

The narratives are presented in four innovation stages for each organisation: 'market planning' leading up to the equities dematerialisation, 'equities dematerialisation' including system development and operational implementation, 'market evolution' following the dematerialisation up to the current situation and including the electronic money market initiative, and 'outlook' including the current situation and future outlook. Stages are a typical approach to conceptualise a process (Van de Ven & Poole, 2005). The stages represent temporal brackets that separate the data into successive discrete but connected periods of time (Langley, 1999). The stages are numbered sequentially; for example, A1, A2, A3, and A4. They enabled comparative analysis across the cases and were carried through to higher levels of analysis where they provided a time sequence indicator.

Within case analysis

The within case analysis was done in two stages. The *first stage* of the analysis involved writing a narrative that explained managers' reasoning behind the problem solving approach taken pertaining to an innovation process within a business function. The narrative method is high on accuracy, but low on simplicity and generality, in terms of theoretical criteria (Langley, 1999). Managers' reasoning provided an explanation of the causes and consequences of events within the process pattern, which is part of answering a research question on how a developmental process occurred (Van de Ven, 2007).

The case narratives were used as base data and coded to group them into similar business functions pertaining to technological innovation in projects and in operations. The codes represented topical narrative markers (Rubin, H.J. & Rubin, 2005). The descriptive codes included: custodian background, innovation focus stages 1 to 4, project (organisation) structures, project (human) resources, market interaction (in workshops), project processes, innovation problem solving (approaches), as well as a similar set of codes for operations. (See narrative coding in Appendix I).

The problem solving approach narratives for a particular case were written in *two parts* representing innovation features and ways of innovating. The analysis

followed a similar approach used to explain the development of capabilities in other empirical studies (e.g. Collis, 1991; Pisano, 2000). The two parts were preceded by an overview of the four innovation stages which provided a brief summary of the system development initiatives undertaken in the organisation, as well as its investment and development goals at each stage. Various analytical templates were constructed to assist with the analysis. (See analytical templates in Appendix J).

Part A of the analysis involved explaining innovation features in terms of managers' reasoning. Three types of features were identified: problem solving strategies developed, organisational and technological assets instituted in the business, and practices emphasised or used. These features represented technological and organisational problem solving strategies in terms of the 'what' of strategy. Problem solving strategies focus on direct learning efforts. The knowledge an organisation focuses on learning is determined by its strategies (Lane et al., 2006). In the dynamic capabilities approach, strategy involves selecting and committing to long term paths of strategic competence building (Teece et al., 1997).

The evolution of an innovation feature was explained in terms of experience gained by managers and their deliberate learning. Deliberate learning involves a purposeful approach to achieve a particular effect or benefit. It was reflected in statements articulated by managers, such as lessons learnt. In addition, an entrepreneurial role played by managers in designing the approach feature was highlighted. It was indicated by advance recognition of the effect or benefit of a particular approach leading to the introduction of novelty, or to promoting learning of new knowledge to shape evolutionary development. Further, the application of the approach feature was explained in terms of particular resources and the process involved. Finally, the outcome of the approach feature was explained, including whether its intended effect or benefit was achieved and what was found or learnt by managers. The analysis also highlighted examples of managers' intuitive thinking that could be developed and applied to facilitate future innovation features. (See within case analysis first stage, part A in Appendix K).

Part B of the analysis involved explaining the implications of a problem solving approach for developing innovation capabilities. The ways in which the features of an approach facilitated managers' learning were identified and explained. The

ways represented technological and organisational problem solving strategies in terms of the 'how' of strategy.

Three types of ways were identified. First, the configuration of structural assets, such as operational processes, information systems, and project management structures, helped to focus or change managers' framing of issues. Second, the interaction which managers were exposed to, through processes and in organisational structures and market forums, helped to broaden their framing of issues. Third, analytical problem solving methods employed by managers helped to deepen their framing of issues. Managers' learning in turn, led to the institutionalisation of their knowledge and organisational learning (Crossan et al., 1999).

The ways in which an approach facilitated managers' learning about innovation were explained. Managers' learning led to the accumulation of knowledge suggesting the development of innovation capabilities by stage four. The analysis provided examples of managerial knowledge and capabilities that could be applied to future system development initiatives. (See within case analysis first stage, part B in Appendix L).

The *second stage* of the analysis involved writing a single narrative for each problem solving approach, which related to the development of a problem solving strategy. The narrative, comparable across organisations and innovation processes, combined and consolidated the two parts of the previous stage. It also resulted in a consolidation of the innovation processes and business functions and evolution of the basic structure to the five functions previously noted and 10 innovation processes.

The narrative highlighted ways in which managers learnt about innovation which were similar across the organisations. It included three parts: the 'ways and features that evolved'; the 'evolution of the ways and features'; and 'managers' knowledge and capabilities' as a result. In terms of technological problem solving, an example of a feature was a problem solving strategy focused on acquiring particular knowledge, and an example of a way was analytical methods developed that helped facilitate learning and the development of the required knowledge. In particular, the part on 'ways and features that evolved' included managers' ideas and theories about the ways that could be applied to new types of situations.

The part on the 'evolution of the ways and features' included the critical events in which knowledge was developed to satisfy the feature. The stage in which the event took place was indicated by the stage marker; for example, A1, A2, A3, and A4. Notably, the critical events were separated into entrepreneurial learning and expert learning. These two types of learning are more fully elaborated in the Discussion in Chapter Seven. At that stage of the analysis, entrepreneurial learning was based on an informed conjecture of a benefit sensed in advance, and the latter on past experience, either an organisation's own experience or that of others. Entrepreneurial learning that took place was specifically highlighted in the analysis. Further, the critical events included what was learnt or recognised in terms of a feature or a way in which the feature was achieved. The third part on 'managers' knowledge and capabilities' included examples of what managers knew and could do by stage four.

Cross case analysis

The third level of analysis was the cross case analysis. For each of the 10 innovation processes pertaining to solving an innovation problem, the within case narratives were visually mapped into a table comparing the two or three organisations. The analysis resulted in 10 tables of one page and 29 problem solving strategies and their associated developmental approaches. Each strategy pertained to a particular organisation and innovation process. Note that one innovation process was not evident in one organisation. Visual mapping is an organising process method enabling process information to be systematically represented in an organised form (Langley, 1999). It allows large amounts of information to be presented in a relatively little space and provides a useful tool for the development and verification of theoretical ideas (Miles & Huberman, 1994 in Langley, 1999).

The table components are described in Table 3.1. With reference to the innovation capabilities shown in the table, these can be technological or organisational. In addition, in the case of operations, they can be dual purpose, serving both dynamic and operational purposes (Helfat & Winter, 2011).

Table 3.1 Cross case analysis table components

Component	Description
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Way (how)	The technological or organisational sensemaking practice that evolved and facilitated learning – the ‘how’ of the problem solving strategy
Managerial theory – Purpose of way	The managerial theory on the value of the way in helping learning and/or the effect of the knowledge developed as a result
Innovation capabilities	The cumulative effect of the knowledge developed leading to one or more innovation capabilities
Feature (what)	The technological focus or organisational emphasis that evolved in terms of directing learning efforts – the ‘what’ of the problem solving strategy
Evolution of feature – Contextual influences	Critical events in the evolution of the feature including contextual influences, entrepreneurial learning events and expert learning events
Entrepreneurial learning	
Expert learning	
Evolution of way – Entrepreneurial learning	Critical events in the evolution of the way including entrepreneurial learning events and expert learning events
Expert learning	
Managerial knowledge and capabilities	Examples of managers’ knowledge and capabilities that evolved

The innovation processes were grouped into technological and organisational problem solving, resulting in 11 technological problem solving strategies, and 18 organisational problem solving strategies and their associated development paths. Common learning patterns across the main components of the tables were identified for each group of strategies. Common learning patterns enable the development of process theory to explain the logic behind (deep) patterns of events (Van de Ven, 2007; Pentland, 1999). A process theory argues for patterned sequences of events (Abbott, 1990, p. 375). The patterns form part of the analytical framework on dynamic capability learning developed as a result of the case analysis. An example of a process oriented case study developing learning patterns is Barr et al.’s (1992) study on the strategic renewal of a railroad company.

An iterative analysis was performed using the comparative method to reveal the common patterns. The process involved developing a hypothesis of a pattern

based on available information and then testing it across the relevant problem solving approaches. The comparative method involves developing and juxtaposing alternative theories and then determining which theory better explains the data or how they can be combined (Van de Ven, 2007). The study findings are presented in Chapter 6.

Generalisability, accuracy, and reliability

The study was limited to three organisations which may affect its generalisability. Generality may have been gained by extending the sample size in terms of how the analysis was done. For example, comparing multiple related problem solving approaches across organisations in terms of innovation processes, such as structuring project teams and managing projects, helped to generalise the findings. In addition, grouping together innovation processes in terms of technological and organisational problem solving helped to generalise the findings. Generality may have also been gained through the iterative approach of discerning and testing common underlying patterns across multiple similar problem solving strategies. In addition, the learning pattern statements made and process explanations given are deliberately generic. A process explanation is generalisable if it is generative - versatile and adaptive across a broad range of contexts (Van de Ven, 2007).

Notably, accuracy in discerning relevant data and interpreting it across multiple levels of analysis was important to drawing relevant conclusions. To begin with, the data is partial and incomplete and may be biased. Although efforts were made to ensure validity, some accuracy may have been lost; for example, through multiple levels of analysis, in data reduction, and through misinterpretation of specific industry meanings. Prior knowledge and efforts made to gain an understanding of the subject domain may have contributed to the validity of the conclusions. In addition, comparison of multiple responses related to similar activities, both within and across multiple organisations, helped to provide a more accurate and complete interpretation. In terms of reliability, the repetitive nature of the data collection and analysis procedures helped to contribute to their consistency.

4 CHAPTER: CASE NARRATIVES

This chapter presents the study findings in terms of the case narratives. The narrative for each organisation is presented in terms of four innovation stages: market planning, equities dematerialisation, market evolution, and outlook.

4.1 Organisation A

4.1.1 Market planning

Organisation A was one of the largest bank custodians in the local market in terms of market share and presence. Although it had a predominantly foreign client base, it also had a mix of local clients.

Paper-based operations in the physical equities settlement market had become increasingly difficult due to increased transaction volumes following the advent of electronic trading. There was insufficient time to physically turn around the volume of paper certificates. Certificates had to be received and logged before they could be onward delivered. It was not known when a trade would settle because it was not known when the physical shares would be available. Further, partial settlements were accommodated. As a result there were a number of open client positions which led to corporate action claims. Consequently client service suffered. As one manager put it:

The last days of the physical environment, it was such a challenge to every participant in terms of you'd had this greatly increased activity in this market with it opening up and the foreign element coming in. You'd had the efficiencies that the [stock exchange] had brought in through changing from open outcry to electronic trade matching. And all those electronic efficiencies had sped up the trade side of it, but the settlement side of it was still physical - moving mounds of paper everywhere. And the sheer challenge of that meant that there was very little time left to focus on the client, the client's wishes, [and] the client's needs, or even try and understand the client's business from his perspective. There just wasn't the capacity or the time. The focus was on trying to move this paper 'in sync' with the tempo of electronic trading. (A5 9:5, 17)

A client service department of dedicated client service specialists was set up as a central point of contact for client queries, to try and retain clients because the business was losing clients at the time. In the beginning, client service specialists calmed clients and facilitated the resolution of a back-log of open queries on behalf of clients.

In general, the custodians battled to cope with the relatively high transaction volumes. They set up a joint working team together with the stock exchange to address a need to remove the risk of paper certificates, exacerbated by the transaction volumes, from the market. Having seen the benefits of electronic settlement with the earlier bonds immobilisation, the intention was to move to electronic equities settlement. A manager explained:

We wanted to get the risk of paper out of the market, we really did. We had seen how well it worked in the bonds environment, and we wanted to move to electronic settlement because we knew that it was going to take a huge amount of risk out of the market. (A4 7:32, 241)

Resources from Organisation A, as well as the bank IT area which supported the equities custody system, were involved in market planning workshops for electronic equities settlement. The main issue identified was client claims on corporate action entitlements. The objectives were to provide settlement certainty as far as possible to prevent and reduce corporate action claims, and to implement international best practice in the local market to improve its rating and attract investors. A manager put it like this:

We wanted to move forward into international best practice. There is the Group of Thirty [G30] and recommendations that they put out about what you've got to do to conform to international best practice.... We knew that we wanted settlement certainty because our market was very badly rated in terms of settlement statistics.... We knew we had to move away from all of that.... That was what we were aiming for. And we had to find a way within the confines of the [local] market ... to get there. (A4 7:12, 65)

It became apparent that a CSD was required and a CSD project and then an organisation were created. Research was done on international markets that had dematerialised equities, to find a suitable market settlement model given the constraints of the local market, as well as a CSD system that could be customised for the local market. The working team designed a settlement model based on a T5 settlement cycle to provide settlement certainty for on-market trades conducted

on the stock exchange. A manager noted that: “The thought in the market was that we could get rid of claims on corporate actions” (A4 2:36, 171).

Another issue identified in the market was a high incidence of theft and fraud of paper certificates which was difficult to quantify. A pool of funds, known as the Dispossessed Members’ Fund, was set up to provide compensation to clients on the value of fraudulent and missing certificates that might be uncovered during the equities dematerialisation. It later transpired that claims against the fund were minimal.

Parallel to the market planning, Organisation A evaluated and selected a new primary custody system for both physical and electronic settlement environments and to cater for year 2000 dates. The IT vendor of the system selected also provided a system to the CSD, and had previously designed and implemented a custody system for a global custodian bank. The fact that the same system was also selected by Organisation D was seen to be a coincidence. With the help of system support resources from the bank IT area, the new system was customised for physical equities settlement in the local market and implemented. Other instruments, including bonds, continued to be maintained on an existing custody system.

Staff members were given computer literacy training and also trained on new operational processes. They were gradually moved over from the old system to the new system as a staggered conversion of client positions and trades occurred over several months. A manager recounted:

You exposed them [staff] to a [new type of computer] environment; you’re putting them on to a new system. The process also changed completely from the old system to the new system - the way we settle deals. So it was a big thing for a lot of people to get used to that initial change. (A1 3:30, 205)

From an operational perspective, a vault balancing project was started to quantify the value of the unreconciled position before the equities dematerialisation took place. Initially, teams within the business worked on the project. However, when it became apparent that the exercise would not be complete before the dematerialisation, international consultants experienced in balancing exercises were brought in to scope the work and design a methodology. In addition,

dedicated financial resources from other areas in the bank were brought in to assist with the project and later became a permanent team. At that time, the teams working on the project were also involved in the implementation of the new custody system and only one dedicated resource from the business continued with the project. After the consultants left, the team became a balancing function within the business.

The initial balancing exercise was between stock in the vault and that recorded by the transfer secretaries. Subsequently during the dematerialisation, the project was found to provide the business with a head start because its stock holdings were broadly in line with the transfer secretaries' records. A manager recounted:

We tried to get in a balanced position with the transfer secretaries upfront, prior to the dematerialisation. We were unique in that we were a bit ahead of the pack in getting that done. (A6 2:25, 117)

A second balancing exercise involved balancing stock holdings to client records. The balancing function was maintained through the dematerialisation, and then the process of resolving differences and collecting in shortages continued for a few more years.

Also from an operational perspective, because of transaction volumes the business was trying to service clients in the quickest manner and lost control of the business to some extent. The business was losing both clients and expertise. Only when a new head of the business unit and experienced custody managers were recruited from Organisation D, was control of the business regained. A manager noted that: "Control is the name of the game in this environment" (A6 10:46, 105).

Because of the risk of tainted scrip and cases of crime syndicates operating in the market, control measures were put in place to prevent losses due to theft and fraud. These measures included for example, obtaining a receipt from a transfer secretary for shares delivered. In addition, to retain clients, a focus was placed on client service. Operational benchmark measures were put in place, such as the number of outstanding queries in the client services area. Other measures included the number of settlements per person, and the number of corporate events per team which changed the way corporate actions were processed. As a result of procedures put in place, operational processes in the physical

environment were improved considerably. For example, the percentage of trades settled on settlement day was improved within a relatively short period of time.

After about three years in which none of the custodians in the market had achieved a *Global Custodian* rating, Organisation A became the first custodian to be rated in 2001. The rating was attributed in large part to a client service focus. A manager explained:

That [client service] focus played a large part in that very first attainment of the commended rating.... Just that whole process to document, to control, and to try and catch up, reduce down, we got recognition from clients on that basis. (A5 2:70, 335)

4.1.2 Equities dematerialisation

After implementation of the new custody system, the business focus on electronic settlement picked up. A dedicated CSD project office was created with resources from the bank IT area. In addition, more business resources became involved in the market workshops on detailed design aspects. With the market concept designs complete, the market workshops were broken down into different work sessions such as tainted scrip, dematerialisation, project, corporate actions, and systems. Documentation was largely compiled by the CSD with assistance from its IT vendor, and was reviewed by the custodians.

Prior to market pilot implementation of electronic settlement, certain members of the broking community joined the market workshops. At that point, it became apparent that the international settlement model that had been applied in the design was not suited to broker trading market practice in the relatively illiquid local market. A temporary solution called 'oiling' was put in place to enable dematerialisation of a few counters to go ahead. Meanwhile, the design of the settlement model was reworked to accommodate local market practice. A manager put it like this:

The problem was, we had perhaps taken [an international] model where there was gross trade by trade settlement, and when certain practitioners in the market got to hear of this they said, "It will never work in [the local] market because we don't trade like this."... And we had a whole process called 'oiling', which we had to do in order to get trades to settle because there was a gridlock situation between securities and cash. Then we...

realised that this didn't work all that well and we had to redesign the whole thing. (A4 2:2, 17)

The reason for the relatively late discovery of broker trading practice was seen to be because the broking community had not actively participated in the market workshops earlier. A manager explained, "because [members of] the broking community themselves, as opposed to the [stock exchange], had not being closely involved in the working sessions" (A4 7:3, 21).

In Organisation A, the development objective was to meet the market deadlines to ensure that credibility was not lost. An implementation objective was to ensure that a core electronic settlement team understood the new settlement 'oiling' process. To help the core team, flowcharts were put on the walls and a business analyst in the project team worked closely with the team, discussing the process and changing the flowcharts as required. Where a system change was required, a formal process was followed including creating a 'gap' document. A manager put it like this:

[We] wanted to be in a position where we could meet the market deadlines. In other words, that we wouldn't be embarrassed by a situation where somehow or another we hadn't got our act together internally, and the market was ready to roll in the new environment. That was crucial. It's a reputational thing. And [we] wanted to be able to ensure that we had a core team that really understood what it was that we were doing. (A4 7:21, 149)

Because only a few counters were dematerialised in the pilot settlement phase with the 'oiling' process, the core team members had time to help with system development. Team members participated in project workshops and in testing. They learnt through a process of trial and error. A manager recounted:

[We learnt by] trial and error. We were fortunate to have a couple of open-minded people - people that can think logically and think around a problem and find a solution. So it was sitting around a table and talking hard and joking and you just sort out a problem. Somebody comes with an idea and it can be so long and it gets streamlined ... until you have a successful process at the end of the day that you can implement. It's just experience that you build over the years. (A2 5:12, 53)

Meanwhile, a net rather than a gross settlement model was redesigned in market workshops to accommodate broker trading practice. The business did not make

many changes to adapt its system to the new model, because most of its clients were institutional as opposed to broker.

Once the net settlement model was implemented in the market, the stock exchange wanted to ensure that there were no failed trades on the exchange or on-market. As a result, a new guaranteed settlement process was designed to prevent failed on-market trades. It then became apparent that there were dependencies between off-market and on-market trades. A large part of the market consisted of off-market trades. A manager noted: “A lot of overseas clients trade with each other and settle without involving the exchange at all” (A4 7:6, 41). Hence, another new process, called a ‘back-to-back’ process, was designed to accommodate the dependencies. A manager recounted:

A lot of the custodians kept on warning about the dependencies of off-market and on-market. It really only became apparent once we moved into the dematerialised environment and then we had to go ahead externally with [the CSD] to design a ‘back-to-back’ process and to internalise that within our own environment. (A4 2:48, 237)

The project team made system changes to accommodate the new processes. To begin with, manual workarounds were put in place. A manager noted: “In our early stages a lot of our processes were fairly manual” (A5 8:20, 33). For example, the ‘back-to-back’ process was initially done on the CSD front-end tool, and accommodated in the system over a period of time. Another manager noted that, “... to build this whole process, the ‘back-to-back’, on the system.... It took a while to get this [process] working properly” (A2 5:20, 125).

The main custody IT vendor development team was on-site for the system development. System support analysts in the bank IT area that were part of the project team, questioned the vendor team to better understand the rationale behind the system design. A manager noted: “As much information as possible that [we] could get out of them.... [We] always tried to understand why it was designed in this specific fashion” (A7 13:7, 33).

In terms of operations, a conscious effort was made to dematerialise share certificate holdings as fast as possible to eliminate the risk of tainted scrip. A manager noted: “We were consciously eliminating all the possibilities that tainted scrip could be thrown our way” (A6 10:6, 21). A manager explained:

We took a conscious decision that it was in our interests to dematerialise as fast as possible in case there was tainted scrip out there and we needed ourselves to claim against the Dispossessed Members Fund. (A4 2:26, 119)

Experienced managers planned ways to facilitate the dematerialisation process. A manager recounted:

We did a lot of up front planning in terms of getting the dematerialisation process going.... There was a definite block of up front planning.... Having the expertise of people [who've] been around the market for a long time, they put effort into thinking about the process itself. (A4 7:29, 225)

For example, to eliminate the risk of paper, certificates were 'bulked', where a number of certificates were exchanged with a transfer secretary for one of the combined value. Having fewer certificates to deliver to the transfer secretaries was found to speed up the dematerialisation process. The vault balancing exercise that had previously been done with the transfer secretaries was also found to provide a head start because the certificates had been validated. In addition, an agreement was made with clients on the percentage of their holdings that could be dematerialised up front to enable them to continue trading physical shares prior to the dematerialisation of a share counter, and then prevent delays in settlement once the counter was dematerialised. A client's trades were forecast over the dematerialisation period in order to estimate an appropriate percentage of its holdings that could be dematerialised in advance, a process described by a manager as a "balancing act" (A6 10:3, 17).

The bulk dematerialisation took place in the market according to a schedule of counters to be dematerialised. The schedule was designed to progress from less to more actively traded counters as custodians built up expertise in electronic settlement. Beginning with the core electronic settlement team, staff members were moved from the physical settlement area to the electronic settlement area as counters were dematerialised. A manager put it like this:

And it started off with a dedicated team in this area that did electronic settlements as opposed to the physical settlements.... We started to expand the people who were on the electronic side of the fence as opposed to the people who were on the physical system. (A4 2:13, 59)

Particular attention was paid to help staff understand the new settlement processes so that operational control was maintained. For example, staff members, previously trained on the new system for physical settlement, were formally trained on the new electronic processes and selected to move across to the electronic settlement area. A manager noted: "It's a whole process of retraining the people from the physical environment to the electronic environment ... which was a change in mindset" (A5 2:20, 79). Training was conducted by a team of two dedicated trainers that first attended training courses at the CSD. It included a written examination based on a training manual supplied to staff members. As the electronic settlement area was expanded, knowledge about electronic settlement was found to spread. A manager noted: "People were quite keen to move across as and when it happened, because they realised that this was the way of the future" (A5 8:31, 49). Another manager explained:

We had to make sure that the people that we moved across into the electronic environment understood it well and that there were no glitches. So that we didn't lose control of things like balancing bank accounts and that the service to clients didn't suffer.... Once you get that momentum going of the core people who understand it, it spreads out. So from that core team you had people who had been involved in it, but then went away and ran training for others... And so it went from there. (A4 7:21-22, 149-153)

From a market perspective, it became apparent during the equities dematerialisation that strict operational windows were required to prevent market disruption. Hence, a penalties committee was set up to decide on reasonable penalties outside an operational window. A manager described it: "There was slow realisation that this wasn't working or that. And we started committees where we look at things like operational windows and out [of] that will come the penalties committee" (A4 2:61, 301). Over time, the CSD performed both a function as a service provider to the custodians, as well as a regulatory and supervisory function that put formal directives in place.

Also during the dematerialisation, the business created a separate settlement support function to ensure that settlement teams met timelines so as not to incur CSD penalties. The support function also performed more complex procedures such as the 'back-to-back' procedures to enable the settlement teams to focus on learning the new processes. A manager explained:

It was really a support to the equity settlements teams; a support function in helping them to keep within the new timeline requirements and the new regime of trading in the electronic environment. (A5 8:18, 33)

The dematerialisation process was found to go smoothly in part because it had been well planned. A manager noted: “The [process] was planned well and it went smoothly” (A2 5:35, 233). It was found to be easier to manage than coping with high transaction volumes in the physical environment. A manager recounted:

Going into the dematerialised environment ... was a much more controllable type of change.... The whole process of dematerialisation was probably far easier to manage than the excessive volume growth in the physical side. (A4 7:9, 57)

The business maintained its early lead in the *Global Custodian* ratings. Once again it was again the only custodian in the market to be rated in 2002 in the cross-border category.

Towards the end of the dematerialisation the business restructured. Leading up to the restructure a staggered retrenchment of staff took place due to redundancy. Although the client base was extended because brokers became clients of custodians, the electronic settlement processes still resulted in staff redundancy. Previously in the physical environment, brokers had settled their own trades or outsourced settlement to a custodian. As a result of the retrenchment, all managers and staff in the business unit applied for positions in a new organogram. People were selected based on panel interviews and what was already known about them in terms of adapting to change, as well as their computer literacy.

The restructure resulted in the formalisation of two new departments. The settlement support function was formalised as a monitoring area and a central point of communication with the CSD. The function enabled the settlement teams to focus on typical settlements and was thought to be unique among the local custodians. A manager explained:

As we developed, we saw this need that instead of involving each settlement area to run ... with [the CSD] and follow-up and see a particular deal. At a central place, at the [monitoring] area that we created, they were the mouth-piece to [the CSD].... So they [settlement teams] could get on with their normal settlement and run around with that, and [we did] not concern them too much with timelines and exceptions. (A6 10:22, 41)

The other department formalised was a product development function. The function was established to help with system enhancements and innovation because the market was continuously changing. It was intended to provide an intermediate function between operational end-users and the bank IT area, and enable end-users to focus on client service. The CSD project principal architect and spokesperson at market workshops, from the bank IT area, was retained in the new function. In addition, members of the core settlement team were retained in the function. A manager explained:

To get that bridge between an end-user and the IT department you had to get that user that [knows] IT but also knows what's going on in the business.... where the market, we were continuously changing. So we needed a group of people that could attend meetings in the market, bring that information [back], translate [it] into the [system] changes that needed to be done, so that your end-user could focus on client service, and not be distracted in other meetings [by] what's going on in the market; to separate that completely. (A6 10:29, 69)

Following the dematerialisation, there was a level of automation of corporate actions with a feed from the CSD on corporate events. However, the processing of corporate actions did not change much with the move from physical to electronic settlement. Further, although a custody-related product area, securities lending, moved to another business unit within Bank A, the business continued to provide associated services.

4.1.3 Market evolution

After the CSD implementation, another custody-related product, unit trust services, appeared to be implemented on an in-house system maintained by the IT bank area. A project was also started to integrate bonds, operating on a separate system, into the main custody system. However, the project was stopped when the business became aware of a market initiative to redesign electronic bonds settlement after the implementation of electronic money market settlement.

The dedicated system support team from the bank IT area that had been part of the project team for the CSD implementation remained in place, because the new custody system was found to be more work to maintain than the old one. The team also supported the bonds custody system and the unit trust services system.

Over time, the role of the team expanded to include project management and it became an IT project team. Over time, it was brought into the business. Its main function was to liaise with the IT vendors. In particular, members of the team provided continuity with the main custody IT vendor given that the vendor had a high turnover of development resources. A manager explained:

That's what [the IT project] team is really there for, to get that continuity when the [IT vendor] developers change. To say, "We've done this for this reason", or "This was the rationale behind it - why we did this way, not that way." (A7 13:8, 33)

Many changes to the market participants' systems were found to be required to resolve issues that arose in the market during the dematerialisation. A manager noted that: "As part of the dematerialisation process, things came to light that didn't work in the market as a whole and didn't work for us" (A4 2:55, 275). All participants had to work within a regulatory framework and governing parameters, such as rules and directives. Issues were raised in regular forums coordinated by the CSD, and debated in one or more workshops to determine a feasible resolution. The market participants typically included the CSD, custodians, transfer secretaries, and the stock exchange. A formal system development process was followed by each impacted participant, typically involving documentation of its business requirements, development of a solution by its IT custody vendor, and joint market testing of the market solution. A manager put it like this:

How it really works [is], we as a market, or we as an organisation identify a problem. We sit down at the user group, the IT group, and say, "We've got this [issue]. What can we do?" To resolve it, we prepare a 'gap' document that says, "This is the business issue. This is the need that we see". We then give it to our IT vendors and say, "Provide us with a solution." We take it from there and once you've got the solution in place, we retrofit the business process.... It's an organic thing. (A4 2:49, 241)

The process was used during the CSD implementation, and because it was found to work well it continued to be used. A manager recounted:

It's a process that hasn't really changed that much, but that is the best way of doing it. [The CSD] was a very successful implementation, the equities originally, so much so that it was a non-event because it went so smoothly. It was a winning formula that with time they just kept with it. (A2 5:22, 145)

Besides market changes, operational users were encouraged to automate their processes to make them more efficient. A manager noted: "Many of the changes come from operations. All [of] the changes that are made are to help [operations] work more efficiently" (A8 14:11, 81). At the same time, an ongoing campaign within Bank A provided financial incentives for innovation. As part of a business philosophy every idea was considered in a workshop. A manager put it like this:

Automated, continuously - that was in the process that we rolled out. Innovate, [come up with] new ideas, better ways of doing it, smarter ways of doing it... We've always had the philosophy of, "Listen to the people. Don't shoot them down if they've got an idea. That small idea, let's take it." (A6 10:23-24, 49-57).

A formal system development process was followed similar to the market process. To begin with, alternative solutions to requests were debated in a workshop involving business analysts from the product development area, system analysts from the IT project area, and the business users requesting enhancements. Although there was no formal business case, factors such as business benefit and cost, client impact, and risk impact were considered. In some cases, the CSD front-end tool was used rather than changing the system. A manager recounted:

We don't have a formal business case. It's more a very loose agreement. What we discuss is ... "Why the user wants it. Can we save money out of it? Is there a risk involved in it?" (A7 13:5, 25)

Typically, business analysts documented the business requirements in a 'gap document', system analysts liaised with the respective IT vendor, the vendor provided an 'impact document' including a costing and did the system development, and business analysts and operational users tested the system. Documentation also included enhancement requests and test packs. In particular, an effort was made by the product development team to avoid piecemeal system changes.

To promote continuous process improvement, regular meetings were held between product development and operations where issues and potential enhancements were solicited from operational staff. A manager noted: "We also try and do continuous process improvement.... It is an ongoing process that we try and review all the time - what the business model looks like and can we make it better" (A4 2:53, 261). A number of system enhancements took place, with no

major change to the equities settlement process. In addition, the IT custody vendor provided an annual system update related to communication standards to all its clients.

In terms of corporate actions, the customisation of the system was redesigned and redeveloped. The initial customisation of the system was found to be sufficient to start with. However, unforeseen settlement complications required corporate action adjustments. The complications were in large part due to active off-market and securities lending components, because the business had a large foreign client base. The system customisation was redesigned to make it more flexible so as to cater for the settlement complications and new types of corporate events that occurred on an ongoing basis. A manager noted: "We had a core to work with and it was sufficient to get us going. If you had to look at the system now compared to what the initial corporate action core was, [it's] very different" (A3 6:27, 179).

A dedicated team within the operational area was involved in the redesign and then became a formal corporate action support team. A manager recounted:

The whole system was started from scratch and then it's still ongoing today because the problem with corporate actions [is], there's always something new... So with the new system, it's fairly flexible....The whole system had to be rethought and reworked. Still today, we have a dedicated team that looks after the system. (A3 2:39, 183)

The team was responsible for both an operational planning function as well as a business analyst function. The latter function was overseen by the product development team. In contrast to earlier system development, formal procedures were followed as noted above. Managers developed a better understanding of the system by experimenting with it and questioning the main custody IT vendor. A manager explained:

Now it's more structured. Up front we really played around with anything and everything that we could [to] make it work.... It was a quick work-around, a quick win. We were getting automation that we didn't have before, but there're always pitfalls.... It's a lot more formalised. And we understand the system better.... The more you play with it [the system], the more you experiment, the more you can understand what it does. And talking to the [IT vendor], raising the questions, listening to the answers. (A3 6:19, 119-123)

The corporate action support team was tasked with automating processes and getting meaningful client information from the system. Although managers recognised that the business analyst function in the team was duplicated to some extent with that in the product development area, the team continued to be kept in the operational area. Close contact with operations was found to help team members gain specialist expertise which was considered necessary, given the risk of corporate actions and that processes were not highly automated. A manager explained:

Those people are just concentrating on corporate actions.... But it's always a debate to say, "Should we take some of those people and put them into [the product development] area?" The thing is then they're not so specialist, specialising on the day-to-day [business] - what's going on in the corporate actions [area]. And because of the risk in the corporate actions area ... you may lose some of the detail that they need to attend to if they start doing other work as well ... (A6 10:65, 69)

Once equity settlements were relatively stable in the market, a market initiative to move from physical to electronic money market settlement was embarked upon. Because Organisations A and B had originally acquired the same custody system, a joint venture was considered by the organisations whereby the IT vendor would develop certain common components at a shared cost. However, the IT vendor found that the two organisations did not have any common components for development.

The market initiative was seen to be more complex than the move to electronic equities settlement because the market was unregulated, unlike equities. A manager noted: "The fact that's it's an unregulated market makes it a bit more difficult to get people to agree on the requirements for the electronic environment" (A1 3:16, 105). For example, traders tended to structure a deal to meet their client's needs. In addition, the market initiative involved implementing a new, more complex market settlement model, a 'securities ownership register' held at the CSD.

Following the initial unsuccessful market implementation of the electronic money market settlement initiative, managers recognised that major market projects involving "radical improvements to the market" (A4 7:39, 277) took time. They found that it took time for stakeholders to understand the market requirements, and to assimilate them into their businesses. A manager explained:

These big projects do take time; there's no question about it. Especially if you're putting in a market change that affects a whole [lot] of people, and they've got to assimilate that change into their thought processes and get their systems and all the rest of it into a position to participate. (A4 7:41, 281)

A parallel was drawn with the earlier equities initiative where brokers' trading requirements had resulted in a change to the market settlement model. Similarly, in the money market electronic settlement initiative, the issuers' trading requirements were found not to have been fully taken into account. In the latter case, the issuers had only realised that the settlement model did not meet their requirements once the initial finished product was in place. A manager put it like this:

One of the big cautionary things is, in these market initiatives, sometimes it takes quite a lot of time to establish what the real market requirement is. And sometimes until people see the actual finished product in front of them.... that's when you get down to the real bottom of the requirements. (A4 2:3, 17)

Managers found that the money market issuers who were new to joint market system development initiatives, were not used to participating in market workshops to determine requirements. For example, they were not necessarily represented by people who understood the implications of a particular scenario being discussed. A manager put it like this:

You talk a lot, and a lot of people are not used to those types of sessions and workshops, trying to visualise, "This is the flow diagram."... The people who're sitting there, they know more or less what they want, but they don't know the detail of exactly what they want. And also, if you've got the right people there. (A7 13:24, 105)

Managers also recognised that thorough testing was required by market participants, especially when new IT system developments were implemented. A manager pointed out: "Proper testing needs to take place across market players to make a success of a change of this nature, because it could have rippling effects on the market" (A6 10:62, 133).

From an operational perspective, electronic equities settlement was found to free up staff capacity to handle a greater volume of business with less risk. As

transaction volumes in the market increased the business became profitable. A manager explained:

You see the benefits of electronic settlement.... It gives you the potential to handle larger volumes with fewer people. So that immediately, because it's a volume-driven business, adds to your bottom line. With less people you can handle more volumes. You take the risk out of it. (A6 10:60, 133)

The operational focus changed from control of physical certificates to exception management of high transaction volumes and a strict discipline around keeping to the CSD timelines. A manager put it like this:

There're other control measures; the focus has changed. The focus has gone now to more exception management and sticking to your timelines. Those are the controls you need to have in place.... But control stays with us, just in a different format. (A6 10:48, 109)

The business became "timeline-driven" (A6 2:58, 283). If operational process timelines were not met, then penalties were paid to the CSD. A manager pointed out that when less experienced settlement staff members joined, "we pick up penalties in that learning curve" (A5 2:60, 297). Training of new staff members was done on a one-on-one basis. In addition, the monitoring department set up during the equities dematerialisation to help meet settlement timelines was maintained. It was found to simplify communication with the CSD monitoring and supervisory side. Over time, its function evolved to be a single point of contact with the CSD as well as the bond and stock exchanges. A manager noted: "It's a different focus altogether to what a settlement specialist is doing and because they do that in a [monitoring] mindset it's a lot more efficient" (A5 8:50, 73).

In terms of corporate actions, dramatically improved settlement rates resulted in claims on subsequent corporate events becoming the exception instead of the norm. A manager noted: "It was quite quick in that the moment that something was dematerialised into that timeline, claims going forward disappeared" (A3 6:25, 163).

In short, electronic equities settlement was found to change the nature of the business. A manager put it like this:

The whole nature of the business changed. We went through the whole exercise of right-sizing, of selecting the correct people for the new

environment; of not just changing technology, [but] changing process, [and] putting people through training courses. That was radically different; it wasn't just a technology change. (A4 7:20, 137)

Reduced client queries and corporate action claims were found to free up staff capacity for client service. A manager noted that: "Once you get a whole lot of the baggage out of the way, you can talk about moving the [client] relationship forward" (A5 9:15, 25). A number of initiatives took place to improve client service levels. These initiatives included straight-through-processing of client instructions from a client's system to the main custody system, more frequent and in-depth visits especially to foreign clients, and the introduction of a web-based reporting service. In particular, "more comprehensive, [and] more efficient reporting" (A5 2:68, 331) was found to further reduce client queries. A manager explained:

There were a whole lot of initiatives that were then started to improve our service delivery in the eyes of the clients, and to meet their requirements more fully. Because we knew [that] settlement was happening a whole lot more efficiently. (A5 9:12, 25)

The business continued to focus on client service. A manager noted: "We are constantly reinforcing that client service.... Everybody practices client service" (A5 9:47, 73). It maintained a consistent commended rating in the *Global Custodian* cross-border client category, and achieved a top-rating status in 2005. In the domestic client category, it was first rated in 2005 and achieved a top-rating status in 2007. Initially, settlement rates of off-market trades were found to contribute to the rating, but over time clients were found to expect more in terms of service. A manager explained:

Moving into the electronic environment has perhaps become easier in terms of the type of service that we provide; in terms of managing clients' expectations, [and] in terms of settlement rates. But as soon as you do that, what happens is that people then after a while, take that as a given in the [local] market because they expect it. And then you've got new benchmarks and requirements to meet in order to get a satisfactory Global Custodian rating. (A4 2:62, 315)

4.1.4 Outlook

Organisation A had become a profitable business. Its divisional reporting line within the bank had recently changed. The business offered custody, securities lending and unit trust services. In addition, it operated in a few regional markets.

Recently, an operating alliance had been formed with an international bank enabling it to expand its offering to include global custody as well as local custody services. Global custody services were provided through the alliance partner, which acted as a sub-custodian to the business. The global custody offering was a custody service to local clients in foreign markets. In turn, local custody services were provided to the alliance partner. The operating alliance also enabled the business to extend its offering in regional markets where its alliance partner was represented. One of the main reasons for selecting the alliance partner was that its systems had been adapted to regulatory requirements in the local market.

The business had gone through an upward cycle with a substantial increase in market volumes leading to a demand for additional staff capacity. A manager noted: “The electronic settlement did give us extra capacity for a while. It comes to a point where you just need extra people to process” (A4 2:74, 399). The fact that Organisation D had the same core system was found to be an advantage when it came to sourcing staff members, because they had a good understanding of the system.

An initiative by the CSD to benchmark the custodians in the local market was keenly anticipated, “to see what else we can improve” (A6 2:88, 483). In general, system changes were found to be easier because the people involved in making the changes had gained experience over time. A manager explained: “It just makes it easier to change a process now, because there’re people that have historical experience in this to make sure that the same problems don’t reoccur” (A2 5:31, 217). A practice of typically discussing a system change in a workshop was found to help in sharing system development knowledge within the business. In addition, experienced people helped resolve system problems because they were able to quickly identify the cause of a problem. A manager pointed out: “If something goes wrong, [then] where to start looking for it, that comes with experience” (A7 13:44, 201). Further, both system changes and problems were tracked to provide a historical reference database, including the rationale for a particular solution.

When making a change to the main custody system, managers had found that it was more cost-effective in the long run to think broadly in terms of improving the flexibility of the system at the same time. Once the business became profitable,

managers found it easier to justify making more comprehensive system changes. A manager put it like this:

In the past, we used to do many more quick fixes, maybe from a cost-saving perspective. Whereas now we say, "It's going to 'bite' you somewhere or later if you make a quick fix." So rather think a bit [more] broadly and say, "How can I make it more flexible, although it's going to cost me slightly more now?" But in two or three year's time, when that scenario occurs, the system does cater for that.... It's probably one of the big drivers that also [Organisation A] was a loss-making department at one stage, and turned into a profit-making department. So that also helped. When you're in the red the whole time, you can't spend the money because there is no money to spend. Now that we've turned it around, it is easier to justify spending a bit more money, because you do have those funds available." (A7 13:41-42, 181-189)

At times, a temporary system change took place to provide an interim solution that was later reworked; for example, to handle a new type of corporate event or a particular client demand. In other cases the expense of a more comprehensive solution was not warranted. However, in such cases, managers were aware of the risk involved. A manager explained: "We'll take the risk and take a shortcut. But then everybody's aware of it. It's not a case of like in the past, it was just done" (A7 13:6, 29).

In particular, knowledge of the main custody system gained over time was found to help in managing the business relationship with the IT vendor to ensure that system changes were of a longer term nature. A manager noted: "When we specify a change, we know what's possible, what's not possible, [and] more or less what it's going to cost" (A7 13:6, 29). In contrast, when the system was new, the IT vendor had tended to make changes at least cost and these were later found to constrain system flexibility, and in some cases had to be redone. In particular, developing reports on the system had helped managers to better understand it. A manager noted: "We do the report-writing and that helps a lot to start understanding the database structure" (A7 13:7, 33). A former IT vendor developer had also joined the IT project team and contributed in-depth technical knowledge of the system.

In terms of participating in market forums, a particular focus was placed on sending appropriate people to gather relevant information in order to address market requirements in system changes. A manager explained:

There're quite a lot of joint market initiatives that lead to internal system changes.... And that's why we have this focus of sending people to the meetings, and sending the right people to the meetings to gather the correct information, so that we can feed it back into our own internal workshops to say, "How're we going to address this?" (A4 7:18, 113)

In addition, emphasis was placed on involving different managers in market initiatives to help them gain experience in contributing to discussions, as well as in reading, interpreting, and commenting on documentation. A manager noted: "We do try to and get other [people] involved, and try and grow them in the process.... of being involved in market initiatives" (A4 7:46, 306).

Market workshops were found to provide a forum for participants to consider alternative solutions to problems and to "try to convince another party" (A7 13:16, 69) of an appropriate solution. The workshops provided insight into other custodians' technology from their motivations for particular solutions. A manager put it like this:

There're patterns that come out, [of] how people think and you start getting a sense also [of] how people's systems work. You don't know exactly, but the way they talk, they always want a change in this type of thing, or they want something like that. Then you start visualising and say, "Their system is probably working [like] this, so these are probably their type of limitations, and this why they wanted this." (A7 13:26, 113)

From a competitive perspective, managers recognised that: "It's [the country] incorporated in competition with other developing markets in the world for investment capital that sits in developed markets" (A5 9:35, 81). In order to make the market more competitive, an effort was made by market participants, and the CSD in particular, to align with international standards and best practice. A manager noted that, "we stick very closely to international market practice" (A4 7:35, 265).

Local market participants were seen to have "learnt a lot" (A4 7:36, 273) in terms of collaborating on market initiatives. Based on a view acquired from attending international conferences, local participants were seen to be relatively cooperative compared with some other markets where there were "more vested interest groups" (A4 7:36, 273). For example, there were regular forums "to discuss the market and the way forward" (A6 2:85, 467). These were typically coordinated by

the CSD. A solution for a major market initiative was arrived at through “a combined market effort” (A1 3:15, 93) involving many workshops.

In the more competitive local market, differentiation was seen to lie in providing value-added services and a flexible service offering. The business focused on understanding client needs and providing additional reporting to meet those needs, such as settlement statistics and cash planning information. A manager observed:

It's just more competitive. It's easier for everybody now in the electronic environment. It's that extra service, that extra mile that you go for the client that gives you the edge. (A6 2:63, 317)

Settlement was found to be largely commoditised; whereas, in the past a good settlement rate had been a competitive factor. However, managers recognised that value could still be added to corporate actions. For example, supporting information to help explain a particular corporate event could add value to the event. A manager explained:

People [clients] expect us to have a good settlement rate now. So that is commoditised. They want to see what other value-adds we can give them in terms of service.... There's a lot of value-add that you can do with corporate actions in terms of extra information that you provide a client. It helps them [to] understand the complexity of a particular corporate action. (A4 7:43, 289-293)

The global securities industry was seen to be going through many changes. Clients were found to be increasingly sophisticated and demanding. Most of Organisation A's clients had a direct system links with the business for straight-through-processing of instructions. The focus in international market practices had shifted from settlement to refining processes for corporate actions. In particular, in order to further automate corporate action processes the focus was on standardising corporate action messaging to clients. One international initiative identified was the alignment of terminology between Europe and America in messaging standards. For example, a corporate event might be known as an ‘unbundling’ in Europe and a ‘spin-off’ in America.

Going forward, managers anticipated that the completion of the electronic money market settlement initiative was likely to result in a better product delivered. Their approach to major initiatives was to cater for most of the requirements to get a

system implemented and then enhance the system at a later stage. A manager noted: “You can enhance afterwards, but get the bulk of the [requirements] out of the system” (A6 10:64, 137).

Two major equities initiatives were seen to lie ahead in the market, besides completion of the money market initiative, and another platform for bonds which was under consideration. Both of these two market initiatives were viewed as potentially contributing to market competitiveness depending on the market models used. Given that the global market was continuously evolving, managers realised that the local market also needed to evolve to remain competitive. In particular, because custody was a volume-driven business the local market needed to be competitively priced in order to attract transaction volumes. A manager explained:

We've got to be realistic that the world market is evolving all the time and you've got to try and deliver the goods at the cheapest possible rate ... to grow the volumes. It is a volume-driven business. (A6 10:55, 117)

The first initiative was a move from a T5 to a T3 settlement cycle. Managers recognised that a move to a T3 settlement cycle would bring the market in line with a major international standard, known as the G30 recommendations, to make the market more competitive. A manager observed:

There's international best practice, the G30 recommendations, one of them is that settlement timelines around the world should be standardised as far as possible.... This market complies with all of them except one, which is the T3 cycle. And once we move to that then we can say we comply completely with the G30 recommendations. (A5 9:34, 81)

The initiative was prioritised by the stock exchange to align the market with the international standard. An implication of the initiative identified was that it was likely to involve a similar settlement model to the original model piloted during the equities dematerialisation. The immediate reaction from brokers was that it was too expensive, as it had been during the equities dematerialisation. However, given the growth in market transaction volumes and provided these volumes could be sustained, the initiative was seen to be feasible. Another implication identified was that accommodation of the shorter settlement cycle was likely to involve a trade-off with the guaranteed on-market settlement process leading to more corporate action claims.

The second initiative was a move to a 'securities ownership register' held at the CSD. Managers recognised that the initiative could contribute to market competitiveness, although it was also a potential disintermediation threat because the CSD might take over certain custodian processes. If custody services were disintermediated over a period of time, managers realised that the business would have to provide other services. A manager noted: "If over the years, we get phased out of the market ... then ... we've got to look at other ways [to make money], and [at] offering services that we can make money on" (A6 10:55, 117).

Managers recognised that both market initiatives could be done together if a suitable settlement model could be found for a 'securities ownership register' held at the CSD. Because of the interconnectedness between the CSD's system and the custodians' systems, managers realised the market models used for both initiatives were dependent to some extent on the CSD's system. A manager noted that, "anything that we do in [our custody system] would be aligned to how they are doing it all in [the CSD's] system" (A5 9:3, 9). At the time, the CSD was conducting an exercise to see whether or not to replace its system in order to accommodate international standards and best practice. A Bank A philosophy was that the business case for any market initiative must be justified in terms of market requirements and client expectations. A manager put it like this:

What we do have is 'show us the business case'. That's a Bank A philosophy. So we're not against doing any of these things, but we want to prove that there's a need to do it and that whatever we spend in doing it is justified in terms of what the markets require and clients are expecting, because you can't do these things in isolation and in a vacuum. (A4 2:86, 471)

In terms of responding to market changes, there was ongoing debate in the business about whether all the business analysts should be in the product development area. Managers recognised that the business analyst function was duplicated to some extent in the corporate action support team which was part of the operational area. However, they found that close liaison with operations enabled business analysts in the team to gain specialist expertise on daily operations. The intention was to keep the support team in the operational area because managers anticipated further automation of corporate actions. A manager explained:

We're still debating that a lot of times to say, "Is that a duplication of the function of the business analyst that's sitting in the corporate actions area?"... For the time being, because there're quite a lot of corporate action changes in the market that we foresee ... to further automate that [function], [and] because it's working at this stage, [we'll] live with that for some time.... They're in close liaison because of the [specialist] expertise [required] in the area. We keep their direct liaison on working committees with [the CSD] as well. (A6 10:65, 69-73)

Typical of the local custodians, the business was represented on a national market practice group. The practice group fed into a securities market practice group, an international standards body with the aim of making "market viable exchanges" (A4 2:84, 465). Participants in the market practice group were seen to make a conscious effort to contribute to the development of international standards and to implement best practice. For example, with the international focus on automation of corporate action processing, managers reviewed papers on messaging standards. A manager explained:

We go through the messaging standards and we give comment on those. And then we'll take what they do and see if we can use international best practice in [the local] market. We're very conscious of that. (A4 2:84, 465)

In order to 'move the market forward', the business was seen to play a leading role in initiatives to align the market with international best practice. The intention was to make the market more competitive. A manager explained:

Everybody [in the business] acknowledges that the idea is that 'we want to move the market forward'. We want to attract investors to [the country]. It's in our own interests to do so. Everybody [in the business] accepts that this is an ongoing process and that we move forward. (A4 2:79, 437)

Organisation A was taking steps to enable a more proactive response to market changes. These included maintaining project management structures to support future development in the dynamic market, and contributing to the development of international standards to see whether they could be adopted locally and help advance market competitiveness.

4.2 Organisation B

4.2.1 Market planning

Organisation B was the largest of the custodians operating in the local market, in terms of market share and presence. It had a mix of local and foreign clients. Paper-based operations in the physical equities settlement environment were highly manual and labour intensive. Increased transaction volumes following the advent of electronic trading in the market had led to highly pressurised operations. Given the amount of work, the focus was to “get the job done” (B9 38:11, 29). One manager recalled the noise in the afternoon with a lot of people at the counter wanting their share certificates and then after the cut-off time it died away. In order to enable faster transaction turnaround times, most shares were registered in Organisation B’s nominee name creating a fungible pool. An investor did not have title to a particular piece of paper in the single pool account. However, there were delays in settlements due to registering certificates in the correct name. Clients raised the growing number of corporate action claims, due to failed settlements, as a major issue.

Although Organisation B participated in market planning forums for the dematerialisation of equities, there was a perception that electronic settlement was not going to happen. A manager recalled:

With the dematerialisation we thought it was never going to happen.... Because they talked about it, a long time ago, it was like ‘pie in the sky’, something that can never happen. But [the CSD] was very serious ... and it was implemented. (B12 41:21, 265)

The business started evaluating various options in terms of replacing its custody system. Its focus was on mitigating the “imminent threat” (B2 43:1, 39) of the custody system not being able to handle year 2000 dates. A manager recounted:

Y2K [Year 2000] was a major issue at that point in time. The whole advent of Y2K was to try and negate the issues of the system’s failure.... So the whole business at that point in time was largely geared and focused on this Y2K [issue] and saying, “We have to negate this threat otherwise it will be the end of the business.” (B2 43:8, 113)

A new custody system was chosen from an international IT vendor. A manager noted that: “It just was the best solution available, and from a cost perspective, slightly cheaper than the rest” (B2 24:10, 41). The decision was made independently of Organisation A selecting the same system from the IT vendor, and the CSD also selecting a system from the same IT vendor. The fact that Organisation A chose the same system was seen as a threat. A manager recalled:

If anything we saw it constantly, and even now to some extent, [we still] see it as a threat. That any of our brainchild that goes into the development of the product could potentially be picked up by the competitor. (B2 24:11, 45)

Because Organisation A had also acquired the system, it became a “race” (B2 24:10, 41) between the IT vendor’s two implementation teams to implement the system first. However, Organisation B’s approach was identified to differ from that of Organisation A in two main respects. It implemented dual custody systems, and it deployed equities in a ‘big bang’ as opposed to a gradual stock migration approach. The ‘big bang’ migration involved moving the stock from the old system to the new system in one weekend.

The business engaged locally-based IT consultants to project manage the implementation, including change and test management. A system support team in the business was assigned to the project team. At about the same time, there was an office move to a new building and the project team was located in a separate area from operations.

The business decided on a dual custody systems implementation approach. By then, managers realised that the equities dematerialisation was going to happen, and held workshops to plan the implementation of electronic settlement. In particular, they planned the balancing and reconciliation of physical and electronic stock. During the workshops, someone came up with the idea of implementing two separate systems, to handle both physical and electronic settlement, which could communicate and remain ‘in sync’ with each other. The idea was accepted by the management team. A manager explained:

We did the separate implementation ... because we went [with] the electronic [system] as much as to say, “[the CSD] is going there”, when we didn’t know [the operating model]. So we took a calculated risk because we knew we could operate the business like that. (B2 24:38, 81)

The dual systems implementation was later found to provide an advantage by enabling a single focus on electronic settlement during the equities dematerialisation. A manager explained:

We kept the two [systems] together, but separate.... From a systems perspective, we took quite a huge forward view of saying, "That's how we're going to implement and this is why." So that was our novel approach of doing the whole thing. And [it] allowed us the ability to communicate with [the CSD] a lot quicker, and [to] get that whole project moving in a quicker manner because now we were focused on one thing. We were not getting rid of any physical [stock which] continued on the [physical] system and it still exists now on the [physical] system for the unlisted [equities]. (B2 24:27, 61)

The financial instrument types – money market, bonds, and equities – were deployed on the custody systems in a segregated manner. A manager explained the intention was, “to minimise the impact by segregating the various instrument types” (B2 43:9, 113). Initially, money market was deployed on the physical system because it was the simplest instrument type. It was followed by bonds deployed on the electronic system to provide some knowledge of an electronic environment. With little time left before the year 2000, a ‘big bang’ approach was taken with the migration of equities stock to the new physical system. A manager recalled: “Because of Y2K, we chose a ‘big bang’ approach” (B2 24:22, 57). Also at about the same time, dematerialisation of the first share counter occurred in the market. However, problems were experienced with the ‘big bang’ approach including the performance of the system. The new system did not perform as expected. Another manager noted: “we had all this expectation about the new system and when it was there, it just didn’t perform the way we thought it would perform initially” (B10 39:6, 41).

Meanwhile, managers identified a general lack of computer literacy in the large workforce to be a challenge. Computer literacy and system training of operational staff took place with the help of the IT consultants and the custody IT vendor. A dedicated training room was set up as part of the project and was also used for testing. Training then evolved into part of the system support function. A manager noted: “That training/ testing room evolved and training went in, and during that whole project session, became part of the [system support] ambit as well” (B2 24:19, 53).

Meanwhile, a separate claims area had been set up with a sizable staff compliment to process the backlog of corporate claims. Initially, a high level of temporary staff was employed due to managerial pressure to reduce staff headcount once the equities dematerialisation had occurred. However, due to the complex nature of claims, “staff didn’t realise” (B11 40:5, 25) how to settle a claim in its entirety and partially settled claims continued to remain until they were fully settled. Subsequently, the exercise continued over a number of years and became more formalised across the custodians. Staff learnt how to settle claims from exposure to clients and other custodians. A manager recounted:

From the clients that you speak with, they’ve got more exposure to how claims work in those markets. That’s how we learnt. And we drew up [our] own procedure manual, [and] our own checklist, and we got the brokers involved. We had meetings once a week with different banks [and] with the brokers. (B11 40:6, 37)

4.2.2 Equities dematerialisation

Managers realised that the equities dematerialisation was going ahead at about the time the first share counter was dematerialised in the market. The business was focused on resolving problems arising from the system implementation. Only once share counters started to be dematerialised was active planning started and awareness created. Change management and human resource consultants were engaged to help with the planning. A manager explained:

Dematerialisation was not seen as something coming, as much as it was there.... Because our whole focus was on stabilising the system because of the shock of the implementation.... It was the workforce [that] needed to be taken [to] a level of PC [Personal Computer] literacy. So it was that challenge.... The first counter went live ... the subsequent counters were thereafter, and then the planning really started taking place ... where the awareness was created.... The realisation of dematerialisation really came ... when we were in the turmoil of the system implementation. (B2 43:80, 113)

The objective in terms of customising the custody system for the local electronic settlement market was automation, not reengineering, including a high level of integration with the CSD. A manager noted that: “It wasn’t necessarily reengineered thinking or anything of that nature. It was really about automation. Automation was the ‘speak’ and was bringing about the benefit. Automation was the key” (B2 24:37, 81). The objective was intended to minimise operational

disruption, given the relatively large size of the business and a largely computer illiterate workforce. A manager explained:

Automation and as much integration between [the CSD] and ourselves was the objective, because the size of the business was huge.... And the number of personnel was also sizeable in nature.... [And there was a] lack of literacy from a computer environment perspective that the personnel had. We went and we chose the greater level of integration [with the CSD] to ensure that we had as little disruption as possible. (B2 24:14, 49)

A dedicated project team was put in place, as with the earlier custody system implementation, and located separately from operations. A fixed time and cost approach was taken with the IT vendor for the custody system customisation. In consultation with operations, a list of business requirements was challenged, filtered and refined to the main requirements. The IT vendor delivered on an incremental basis to meet the set end date based on the market deadline.

Being the largest custodian, Organisation B exerted considerable influence on the market direction and deadlines to implement electronic settlement. A manager recalled:

We pride ourselves in being leaders of the market because of our size and our presence. So we drove the process to suit ourselves. As much as [the CSD] had a mandate, a lot of knowledge and a lot of direction we brought to the market. (B2 24:35, 77)

The business participated in the market workshops to introduce procedures, directives, and penalties around the settlement process. In particular, given its relatively large foreign client base, the business focused attention on the off-market component which was “to a large extent ... an ignored component” (B2 43:70, 352). Market collaboration to standardise aspects of the settlement process was seen as necessary for the market to advance as a whole; whereas, previously process information was viewed as a competitive advantage and not shared. A manager explained:

[There] also was the collaborative component in terms of what is standard practice. In the past, it was seen as a competitive advantage not to share information around the process. Post [the CSD] it became a necessity to standardise at least a settlement component. That required more market participation, and that kind of conversation has taken the market further. (B1 43:51, 279)

Meanwhile, with the help of external consultants formal training and change management initiatives took place to prepare operational staff for the bulk dematerialisation of share counters. One of the change management initiatives was a video shown early in the process which helped to create awareness. A manager recalled: “That was a real ‘eye opener’. That’s when it sunk in, when people started acknowledging the fact that we are here and we are going to change now” (B8 36:13, 105).

During the dematerialisation, the stock migration strategy involved a replication process and a balancing and reconciliation process between the physical and electronic equities systems. Client instructions were received on the electronic equities system and replicated to the physical system. A single pool account on the physical system was balanced with multiple individual client accounts on the electronic system. The reconciliation process was considerable due to the sheer quantity of share certificates and complicated due to late settlements that had occurred in the physical environment. A finance manager seconded to the project team from another area the bank, helped to determine a process to balance and reconcile the share certificates in the vault to the holdings on the physical system and between the two systems. The finance manager subsequently left and was replaced by an auditor who understood the process. A reconciliation team was set up and continued to ensure that the business balanced with the CSD on a daily basis, as well as to resolve problems with corporate events.

At the same time, the equity settlement area was split into two to cater for both physical and electronic settlement. As share counters were progressively dematerialised, staff members were selected to move from the physical settlement and registrations areas to the electronic settlement area, based on a training assessment. Managers identified a “balancing act” (B2 43:27, 205) in operating across both environments. In addition, change management interventions took place to help prepare staff for the new environment. A manager recalled the operational transition:

A separate [electronic] operation evolved side by side with the physical [operation].... You’d have the people from the physical [environment] that would slowly transition into the dematerialised environment. And the learning started growing in terms of exposure to what the dematerialised environment was all about, because the settlement model was totally different. (B2 43:26, 205)

Due to high transaction volumes, a transfer secretary set up an on-site office for certificate registration and deregistration. In addition, temporary staff members were employed in the registrations area to minimise the impact of later retrenchment.

Managers identified the new settlement model to be a, “mindset change ... for people to ... grasp this new way of doing things” (B10 39:11, 57). For example, the quietness on what used to be the settlement day in the physical environment was found to be surprising. A manager noted: “We had to get used to that quietness and ... other challenges” (B12 41: 4, 41). Constant feedback and sharing between the teams helped staff to learn the new process.

As staff were getting used to the new process mistakes were made and costly penalties imposed by the CSD. A management intervention, a workshop called the ‘learning hour’, was initiated to try and understand the cause of an error and how to avoid it happening in future. A manager recalled:

If a person made an error we started something called the ‘learning hour’... And every mistake, or every settlement problem that we experienced, we would have a workshop with the whole team ... to just go through ... what we learnt ... [and] how we can avoid it in the future. And ... we updated our procedure manuals as well. (B12 43:17, 163)

The dematerialisation involved a staff retrenchment that applied to the whole business unit. Voluntary retrenchment and early retirement were offered initially. As dematerialisation progressed, managers identified their staff requirements and the people that they wanted to retain based on work performance. The employment of temporary staff members whose contracts were not renewed minimised the scale of retrenchment.

Following the dematerialisation and the implementation of electronic settlement, there was a second smaller transition with the automation of corporate actions. A manager noted, “It was just another implementation of a change, although the size of it necessitated a dedicated team” (B2 24:30, 65). The dedicated project team remained in place for the implementation and then moved back into the operational area. The transition also involved change management and human resource interventions that had been “learnt from the exercise of using external consultants” (B2 43:30, 209).

The corporate actions development involved a high level of automation. A manager noted that the business “had some of the highest levels of automation on the corporate actions side in the market” (B5 37:20, 141). The business contributed considerable intellectual capital to the development. Managers wondered if the intellectual capital also contributed towards the development of the IT vendor’s corporate action system module, for which the IT vendor subsequently won accolades. A manager recalled:

The thinking that went into that [system], and the level of automation that we put into that system.... There’s a lot of IP [Intellectual Property].... We had some foresight in the process. Foresight was there. Whether it was intentional or stumbled upon, it could be argued, but it was certainly there. (B2 24:36, 77)

A view was taken in the market to stage the implementation of corporate event types, starting with the main ones. There was a market perception that all corporate actions could be handled by a few event types. Only the first stage consisting of the main corporate events was implemented by the CSD, which later proved to be fairly inflexible and constrained the custodians in handling nuances to events. Hence, industry experts amongst the custodians discussed the handling of corporate events openly with one another in an effort to find common solutions.

At about the time of the corporate action implementation, a user group meeting took place amongst the custodians using the same custody system purchased from the IT vendor, including both Organisations B and A. The purpose of the meeting was to discuss a common system. However, during the course of the meeting, it became apparent that the different implementations had diverged and it was impractical to bring them together.

Following the CSD implementation, there was a business restructure where the custody processing area and the client-delivery and product area, which were in separate business units, were brought together into one business unit. Before the restructure, barriers were seen to exist between the two areas. After the restructure managers were able to gain insight into complete operational processes. A manager noted: “That was a real growth point in terms of an end-to-end view of the business” (B1 20:55, 29).

4.2.3 Market evolution

After the CSD implementation, electronic settlement was found to be a basis for other value-add products and services which helped to differentiate the business. The new electronic settlement model led to a significant increase in transaction volumes in an existing custody-related product, securities lending, the back-office of which was operated by the business. Further, a unit trust services product was “discovered” (B3 25:27, 177) when the underperforming product was transferred to the business from another business unit, and a new system to automate processes was implemented. Another custody-related product involving a system implementation was investment administration. A manager put it like this:

Once [the CSD] was in place - that was just one of the building blocks - once the whole dematerialisation process and the system change was in place, we were able to add ... value-added type of products and services which we'd never, ever been able to offer.... With our experience of having gone through a big system implementation.... we were approached to takeover the trustee business and we put in a system ... to automate those processes.... And it would be the application of that learning to allow us to add additional products to our suite. In addition to that there was investment administration, which again was a new system implementation, a new product utilising our existing business. (B3 43:57, 287)

As a result of additional systems associated with the new custody-related products in the business unit, the system support function took over support of all the systems. The function expanded to include minor enhancements and IT projects. A manager noted: “Subsequent to them taking on additional systems, that role just grew from a support perspective [into] minor enhancements through into projects as well” (B2 24:2, 17).

The business focused on improving client service levels through automation. The efficiencies created through automation were seen to provide a competitive advantage. A manager recounted:

The system has always been seen, and even up to now, is always still seen as a competitive advantage, because it depends on the approach [that] you've taken. How much of link up you do with your external points and the interfaces that you're automating. The approach that we've taken is a larger portion of automation than what we know of [Organisation A]. (B2 24:12, 45)

Apart from an annual communication compliance upgrade and ongoing CSD compliance requirements, minor enhancements to streamline operational processes took place continuously. Due to rapid change in the market, there was no time for business process reengineering. A manager explained: "Automation has always been a key feature. It's because of the rapid change that we've been going through. There isn't time for total reengineering" (B2 24:58, 137).

Formal development procedures were followed to implement custody system enhancements. Typically operations identified an operational process 'gap' that required a system change, the IT project team specified the business requirements, the system impact was analysed based on a costing by the IT vendor, the vendor did the development, and the enhancement was implemented. Any system changes were known in advance and their implementation was planned.

Soon after the CSD implementation the operational area started to get used to the new processes and to request system changes. However, changes were requested at a faster rate than the IT project team could turnaround, partly because it was preoccupied with resolving system performance problems. Hence, a custody support team emerged within the operational area in order to help deliver some of the more minor changes. As a result, roles between the two teams became unclear, and when management changed the new management started to question the value of the original team. A manager recounted:

Management changed and the understanding of the value that [the IT project] team brought to the party was totally dissolved, as a result of another team that sprung up, that started looking and saying, "'Quick wins' we can deliver and you guys deliver more changes of a bigger nature." And it disempowered [the IT project] team to a large extent, because there was always crossing of roles. (B2 24:44, 104)

Subsequently, management realised the value of the IT project team when major problems occurred in the market with the aborted market implementation of electronic money market settlement. The value of the team was seen to lie in the experience of the team members in minimising operational disruption. The team value was also recognised in their ability to bundle together a set of enhancements. A manager put it like this:

And it had to come about through a major debacle ... with the implementation of 'money market'.... At that time, the management team realised the value in [the IT project] team in terms of what they delivered to help sustain the business through that process. Just through the foresight, insight and knowledge that was available in the collective brains of [the] team.... The value was really seen ... in being able to contain [the operational impact]. And being able to take these smaller initiatives and constant change and bring it together and deliver a meaty parcel. (B2 24:45, 105)

A considerable systems investment was made in the money market electronic settlement initiative. The investment was based on a view that being “a dominant player” (B3 25:12, 81) in a competitive market, participation in market initiatives likely to succeed was necessary in order to retain market share. A manager explained:

It's a competitive environment, and if you're not the first to be there, you're going to lose your market base. That has been our approach in the market initiatives. That we would look and assess the probabilities of it succeeding and internally we'll say, "If it does go that route ... we want to be the first in." And that's what has cost us a lot in the past, especially with the money market project. (B6 29:6, 51)

The system development was done by the CSD and the custodians from a settlement perspective. Managers attributed the unsuccessful market implementation to the traders', in particular the issuers', requirements not being properly taken into account. A manager explained: “The money market [project] fell through because the primary stakeholders weren't taken into account, and that was the issuers” (B1 20:31, 177). Managers recognised that there was no accountability to a regulatory body for the main requirements, unlike earlier market initiatives to implement electronic settlement of bonds and equities.

As a result of the failed implementation, the development was unused. Managers questioned their approach to market initiatives. They realised that they needed to ascertain market accountability for the requirements of an initiative. A manager explained:

We went and developed the system, based on the perception of what could be achieved in the market. And then down the line, as it was pointed out, there was a big gap [in the requirements] which couldn't just be fulfilled within months.... In future, there's more [work to be done] to ascertain that the initiative that's being triggered has at least some accountable body. (B6 29:6, 51)

Further, they realised that the relatively low volume of money market transactions did not justify the investment made, and the transactions could have been settled using the CSD front-end tool without systems development. They also questioned the CSD's motivation for driving the initiative, because the type of settlement model used could also eventually be used for equities and result in disintermediation of some custodian revenue by the CSD. A manager explained:

“The bigger picture being, [a] move towards a ‘central share register’.... The issue is if there was a ‘central share register’ ... and if you move certain functions away from the [CSD] participants, the market doesn’t change. You’re just cutting up revenue flows and distributing that amongst other participants. (B3 25:13, 85)

Further, the business implemented a dual operational processing site as part of a bank project. Due to a substantial growth in equities settlement volumes processed by Organisation B, foreign clients had requested a second operational site to mitigate risk in the event of a disaster recovery. A manager described the implementation as, “taking your operating model and making a mirror of it at a different geographic site” (B1 43:37, 231). Apart from some ‘teething’ problems identified in splitting skilled resources across multiple sites, the implementation was seen to be an application of project and change management practices learnt. A manager noted: “We’ve learnt that you need to create a proper project for it and be cognisant of the change impact on people” (B1 20:37, 237).

From an operational perspective, achieving and maintaining the *Global Custodian* rating became an important goal for Organisation B and “a passion in the business” (B2 43:38, 233). A manager recounted:

Another thing that management tried to do is instill the importance of this rating with staff. And so [the] staff was acutely aware of the importance of improving on last year’s scores. (B5 37:11, 69)

The goal was driven to a large extent by rivalry with Organisation A. The two custodians competed for both clients and staff. A manager explained:

We see [Organisation A] as a major competitor. Because of the likeness of systems there’s a large flow of personnel as well. And management also moved across at a point in time.... Getting the rating, or working towards keeping the rating, it is something that’s out there, and it’s to a large extent rivalry. (B2 24:52-55, 125)

In the early 2000's, the rating was highly regarded in the market, and Organisation A was the first and only local custodian to achieve a cross-border client rating in two successive years. A manager noted: "One of the big aims since implementation of [the CSD] was to get the 'top rated' status at Organisation B" (B5 37:7, 49). The business started an operational process optimisation project with a main objective being to achieve a rating. A manager explained:

And [Organisation B] entered an optimisation project... Because if you get a rating, you're seen highly in the [country] market, you're seen highly in the eyes of your clients, and at that time, it meant that the custodian is dependable, [and] reliable. And that's what clients want. So at that time, it was the 'carrot'. (B8 36:23, 157)

In addition, because claims had a negative impact on how Organisation B was rated by the *Global Custodian*, a "huge focus" (B5 37:3, 25) was placed on clearing the backlog of corporate action claims from clients. A manager explained:

Any low ratings in corporate actions because of claims will have an effect on your overall rating and getting, or not being rated, in the market. That was one of the big reasons why there was a focus on getting those old claims resolved with clients. (B5 37:5, 45)

The rating was seen as "success or failure" (B8 36:31, 181) with nothing in between, which was found to boost staff morale when it was achieved, but to be demoralising when the scores were down, despite staff having worked hard. A manager noted: "It's demoralising for people if you give a 100%, but the scorecard says I'm only four out of seven" (B8 36:31, 181).

The business requested the *Global Custodian* to include a domestic client rating as well as a cross-border client rating. Subsequently in 2004, the business was 'top rated' in both the cross-border and domestic categories, but dropped to 'commended' status the following year. Maintaining a 'top rated' status was found to be difficult, although subsequently, it was achieved again in 2006 in the cross-border client category and in 2007 in the domestic client category. To improve the rating, managers started to analyse client comments in the rating, and to try and understand client expectations and perceptions through questioning and probing. The rating changed from being used as marketing tool to being used as a tool to engage clients. A manager recalled:

Through the process of interviewing and searching and trying to understand what were the shortcomings.... Those were benchmarks that were used from the market... And that process of determining, understanding, [and] questioning, there're gems that come out [to] say, "Here's something that you're doing wrong." So we need to fix that. But then there're also those perceptions that are out there that need to be managed. (B2 24:53, 125)

The rating was found to be an indicator of how quickly a custodian could implement changes, because client service expectations continued to change and grow. A manager noted: "The minute you become more in line with a first world settlement market, the clients' expectations create the need to change your business to meet those expectations" (B1 43:42, 235). Another manager observed:

What it [the survey rating] does indicate, and this is through engaging our clients around the feedback ... [is] how quickly we are able to get to market around those changes.... Also our clients' standards [change] each year. What was a value-added service becomes a norm in the following year. So there's always a stretch target that we're chasing. (B4 34:9, 53)

Over time, there was a "paradigm shift ... from 'processing shop' to 'client centred [service]'" (B1 43:46, 257). Managers found that electronic settlement enabled processing to be more exception-based, making more time available for servicing clients. A manager explained: "What we did with the technology allowed us to look [at] it more from an exception perspective, and that freed up some time to allow servicing the client" (B1 43:48, 261). They slowly recognised that the industry had become a service rather than a processing industry. The manager noted: "There was more recognition that because it's now a service industry as opposed to a processing shop, it needed a different paradigm in terms of your culture" (B1 43:44, 243). The shift only took place as the market became more competitive, even though client service had been spoken about for some years. A manager observed:

We have come a long way.... There was a perception of take it or leave it in terms of our service. At that time, that was possible because we still had the better service offering and capabilities. (B5 37:6, 49-53)

A client centric approach was found to involve more flexibility and interaction in servicing, as well as taking responsibility for the client relationship. A manager put it like this:

It's in terms of a more flexible approach, the client centric approach, which in the old operational environment just didn't exist.... "We don't bend, you'll have to bend." Over the last couple of years, it's very much more around that flexibility; and more interaction at all levels, and ownership of the overall relationship.... But it's difficult to achieve. (B1 20:15, 77)

Over time, the importance of the *Global Custodian* rating in the business also changed. Managers realised that a number of factors contributed to the rating besides operational processes and staff motivation. In addition, several continuous measures of client service were put in place, such as weekly and monthly error reports and a quarterly error trends analysis. Trends were analysed to determine the type of issue; for example, client, regulatory, training, or processing. These measures enabled the business to be more proactive in terms of correcting errors. In addition, more frequent service evaluations were done with select clients. A manager recounted:

We've learnt and we've evolved since then.... Within our business, it's [the rating] not as important as it was ... because now service is a way of life. There're other ways of measuring our service to our clients.... Now there're continuous measures during the course of the year and then we know if we're dropping the ball or not. (B8 36:24, 157)

Reflecting on the transition from physical to electronic settlement, managers noted that operational processing had become a lot more efficient and as a result, the market more competitive. The business processes had changed, although the custodian business of settlements and corporate actions remained the same. A manager put it like this:

The way we did the business changed but our business never changed. We still made money from settling trades and assets under custody. So from a market perspective, the market became a lot more efficient. Which is probably [the reason the country] became a more attractive destination for indirect investment through the markets. (B3 43:52, 283)

In short, operational processes became more “systematic” (B11 40:1, 17). The market infrastructure enabled electronic delivery solutions with clients and processing of higher transaction volumes. Over time, settlement became more exception-based. The consistency in corporate action messages reduced the number of client queries, and corporate action claims reduced as a result of on-time settlement. The nature of client queries changed from transactional to information requests. Fewer staff members of a higher calibre and with greater

market knowledge were required. In addition, more staff interfaced directly with clients.

4.2.4 Outlook

Organisation B had become significantly more profitable in recent years, largely as a result of increased market transaction volumes which had enabled the business to achieve economies of scale on its technological platforms. Custody was seen as a “game of scale” (B3 33:1, 14). As a result, the business unit’s profile was raised in the bank and there was a better understanding of the business amongst the bank executive. The business unit was no longer a cost centre in the bank but a product area generating revenue. A manager explained:

Only probably in the last three years have we seen a huge increase in volumes in our market and [a] huge increase in assets under custody.... We saw the scale of our operation coming through by having the system in place.... And from our position within the bank, that’s changed how we’re seen.... From a profitability perspective within the bank, the profile of our division has been escalated. There’s greater understanding of our contribution and a better appreciation of our business. (B3 43:55, 283)

The business offered custody of assets in the local market, as well as global custody to local clients investing in international markets. Global custody was provided through an alliance with an international bank, as was typical of the local custodians. The alliance had been in place with a global bank custodian since prior to the equities dematerialisation.

The management of Organisation B had recently changed. The new head questioned the significance of the *Global Custodian* rating as an all important goal. Managers realised that rather, servicing clients was important and the rating was a “consequence of the work ... put in” (B4 34:36, 193). A ‘top rating’ was also found not to be necessary to obtain support in the bank. A manager put it like this:

You don’t need the survey [to] get you that profile in the bank. All you need to do is bring in the revenues - keep our clients happy and cross-sell them as many products as you can - a slightly different focus. That’s the direction we’re going down. It’s not like a carrot that we’re dangling in front of staff.... It’s an accolade for a job well done. (B4 34:37, 197)

Organisation B had also recently experienced a high operational staff turnover. Consequently, there were increased settlement errors and corporate action losses due to less experienced staff. There was a renewed focus on the 'learning hour', the scope of which had broadened since it was first instituted, to look at impacts across operational areas. Accordingly, especially in the settlements area, there was an "expectancy not to make errors and to get the basics right" (C8 36:30, 177) to enable improvement. A manager explained:

Being an operational area is simple. We need to get the basics right every single time, and if we do that, clients will be happy. If we do that then we can evolve and move forward.... That's just the basic premise. (B8 36:27, 165)

'Change fitness' in the form of continuous operational improvement was identified to be part of Bank B's culture. A manager noted: "If there're small changes we are a 'change fit' company; part of our culture is change" (B8 36:30, 177). Part of what made the business 'change fit' was seen to be a common mindset that had come about with the implementation of the CSD, of continually questioning how to be the best in the industry. A manager explained:

That mindset change [happened] when [the CSD] was implemented. It wasn't as if this was one big task and now we're done with it. We have this mindset in our business that we always need to be the best, and what is it that we need to do to be the best? (B4 34:16, 105)

The IT project team had evolved into two distinct sub-teams. The two teams were the main IT project team with a future focus and a business support team with more of an operational focus. The idea for the two teams had come from the bank IT area which had experienced similar problems in terms of different teams competing to some extent, due to a lack of role clarity. A manager explained:

What we have done - IT [bank IT area] has started this whole thing and then gave us the impetus to work in their shadow. They went through all the problems and the troubles. We saw of all this. And they separated their teams and called them a [support] team and a [project] team. (B2 24:49, 109)

The IT project team was concerned with any new products and initiatives that required new system development, such as the money market initiative. A manager described the scope of the team as: "Any major change, or any major initiative, that consumes the resources or personnel and is part of the strategic

objectives, or the drive of the business, or the future of the business” (B2 24:49, 109). The function of the team was to deliver those products and initiatives into operation. Work was taking place on a methodology to support the delivery.

The business support team provided support to the business operations across geographically disparate locations that used the same system. The support team resolved system-related problems. Documented processes included a business impact assessment of system-related problems. The team was also tasked with automating to streamline operational processes and manage exceptions. A manager recounted:

[For a] system process, we still look at saying, "Let's automate to the nth degree", so [that] we take away the pain of the operations. There are exceptions and we look at managing the exceptions rather than the process. (B2 24:59, 137)

In terms of proposed major market initiatives, market research was conducted to assess the implications of an initiative. Market trends were analysed and initiatives were systematically ‘unpacked’ to identify possible impediments. The experience of other markets undertaking a similar initiative was applied to the local market. A manager explained:

You research. You might find markets that have gone that route and [can] also enquire in terms of what their experience is.... That helps to set the scene to say, "We're better off approaching this problem this way, because there are markets that have gone that route. They're successful." Instead of just going blindly and then we end up with the ones that couldn't pull it through because there's some things that they didn't think of. (B6 29:13, 95)

In general, the custodians worked cooperatively in workgroups on issues of common interest, such as Basel II - an international risk management framework, although promoting their own organisational objectives. Managers identified a number of potential operational efficiency improvements in the local market based on what had been learnt as the market evolved. These included more exception-based communication rather than continuous reporting, and more automation of corporate actions, seen as the riskiest operational area.

From a competitive perspective, custody was recognised as having become largely commoditised. A manager explained that the CSD had largely “levelled the

playing field amongst custodians” (B4 34:1, 17). As a result of the competitive market, the business faced increased pricing pressure especially from foreign clients conducting off-market trades. A manager explained: “We do [settle] the most off-market trades in this market, and that’s a consequence of the fact that we have a lot of foreign clients in our book” (B4 34:29, 165). Because the business was “defending” (B4 34:38, 201) its market share the pricing pressure was particularly acute. Pricing was also constrained by CSD fees. A manager put it like this:

Over the last 18 months to two years ... we’ve come under tremendous pricing pressure ... and you want to provide a premium service, but clients aren’t prepared to pay a premium for the service. It’s become fairly commoditised. (B3 25:6-7, 53-57)

Managers questioned the future profitability of the business. A manager pointed out, “custody is becoming something that you can’t be dependent on; it’s becoming a very [much] commoditised product” (B3 25:3, 9). In addition, with the profile of Organisation B raised in the bank, the business had “tough targets to meet” (B1 20:26, 141). Competition existed among business units in the bank to justify capital investment in infrastructure. Sustaining significant returns on investment was seen as a challenge.

The profitable business of global custodians, such as the business’s alliance partner, was identified to be in value-added products as opposed to custody. These products enabled the custodians to differentiate their client value propositions in competitive markets. A manager observed:

If you look at the products and services that global custodians offer, they’re more value-added type products and they almost have custody as a commodity. And you don’t make money on custody; you make money on your value-added services. (B3 25:1, 5)

Since the CSD was implemented, the business had implemented a number of value-added products and services to differentiate itself from competitors and it also operated in several regional markets. However, a challenge was identified in continuing to ‘move up the value chain’ and stay ahead of competitors in a rapidly changing environment. A manager put it like this:

What we have realised is that as we’ve moved up that value chain, our competitors are constantly on our tail. So what differentiated us yesterday

is not what is going to differentiate us tomorrow. And that is always our challenge - how do we innovate [and] always stay ahead of that curve (B4 34:24, 129)

From a market perspective, a strategic initiative prioritised by the stock exchange and under discussion was a move from a T5 to a T3 equities settlement cycle. The business supported a move to the shorter settlement cycle in order to align with international markets and to provide opportunities for additional services. However, as previously noted, its approach to the market initiative was to analyse potential impediments. Several issues were identified that highlighted regulatory differences across markets, such as taxation, which would have to be taken into account within a shorter time period. These were particularly relevant to Organisation B because a large component of its book was off-market. The off-market settlement component was still seen to be ignored to some extent. A manager described the approach:

There's a project that we're involved in with the [stock exchange] moving to T3... We sat back and said, "What will it mean for us to move to T3? What are possible impediments that we could experience along that route?" And there're a lot [of issues] that have been identified.... Those are [examples of] issues that highlight the [degree of] uniformity across markets and [those issues have to be taken into account] within a shorter space of time. (B6 29:9, 71)

Another strategic market initiative, a move to a 'securities ownership register' held at the CSD, a type of 'central share register'. The initiative was seen as contentious because it could enable the CSD to disintermediate certain custodian revenue streams. Managers had not identified a clear market business case for the initiative, nor an established global market trend among many alternative market settlement models. An element of denial about the initiative was identified in the business, to be similar to that prior to the equities dematerialisation. However, there was also a focus on understanding the potential impact of the initiative, as with other market changes, and on managing around them as a result of experience gained. A manager noted: "However, we have the experience from what we've gone through to help us counter that [initiative] and any [other market] changes that do happen" (B3 43:61, 308). Another manager put it like this:

The whole question of SOR [Securities Ownership Register] for example, it's a debated concept and it's almost a concept of what was in the pre-dematerialisation days. In the mind of a large number of people it [dematerialisation] was never going to happen. In the mind of a large

number of people now, it's [SOR] also seen as never going to happen. It's [SOR] a function of the future that will happen.... That impact is out there [and] is being studied to understand the virtual impact to the business and how you manage around that. (B2 43:39, 233)

In terms of responding to market changes, there was discussion amongst managers about the future business, given increased competition. Global changes also contributed to the competition. For example, an acquisition or merger between global custodians with different local custodian service providers could result in a choice of a single local service provider and a consequent loss of business. Thus, the business focus had shifted from “a present focus” (B1 43:73, 382) centred on gaining custody operational efficiencies and effectiveness to “a strong focus on [the] future and meeting future targets” (B1 20:19, 89). The future focus had also broadened to take account of the global context of the bank. A manager observed:

We've moved away from small efficiencies into a real future scenario, and [we're asking], “How are we going to regroup and form ourselves to meet that future?” Because it's not just change in [Organisation B], it's change within [Bank B] because we're becoming global. (B1 20:19, 89)

Because custody was largely commoditised, managers recognised that the business needed to be proactive and further diversify. In particular, it needed to innovate by adding more products and services as a means of differentiation. They also anticipated that experience gained in becoming ‘change fit’ would help the business to further diversify. A manager put it like this:

It's a commoditised product.... We need to be proactive around that and look at additional products and new services to further 'lock in' our clients. So that would drive innovation for us to be open to change. And probably having gone through change we're quite 'change fit'. (B3 43:65, 336)

The main focus was on ‘moving up the value chain’ by diversifying into other products ‘built around custody’. The business focus was also on retaining clients. Custody, and the relationship with the CSD, was seen as “one component” (B1 20:26, 141) of a future broader business model. A manager put it like this:

'Moving up the value chain' would be the main focus, given that these other businesses are essentially built around custody. It's a major product at the moment. If you look at the threats in the market, there's only downside to domestic custody, particularly with pricing pressure.... So, the

focus is more on product diversification and retention of clients. (B3 25:30, 185)

More extensive product diversification of the business was also prompted by the market initiative of a 'securities ownership register' held at the CSD. As previously noted, the initiative could result in disintermediation of certain custodian revenue streams by the CSD, and had created uncertainty about the relationship between the CSD and the custodians. A manager questioned:

Are they [the CSD] partner or is the whole relationship with the market infrastructure also undergoing change? And [it] has from its inception. There's a lot of dynamism in the system that needs to be constantly reviewed and that's what we have to do. (B1 43:62, 310)

However, the market initiative was identified to be a "probability" (B6 29:8, 63) because it could gain market support. Hence, it had prompted the product diversification focus. A manager explained:

"What else can we offer our clients to keep that relationship with our clients?" Then we started looking at other products that we can offer to clients and looking at custody differently to what it is now.... That's a total paradigm shift. (B6 29:8, 63-67)

More extensive product diversification was identified to be a major change to the future business. However, its product diversification experience contributed towards the business being more accepting of further change. Although there had been no major changes with the CSD since it was implemented, electronic equities settlement had enabled the business to grow and change its business model in the form of value-added products. A manager observed: "It's just been easier, as a result of that huge change to where we are right now" (B3 25:23, 161).

Managers recognised that "'change fitness' and [an] ability to be flexible" (B1 43:79, 428) was required to reposition the business in a changing environment, given uncertainty about future scenarios. In contrast, changing the business for electronic settlement was seen to have been reactive to an external event. A manager observed:

Strategy is not something you solve. It unfolds, and it changes, and it re-emerges, and we need to be positioned to cater for the flux. And that's a very different type of business.... It [changing the business for electronic

settlement] was almost reactive to something that was happening externally. Now the model is, "Given that scenario, and given what's happening in the market, where do we position ourselves?" (B1 20:20-23, 93-125)

As part of being more flexible and responsive to the dynamic market, the business needed to innovate more quickly. A manager explained: "You don't have the luxury of being able to take two years for an implementation of [the custody system], for example. With the maturity of the market ... the business model is very different" (B1 20:22, 117). A 'balancing act' was identified in innovating to keep pace with a rapidly changing market while, at the same time, maintaining operations. A manager explained:

The market is moving at this rapid pace, and we need to keep track with that and keep this balancing act of continuously servicing the clients and making the revenue and keeping the business afloat. (B2 43:41, 233)

In particular, discussion amongst managers centred on the processes in the IT project team and "how to split it [the team] between an operational and a future orientation" (B1 20:34, 221). The intention was to move the operational support component out of the IT project team into the operational area "without introducing risk" (B1 20:34, 221). A manager put it like this:

We're putting things in place to create that facility to focus. So structurally ... you can separate the two. You've got your operational [focus] and your future focus. From a structural perspective you can reflect that in the way that you have your people's minds focused. (B1 20:27, 149)

In addition, the intention was to create a product development team in the innovation area as an outgrowth of the business support team. The purpose of the new team was to introduce new products to grow the business due to the maturity of the custody product. A type of product team had previously existed before a business restructure. The purpose of the new development team was to introduce new revenue streams based on the custody platform. A manager explained:

The maturity of the business has an impact on your future view of it. Where is it in the cycle? And that's why the new product area will be introduced again. (B1 20:22, 113)

Further, the product development team was also intended to better share and utilise specialist expertise gained over a period of time. Specialists could promote

understanding about operational processes. For example, one analyst stimulated thought amongst project team members by encouraging practical questions. A manager described the value of experience:

The experience of looking at a situation, and reading into a situation and understanding from past [experience] ... and making those calculated guesses, and taking those value judgments.... Experience is something, as much as you can share [it], you can't teach [it] because experience is something that you gain. (B2 24:62, 45)

Managers expected that once the operational support component was moved out of the innovation area, the area would become “totally focused on growth and change” (B1 20:29, 153). They envisaged that a future-oriented innovation area separate from operations could play a much stronger role in leading strategic changes in the business.

Another important element identified in being more proactive in responding to market changes was market research. Managers recognised a need for a greater depth of awareness of the global environment in the context of the bank. In contrast, past response to market changes was seen to be largely reactive. A manager explained:

You have to put more research in. You have to be more aware of what's happening globally. You have to know what's happening with the bank globally. Your antenna has to be out there.... It's about the quality of the awareness, rather than in the past it was [very] much reactive. Now you have to be more proactive. (B1 20:24-25, 129-137)

In addition, ‘emerging realities’ in the market had prompted managers to question the reasoning underlying current operations in order to resolve a market issue. For example, as a result of increased pricing pressure from clients, managers questioned a client billing method. A manager pointed out that the custody business had moved from “vault keepers” (B6 29:1, 19) of physical securities to “record keepers” (B6 29:1, 23) of electronic securities. However, remnants of the physical settlement model persisted. The billing method was still based on the value of assets held under custody in a vault, although the cost of electronic record-keeping was independent of asset value. Further, the relatively high charges posed a threat to the existence of an exchange and to the regulation it provided because large investment banks could circumvent it. The manager explained:

The mindset is still based on the old processes. That's one thing.... And there are threats already with the first world markets where they're saying ... "We can trade amongst ourselves and not necessarily go through an exchange."... Those are realities that are emerging. And that's what we have to drive [to] the back of to say, "What's the way forward?" (B6 29:14, 31)

Organisation B was taking steps to enable a more proactive response to market changes. These included putting in place project management structures to help it innovate more quickly, and market research and analysis to help it generate a greater depth of awareness of the global environment.

4.3 Organisation C

4.3.1 Market planning

Organisation C was one of the larger bank custodians in the local market in terms of market share and presence. It had a predominantly local client base.

Paper-based operations in the physical equities settlement environment were highly pressurised due to an increase in trading volumes with the advent of electronic trading. The labour-intensive nature of the work meant that it was organised in 'silos' with little time to look beyond a team silo. For example, the equities settlement area was organised into different teams for purchases and sales. A manager noted: "You just had all that paper and you just had to push it out.... You had no idea what was happening in this [other] silo" (C6 22:50, 306). Typical of the industry, the bank executive had little understanding of the business, partly because it dealt in specialised financial instruments. A manager recounted:

This was one area of the market that very few people were 'au fait' with from a bank perspective. And all the [custodians] would have had similar cultures. It was normally the 'orphan child' part of the business that was left to run on its own. No one really bothered, because it wasn't banking in the true sense of the word. You were part of the bank, but you dealt in instruments that not a lot of the market dealt with. (C3 26:11, 14)

In particular, the complexity of corporate actions was not well understood in the business including the risk impact that failed trades had on corporate actions. For

instance, a marketing practice offered clients corporate action entitlements on traded positions before settlement was finalised. Because trades sometimes did not settle, the practice was subsequently found to compound problems in reconciling share positions. A manager explained:

A lot of the problems within [Organisation C] were that you had a lot of pending trades. You'd paid for something that sometimes didn't settle, and you had to get the money back. It was a huge matter from a reconciliation perspective. (C8 28:9, 42)

Managers were aware of market planning at an industry level of a move from physical to electronic equities settlement. However, the conceptual planning phase in the market was perceived to be taking too long and the business could not wait because it was in decline and losing market share. In particular, internal fraud led to a decision to reengineer the business in the physical environment. The decision resulted in investment in a new custody system, partly because the controls in the existing custody system were loose. A manager noted that, "everyone had a hand on" (C6 22:22, 134). A manager put it like this:

Because it's a highly securitised, high risk business to control administratively, we were losing quite a bit of money internally due to fraud. And a call was made to reengineer this entire business. And they were playing for time, knowing that from an industry perspective [that the CSD] was coming along. But we just couldn't wait any longer because this conceptual phase from [the CSD was taking too long]. (C2 19:3, 14)

A "strategic decision" (C10 6:1, 18) was made to purchase a custody system from an international IT vendor, rather than to custom-build a system. Although an effort was made to determine the market direction in terms of electronic settlement, it was later seen to be too early in the planning phase. Hence, the system was chosen based on assumptions that its electronic settlement component would largely meet the local market needs in an electronic environment. A manager recounted:

We tried to research what [the CSD] team was doing, to see where they were going, but it was very premature. And we were pressed against time because of internal issues. We thought this [custody system] was going to be the best fit and we made the call. (C2 19:5, 18)

Once purchased, the physical settlement component of the system was customised for the paper environment by operational managers. In addition to the

system investment, international consultants were brought in to help with reengineering the physical environment.

During the system implementation, client holdings were gradually migrated from the old system to the new system. However, the migration approach was later found to be flawed leading to “turmoil” (C2 19:8, 22) in the business and to further losses. At the same time, a new management team was brought in to replace managers that had left, and a move was made to a new building with a significant investment in security infrastructure to prevent fraud. A manager put it like this:

While the business was trying to bed down the transition [to] the new system, we moved buildings. We put in a new management team, we moved from the old [building to] new offices, [a] new working environment [with] glass tops [tables with] no draws [and] no place to hide paper. All the learning from an operational side which we experienced at [the old building] we were eradicating. (C2 19:8, 22)

Computer literacy training was provided by a trainer brought in from another area in the bank, and training on the new system was provided as staff gradually moved from the old building to the new building. However, the staff experienced difficulties in adapting to the new processes. At the same time, transaction volumes increased dramatically due to the impact of electronic trading. Staff worked long hours to handle the high volumes. Additional staff members were hired to try to increase capacity, but were found to lack appropriate skills.

To help resolve the system implementation problems, the bank executive assigned experienced IT project management resources from the IT area in the bank to the business. A key problem identified by the project management team was little operational expertise in the business. In particular, the operational managers that had been involved in customising the system had left. A manager recalled that, “we lost knowledge of why and how the processes were specified the way they were” (C11 7:9, 103). In addition, there was little expertise in the bank IT area of how to support a custody system, because support of the old system had been outsourced to a local IT vendor. Further, operational processes were found to be inefficient and complex with multiple handovers between different parties. New operational processes designed by the consultants were seen to be largely “ignored” (C11 7:9, 103) and changed indiscriminately.

The IT project management team started to apply a formal project management methodology and disciplines. In addition, further resources were brought in from other areas in the bank to help understand processes, and external change management consultants were brought in to help staff members to adapt to the new processes.

Despite implementation problems, the more stringent equities settlement processes in the new system included a 'flow status' which enabled share certificates and deeds attached to a trade to be tracked between different operational areas. Although cumbersome, tracking of the paper was found to be an important step in controlling the paper environment 'like a factory'. A manager recounted:

They started introducing tracking systems to track the physical certificate. And it's only when they started introducing systems like that, that the management became better. The controls of where it could be, and where is the delay, and where is the slow-down, and they could pick up all of that. Because then they started applying the correct operational ways of doing things, like a factory. (C4 27:22, 78)

Meanwhile, market planning continued. An industry decision was made to go ahead with the move to electronic equities settlement. It provided an incentive to the banks to stay in the custody business. Generally, the custodians were seen to be willing to move to electronic settlement because the "antiquated paper settlement couldn't keep up" (C9 18:1, 23) with the surge in volumes due to electronic trading, and the risk of losing track of paper certificates was high. Once the decision was made, a timeframe was put in place for the market implementation of electronic equities settlement across five phases, known as the CSD implementation: (I) pilot settlement, (II) settlement, (III) corporate actions, (IV) securities lending, and (V) further corporate actions.

The industry decision led to a greater commitment of resources by Bank C to the initiative and to the business. In particular, at about that time, a joint venture was formed with an international bank to provide expertise and funding to help with the investment in electronic settlement infrastructure. Subsequently during the CSD implementation, the venture partner was found to help provide electronic settlement expertise. A manager recounted:

Their experience played a vital role to us. And we always found [that] if we were stuck with a solution on [the CSD], we would bounce it off the [joint venture] people.... we would find some bright idea coming out of that, to get a solution. (C2 20:71, 379)

In preparation for the move to electronic settlement, a balancing and reconciliation project was set up to quantify the risk in share positions. Financially skilled people from other areas in the bank were assigned to the project. In addition, the venture partner provided skills and expertise. The project undertook various exercises going forward enabling significant recoveries over the years. It instilled a reconciliation and exception management discipline which was seen to be required in an electronic settlement environment. A manager recalled:

And the reason why we did that is such that when we moved into a [CSD] scenario, we did not have a lot of historical [issues] to deal with. And you had things that were kept in balance, and you maintained that going forward. That allowed us to change the culture in the area of reconciling and managing the exceptions timeously. Because that's the type of temperament and culture [that] you needed to have in a [CSD] environment. (C3 26:4, 6)

Reconciliation problems were interlinked across the market due to corporate action claims as a result of transactions that were not settled. Trust was gradually built up with clients through transparency and efforts to work together in reconciling items. A manager put it like this:

And it took a long time because you had to build up trust with the client and you took it piece by piece.... now that there's a lot of trust from both sides, because at the time it was really tough. We helped each other. (C8 28:5, 30)

The focus was on resolving problems in the business, refining the processes, and stemming the losses in the business. The combination of measures put in place, including the reconciliation discipline and paper certificate tracking, helped significantly to manage and control the business. A manager recalled:

Great strides were made ... to deal with the legacy problems, to deal with some of the main problems within the system, to clean out the old, to refine the process and [to] close the holes in the bath so that it can stop leaking. That was the focus. (C4 27:27, 98)

4.3.2 Equities dematerialisation

Having just completed the transition in the paper environment, the business was faced with the transition to an electronic environment. Managers realised that considerably more substantial changes would be required to customise the custody system for electronic equities settlement in the market than originally assumed when it had been purchased. A manager recalled, “When we thought originally that it would cater for a dematerialised environment, we were unaware that we had to make so many substantial changes” (C2 19:19, 54).

Given the complex nature of the transition, a decision was made to go against the norm in the bank at the time and form a dedicated project team to see it through its multiple phases without having to necessarily re-skill resources. A manager explained:

So what we did then, we said, “We’d best form a project team which is going to see the whole thing through. We don’t want to re-skill people as we go along. It’s quite difficult.” So we had a fully [dedicated team]. We went against the model which was in operation at that stage. (C2 19:17, 46)

Business analysts in the team included an analyst from the local IT vendor that had supported the old custody system as well as local IT consultants. In particular, the business analyst with experience in supporting the old system was found to greatly assist the project team, acting as a “principal architect [who] would pull everything together” (C2 20: 76, 407). The team also included project and process management resources from the bank IT area. Business resources included custody subject matter experts. A manager noted: “It was a totally dedicated team. And that made it easier for us” (C2 19:18, 50).

During workshops with the business, project team managers realised that staff were unsettled and were not fully participating largely due to fear of being made redundant. As a result, the project team was relocated to a different floor to minimise its impact on operations. In addition, a decision was made upfront to redeploy staff to other areas in the bank rather than to retrench staff at a later stage. The early timing was found to enable staff to be redeployed to other areas in the bank before financial difficulties in the bank set in. A skills-based test was

used to assess staff for redeployment. It was developed and conducted by a human resources manager from the bank and change management consultants.

With the market implementation of the CSD phase I, pilot settlement, the CSD front end tool was used for settlement transactions which were then captured on to the custody system. Use of the front-end tool provided insight into how the process worked. Having gained experience in the costly and lengthy customisation of the custody system for physical settlement, managers focused on carefully understanding requirements for electronic settlement. A manager put it like this:

That [front-end tool] gave us better insight of how this thing was working.... And we just decided, "We've learnt our lesson." And having an expensive vendor ... "We'd best understand our requirements first." (C2 19:23, 70)

The system implementation involved a process of "trial and error with human beings" (C1 25:2, 10) in the operational area. It was found that one team could do in electronic settlement what five separate teams could do in physical settlement. At the same time, the project team "learnt from the working environment" (C7 23:12, 58) and helped with improvements. In particular, the IT consultants assisted with writing 'macros' or small computer programmes to make the transfer of data between the CSD front-end tool and the custody system less cumbersome. However, the 'oiling' process, as it was known, was found to be cumbersome and the business, as well as other custodians, reported at the CSD market workshops that it was not working well. Subsequently, a revised settlement model was designed in the CSD phase II, settlement.

In participating in the market design workshops, project team members from the business found that their project management disciplines were strict compared to the other custodians and to the CSD. A manager noted: "What we found [is] "[Bank C] is a very process-driven organisation." We picked it up. They were very relaxed in their version [control of] their documents" (C2 20:96, 567).

Team members learnt how to interact and negotiate at an industry level. In particular, they found it was important to select people with appropriate competencies to attend the workshops. A manager recounted:

We learnt how to position things better.... how to interact at industry level and come out ... winning the argument. That was a big learning. It taught us that, in future when there's these industry programmes, just make sure you select the people with the right competencies to go to them. (C2 20:100, 595)

In addition, managers placed an emphasis on having separate market workshops to suit different types of competencies, such as analytical and project management workshops. They also held internal meetings to align the business representatives. A manager explained:

There're many different types of competencies [that] you need. If you find that in an individual you'll be extremely lucky. So always break them [market workshops] down ... into an operation-type of meeting, into a decision-making steering meeting and then you [send] your appropriate people. And then [we learnt] how to align these people who go to these different sessions to make sure you have one view of [Organisation C]. (C2 20:101, 599)

The objective in terms of customising the custody system for the local market was to “optimise versus comply” (C11 7:36, 391) with CSD requirements. The goal was, “not [only] to automate but to reengineer to make the business as profitable as possible” (C11 7:33, 366). The design priority was to automate and streamline high transaction volumes. In addition, the intention was to detect transaction exceptions and problems ahead of time to help manage risk. A manager put it like this:

Our philosophy was, “If we get this thing right on an electronic front, you would be able to do a lot more electronically with your technology rather than pushing people to do the [work].” So what ... we wanted to do is for the technology to do the bulk of the work. We only wanted intervention at exception levels. (C5 21:11, 44)

Because managers had found it expensive to make changes to the custody system when adapting it for physical equities settlement, the strategy was to develop a sustainable solution even though they knew that it would take longer than a more immediate solution. There were market level debates on a length of the settlement cycle. Hence, a variable length settlement cycle was catered for as far as possible. In addition, there was talk of equities being “just the tip of the iceberg” (C2 20:30, 178) with other instruments, such as money market and bonds to follow. Hence, money market instruments were also catered for to some extent. A manager recounted:

Some of it was a strategy, “Let’s get it right.” Not because we had to get a sustainable solution, [but] because it was expensive to change this [currency-based] system. So, “Let’s take a bit longer, but it will save us in the long run.” (C2 20:17, 110)

Managers believed that the system solution would provide a competitive advantage to the business. A manager noted: “We believed it. That the solution we were putting in was going to be our differentiator” (C2 19:37, 134). The focus was more on developing a sustainable solution than on achieving the market deadlines. It was intended to achieve a first mover market advantage which could be negated if substantial rework was required. A manager explained:

If we had achieved the [market] dates, we would have sacrificed on quality, and that would have had a long term impact on us. We would have had to have done substantial rework, and we were going to lose our first-to-market advantage. So let’s rather push the timelines a bit further out and make sure what we’re going to deliver is of quality. The big focus was on sustainability. (C2 19:40, 142)

A comprehensive project management methodology was followed. The system development process involved preparing detailed business requirements, operational process designs, and test packs. A manager noted: “We followed the full [Bank C] project management methodology” (C2 20:34, 198). Because a reputational risk was identified in not complying with the market deadlines, a series of software releases was planned. Functionality not completed in one release was carried forward into the next release.

When the bulk equities dematerialisation began in the market, for the implementation of CSD phase II, settlement, the business continued to process transactions manually using the CSD front-end tool. Managers tried to better understand the market requirements from the daily transactions taking place. A manager put it like this:

Then we got the whole roll-out plan [dematerialisation schedule]. And that’s when we started getting momentum. But we were playing for time, because while this was happening and they were trying to figure this thing out, we could figure out from the daily transactions which were coming through, how this thing was really working.... There was a strategy behind it. (C2 19:30, 98)

Initially, development with the custody system IT vendor took place on a remote basis. However, remote development was found to add to time delays, and to put the business at a disadvantage in negotiating requirements at market workshops relative to the other custodian teams which had their IT vendor teams present. Further, Organisations A and B were seen to have an additional advantage in that they shared a common IT vendor with the CSD. After the first few releases of software, managers found that it was more cost effective to bring the IT vendor on site. The vendor also helped to train a system support team in the bank IT area. A manager recounted:

Initially, we had those releases, and it cost us an arm and a leg to get that right. So we took the lessons learned [and] we decided it will be cheaper if we bring two people from [the IT vendor] here for three months. (C2 19:31, 102)

An industry delay occurred in order to design a more complex process, called 'back-to-back' settlements, to accommodate the impact of off-market transactions on on-market transactions. Meanwhile, Bank C experienced financial difficulties resulting in 'severe' cost constraints which added to project time delays. Despite the constraints, managers lobbied the bank executive for additional funding in order to develop a sustainable solution. They pointed out that, "There could be a healthy revenue stream in this business, if we just do things the right way, smarter" (C2 20:55, 319). However, a manager noted that the lobbying itself "took a lot of time and research and presentations ... and it added to our timelines" (C2 20:53, 311).

Delays in system implementation resulted in additional work for operational staff until implementation took place. Due to financial constraints staff capacity was not increased, adding to pressure on staff. Workaround solutions or 'macros' in the form of small computer programmes to extract data outside the main system helped to ease workload pressure on staff, despite causing some communication problems initially. Some of these solutions were later used as a system backup and recovery mechanism. There was a period of 'catching up' to the market in terms of system development which had not kept pace with market development. A manager put it like this:

We were still always playing 'catch up' to the [market] implementations, because a system that was implemented in [one year] had already been in design [one or two years ago]. So by the time it was implemented, the

market was already two years ahead of us. And we had to play 'catch up', and enhance our system pretty fast, and make all those workaround solutions. (C6 22:20, 130)

Pressure on staff was exacerbated by transitional practices during the equities dematerialisation that unnecessarily replicated work because of a lack of complete confidence in the stability of the system. A manager noted: "Lessons have taught us we wouldn't replicate so much work. We needed to believe that the system was stable enough to handle all those things. (C6 22:13, 86). For example, besides the physical and electronic settlement accounts, an additional 'transition' account was created in which transactions were replicated to provide an audit trail. However, the transition account proved to be cumbersome and errors were introduced given the high processing volumes. Another challenge was balancing physical and electronic client holdings over an extended period of time. The challenge was compounded by several practices including the use of the transition account; an approach of dematerialising half the client holdings up-front which in some cases proved to be too much; and the use of both a paper record and an electronic record of share certificates sent to the transfer secretaries for dematerialising. On the latter point, the transfer secretaries themselves were under pressure in processing the enormity of paper which increased the risk of certificates being misplaced.

During the equities dematerialisation, the electronic and physical settlement environments were run in parallel. Training on electronic settlement was done as the staff gradually moved from the physical side to the electronic side. Prior training of all settlement staff on the overall process had taken place, which was found to be an advantage. Managers and staff had a better idea of what to expect, enabling planning and preparation to facilitate the transition. A manager noted: "We had a good idea of what was going to happen. And we took that into account with going forward... We were quite well prepared" (C1 25:6, 22). However, although there was some idea of what to expect, unexpected small issues still occurred until in time they were addressed. The manager continued:

Even though the basic outline was there ... it wasn't that simple in the beginning. Now, yes, because they've ironed out all those little issues. In the beginning ... we were sorting out 'fires' as they started, because we didn't know what all the errors would be. (C1 25:25, 158)

In particular, electronic settlement was found to require a different mindset to physical settlement. For example, there were no paper certificates to see and touch. To convert from the physical to electronic environment was found to be more difficult than entering the electronic environment for the first time. A manager recalled:

You've been in that mindset for many years and then all of a sudden to change that is very difficult. If you've never been in that environment, you'll pick up the new way a lot more quickly. (C1 25:30, 206)

Meanwhile, corporate events were processed twice because client holdings were split across paper and electronic and were balanced back to different records. Staff worked long hours on a sustained basis until corporate actions were automated. Additional staff was bought in from another area in the bank but were seen to have difficulty in grasping the concepts. Balancing was further complicated by certain new corporate events that occurred during that time; for example, a dual listing where a company listed on both the local and a foreign exchange.

The automation of corporate actions, CSD phase III, was delayed from a market perspective because it took some time to finalise. Corporate actions was recognised as a more specialised and risky area than settlement. IT consultants assisted with preparing the business requirement specifications for development by the custody IT vendor. An approach was taken of automating communications with clients as far as possible. Subsequently, a further market phase for more comprehensive automation of corporate actions, CSD phase V - further automation of less frequent corporate events, was cancelled at the market level.

Although a further last software release of lower priority requirements was planned, it was not developed because the dedicated project team was disbanded. The development done was seen to be adequate. A manager noted: "Towards the end of the programme [we said] "We'd better start disbanding this project and let it go now. The business can survive" and that's why we didn't do [the last] release" (C2 20:56, 319). The project team recommended that a business support function was set up in the business to maintain the custody system. A business support team was set up and retained some project resources, although the 'principal architect' and some project management resources left.

4.3.3 Market evolution

A new system was implemented for the automation of a custody-related product, securities lending. The implementation followed the completion of the main CSD implementation as the final market phase, CSD phase IV. Organisation C was seen to be late to the market because it did not already have a securities lending system. The implementation was required due to growth in securities lending transaction volumes as a result of electronic equities settlement. A new project team was set up for the implementation.

In addition, an in-house system was developed by the bank IT area to cater for another custody-related product, unit trust services. The new system was implemented due to additional regulatory responsibilities that came into force for trustees.

The business support function became part of the settlement operational area. It included business support resources. The purpose of the team was, “to maintain [the custody system] and support the business, and have the relationship with the technical people [in the bank IT area]” (C2 20:33, 194). IT consultants and the joint venture partner helped with system development. The joint venture partner was found to be especially helpful in providing expertise on the custody-related products. IT consultants provided both business analyst skills to specify business requirements as well as some system analyst skills. Over time, the function expanded to include system enhancements and projects.

From a systems development perspective, the focus was on recovering the investment made in the custody system. Given ongoing financial constraints, the cost of the last equities software release was seen to outweigh the benefits. Knowing that the market would evolve, managers decided instead to put additional human capacity in place and develop more at a later stage when some of the investment costs were recouped. In addition, they decided to defer development until the business requirements were better understood and the system was stabilised. A manager explained:

Then we thought, “We’ll go to a point and then once we get the people in place who understand [the business requirements] and [we have] bedded

down the system properly, then you can start moving into building more in terms of the system.” (C5 21:3, 4)

Subsequently, the last software release was not implemented even when operations were stabilised because the market continued to evolve and requirements changed. A manager explained, “If we have to look at that one [last release], we would have to redesign it completely, because that has now been four, five years [ago], and the market has moved on again” (C6 22:33, 170).

System enhancements, driven by operations or the CSD, as well as vendor-initiated system updates took place without any major changes. The market evolved resulting in new types of corporate events, such as for dual-listed stock, and changes in trading patterns from mainly on-market trades conducted through the local stock exchange to an increase in off-market trades conducted between foreign clients. A manager noted, “A lot of it started evolving over a period of time, because as people got comfortable with the process of trading on [an] electronic platform, more and more trading went the off-market model” (C5 21:16, 60).

To adapt to ongoing subtle changes in the market an approach was taken of only catering for normal or typical transaction processing in the custody system. Requirements were seen to be too many and complex to cater for all of them in the custody system. A manager explained:

It’s those complexities... To try and keep a system updated the whole time with that, the enormity is just too big. You’ve got to say, “I’ll cater for the norm. Anything outside the norm becomes an exception.” (C5 21:37, 96)

The approach was described by a manager as identifying requirements that “will cater for the norm ... cover the [common] aspects, and ... make the system more efficient and better in its use” (C5 21:43, 112). It was found to require knowledgeable and resourceful staff to identify typical transaction processing requirements to handle corporate event variations, for example. A manager explained:

You’ve got to say, “What is the commonality? How often am I going to have them? And if I combined this and that in the system, can it work?” And those are your challenges. Therefore, you’ve got [to] have knowledgeable staff, experienced staff, but also staff that can think out of the box.... People that can from a knowledge perspective say, “... by doing

this, the system will give me the same result as any normal situation without going to build it.” (C5 21:38, 104)

Exceptional requirements were addressed by developing ‘alternative solutions’ that were seen as enhancements to the custody system, although distinct from it. These solutions were small programmes known as ‘macros’ that were developed outside the custody system to extract and provide information. They were used for exception management reporting, for example. A manager explained: “most of our macros are information macros, not transactional macros” (C7 23:46, 394). They were seen to be a flexible form of development that could be done relatively quickly in-house. In particular, they enabled the business to keep up with changes in the market when it had financial constraints. The constraints were partly due to financial difficulties experienced in the bank at about the time of the CSD implementation and soon after. A manager explained:

When all these components came in the system, [the system] was built very rigidly. It didn't provide exception reporting, and ... other ... things. That's why we did these offshoot systems so that we could do the management exception reporting.... Because we were going at such a fast pace on the market that our system development was not keeping ... pace. We were always like a year or two years behind, and that was the frustrating [for] the staff.... And we weren't able to [go faster], because we had financial constraints. The bank was also going through [financial difficulties] at the same time. (C6 24:49, 207)

The alternative solutions to custody system development provided a form of reporting that helped the business to compete in the market. A manager noted, “The flexibility comes with the alternative solutions that have been implemented, which just give us more time and more ‘hands on’ in terms of exception management” (C6 22:24, 142). Over time a robust management information system was developed.

Formal development procedures were improved to an extent that operational enhancements did not lag behind business requirements. Requirements were discussed together by multiple stakeholders before being documented in a specification. In addition, parallel to development of the custody system taking place by the IT vendor, alternative solutions were developed to enable the business to keep up with client reporting requirements. A manager explained:

Today, when we look at it, the enhancement [alternative solution], and any development that happens, we have all the stakeholders around the table

and have their input, then do the specification. And while the [custody system] specification is still in development, more enhancements [alternative solutions] are put in, so that by the time the [custody] system is installed and implemented, it is on a par with what we're doing, and not behind. (C6 24:49, 207)

A formal system development process was followed for a system change. Typically, business analysts, that were IT consultants, documented the business requirements in a specification, the IT vendor provided a costing and did the development, and system testing was done by test analysts in the business support team as well as by operational users. Project managers in the business support team managed the development process. The major steps in the process were “all documented, [and] all audited” (C7 23:45, 366).

Operational users became more involved in the development process. A manager noted that, “[The users] are involved from the beginning because business drives any change that we need, and or [the CSD] does it” (C7 23:27, 158). The users were notified of an impending system change and were involved in testing it. Operational managers then modified the operational processes accordingly and conducted staff training. In contrast to the time of the CSD implementation, the users were able to test system changes more thoroughly and the test analysts were able to pick up potential problems during user testing. In reflecting on the CSD implementation, a manager recounted:

If ... all the business users [were] really involved, [the analysts] would have seen that there were gaps.... And the [users] didn't have the knowledge or the expertise or the experience to take a step back and say, “What am I going to test?” (C6 22:47, 282)

An investment was made in the CSD initiative to develop money market electronic settlement. Although the development had already been catered for to some extent in the CSD implementation, further enhancements were made. Although the original project had been documented at the time, some of the understanding behind the original development was thought to have been lost without the continuity of some of the resources from the original project team. A manager noted, “When the project team's gone, and the IP's [Intellectual Property] gone, the people who are there didn't understand, “Why is this money market rule in here?”... And some of the code [that] was started, was [probably] tampered with” (C2 20:32, 186).

One of the reasons identified for the failure of the market implementation was because a settlement model similar to the equities model had been used, without fully taking into account the differences between equity and money market instruments. A manager noted: “Money market is a different instrument. It’s got different tendencies. There’s different risk attached” (C3 26:69, 238). Consequently, the failure resulted in the reconsideration of an appropriate money market settlement model in market workshops.

Another reason identified for the failure was because there was no substantial market business case, particularly for the issuers. In contrast to the situation with equities, the volume of money market transactions was relatively low and there was little or no fraud in the market. The issuers were also seen to be familiar with a paper environment and unwilling to change to an electronic environment. A manager noted: “They like the paper, they know the paper, and they were one of the key ones [stakeholders]. To get their mindset changed [would be] very difficult” (C3 26:70, 238). Managers questioned whether the initiative was primarily motivated by the CSD in order to build a ‘securities ownership register’ type settlement model that could eventually be used for equities and result in disintermediation of some custodian revenue by the CSD.

From an operational perspective, soon after the CSD implementation, there was a change in management in the top two levels of the business operations. The new head was found to be supportive. For example, when problems occurred a solution was found before questions were asked about what went wrong. The focus was on further refinement leading to a move away from crisis-handling to enhancing operational processes. A manager recalled:

And further refining came about; an improvement, so much so that we were off [no longer] ‘killing fires’. We were now enhancing the processes, and utilising what was at our disposal to better deliver at the end of the day. (C4 27:28, 98)

In addition, the bank restructured and a three-year planning process was instituted across the bank, with performance management measured on a monthly basis. The restructure resulted in the sales and marketing area and the operational processing area of the custody business coming together into a single business unit with one reporting line. There was no longer a divide between the two sides,

the “dividing wall was taken away” (C2 20:20, 130). Issues were seen to be escalated and resolved more quickly.

At about the same time, the major balancing and reconciliation exercise with clients was completed. Instead of time being spent on reconciling issues the focus changed to managing exceptions and providing clients with additional information. A manager recalled:

We changed the focus with regards to how a client service area should operate, and that one-stop contact. So it wasn't just all about reconciling, it was also more now going into exception management.... We kept the client much more up-to-date with what was happening on their account.
(C8 28:12, 86)

With ‘confidence’ in the operational side, the sales and marketing team focused on acquiring new business. In particular, there was a marketing thrust to obtain foreign clients, who were seen to be more profitable than local clients due to their greater transaction volumes. The bank which was the joint venture partner also became one of Organisation C’s first international clients.

Because Organisation C was rated well locally, the *Global Custodian* magazine was lobbied to rate the market on the domestic client base as well as on the cross-border client base. In 2004, the *Global Custodian* introduced domestic client ratings for the market and the business was rated ‘commended’. Thereafter it was ‘top-rated’ for three consecutive years. The domestic rating was found to help in making the business visible to clients by putting it “on the map” (C8 28:17, 110). In time, the business was also rated in the *Global Custodian* survey by its foreign clients. It first achieved a rating in the cross-border client category in 2006, and was ‘top-rated’ in 2007.

Managers recognised that initially the trade settlement rate contributed towards the *Global Custodian* rating. The rate was improved by identifying and referring trade exceptions to clients. Gradually processing became more exception-based and disciplined in terms of timing in order to meeting timelines. Control was found to change from tracking share certificates in the physical environment to tracking trade exceptions in the electronic environment. A manager recalled:

You had a different control. You would exception control the trade itself, not the certificate around the trade. You would see whether the trade is

pending, whether it's overdue, whether it's due in a future date. You could track that.... Eventually we got to a point where most of the processing was by exception. (C4 27:24, 90)

International clients were found to set a new benchmark in terms the service level required which was found to differentiate custodians. Once the benchmark was achieved with international clients it was filtered through to domestic clients. A manager put it like this:

International clients are not concerned about the challenges that you're going through. They're used to first-class service.... And that was a differentiator. And we had to gear ourselves up in order to accommodate the international clients who set up a new benchmark in this country. They set up a new benchmark, and once we got that edge then we sold the same to the local client base. (C3 26:21, 38)

An emphasis was placed on adhering to market timelines for operational processing in the electronic equities settlement environment. The consequences of not meeting settlement timelines resulted in a CSD penalty imposed on the business, and a financial loss in the case of corporate action timelines. As a result, the root cause of an operational error was analysed in order to determine why the error had occurred and how it could be prevented going forward. An error was actively recorded and its cause allocated to a specific category, such as a training issue, a system shortcoming, or a client problem. A manager explained:

The consequence [of] not adhering to [market] timelines is a penalty or [a] financial loss. And the consequences are quite huge. So that in a way has ensured that the culture was entrenched as soon as possible.... The [management and supervisory] calibre and the [staff] competency levels ensure that those timelines are kept in check, because of the visibility and the emphasis on it, and the [root cause] analysis. (C3 26:48, 130)

Penalties were found to be beneficial in helping to identify system enhancement and staff training requirements. A manager noted: "The [most useful] purpose of the penalties, was to ensure that all our systems did what they had to do and that all the staff were properly trained" (C7 23:32, 206). Over time, the discipline of reporting and tracking errors became routine. In particular, a bank view of risk as an enabler, where risk was quantified and explicitly managed, was found to contribute towards establishing the discipline. A manager explained:

A lot of the disciplines are in place. It's a matter of just routinely [reporting and tracking errors]. Initially the push was for you [to] actively log it. But

now the culture is such that [we] would report it as matter of consequence.... and month-on-month we would track it going forward. There's a culture ... where there's no fear of logging of this. (C3 26:47, 118)

An emphasis was also placed on operational training, including on-the-job training, coaching, mentoring, and knowledge sharing. The training was found to help staff members better understand operational processes and initiate system enhancements to streamline processes. A manager recounted:

There was a culture of innovation in the environment. People understood [that] "There's always a better way of doing this", and [were] part of the change. And where the change was not initiated by someone else, the people within the team forced the changes for themselves. (C3 27:17, 34)

Training was also found to help in improving client service and contribute towards differentiating the business. Over time, client service in respect of corporate actions was found to be important in retaining clients because settlement processing was largely the same across custodians. A manager explained:

There was no differentiator [from a settlement perspective]. Corporate actions [processing] was the differentiator for a lot of clients, and we knew the impact. If you service a client, you retain the client. And that drive forced us to ensure that the people were trained in doing things right the first time, all the time, and the people knew the impact of that. (C3 26:19, 34)

In addition, knowledge sharing with a focus on understanding the rationale behind processing took place within teams. For example, the potential impact of processing a corporate event was analysed and presented to peers to prevent a loss. Over time, knowledge sharing took place to a greater extent across the operational areas due to the interdependencies between them. It was found to help better manage operational risk. Managers expected the operational areas to collaborate on a daily basis.

The transition from physical to electronic settlement was viewed as an industry level transformation that took place over a number of years. In the new settlement model a client's risk of a trade settling was seen to have been transferred from the trade counterparty to the custodian bank. During the transformation, the components of the old business model were seen to have been "pulled apart and put back together" (C10 5:5, 25) again by enabling them with technology. While at

the same time, “the integrity and stability of the old model” (C10 5:5, 25) was seen to have been maintained throughout the transition.

Over time, the operational area was purposefully configured for efficiency of common functions, such as settlement, across multiple instruments as opposed to separate equity, bond and money market areas. Control tasks such as logistics management were found to have been automated and supplemented by value management tasks. For instance, client value was created in performing client reconciliations on their behalf and only sending them exceptions. Higher order jobs were required, such as compliance and risk management.

4.3.4 Outlook

Organisation C had grown both its local and foreign client base and become profitable in recent years. Its joint venture with an international bank had ended because it was found to be no longer required.

Support and understanding of the business in the bank had increased significantly since its transition from physical to electronic equities settlement. A manager noted, “The thing that is different for us now, is that we have sufficient ‘buy in’ from the highest levels of the bank that understand the criticality of this area” (C3 24:45, 187). The business was seen as critical because its risk profile affected the bank’s risk profile, in terms of Basel II international risk management standards. The manager explained: “And we’re now part of the bank. Everything [that] we do has an influence on the bank’s risk profile going forward” (C3 26:42, 102).

In particular, CSD regulatory requirements had led to regular risk reporting and monitoring in the business to ensure its efficient running. Any settlement penalties for example, had a direct impact on business profitability. As a result, there was a consistent focus on the root cause analysis of operational errors. In turn, risk reporting had raised the visibility and transparency of the business in the bank. A manager explained:

All the banks are in the same picture in terms of driving efficiencies. Cost is key [important] in terms of our business.... and penalties [or] any loss.... It’s an expense write-off immediately. So the drive is to keep your ship tight and to keep the controls tight continuously going forward.... There’s a lot of visibility and transparency that wasn’t there before. (C3 26:43, 106)

The business had recently been restructured to further integrate the marketing and sales area and the operational processing area. In addition, common processing areas had been combined. For example, equities, bonds, and money market settlements were processed in one settlements area. A manager noted: “Previously, in the old days, you had separate silos [where people were] just looking at that and not beyond those [silos]. Now we’re breaking those walls apart and people are getting together more” (C3 26:32, 58).

After years of little staff turnover, more than half the settlement staff had recently been lost to other market players. The loss in staff had prompted attention to “talent retention” (C3 24:34, 171). With new staff, the number of penalties had increased; however, none were found to be surprising. A manager noted: “We know why things happen. We never have a penalty that’s a surprise” (C7 23:31, 198). The loss in staff was partly attributed to the staff being multi-skilled which had made them “a lot more marketable” (C4 27:39, 167). Staff cross-skilling had made more time available for staff up-skilling, broadening their knowledge. A manager recalled: “The more we did it, the greater the capacity we had. Because of cross-skilling, more time was available to up-skill, because that developed over time” (C4 27:42, 175).

The recent business restructure had also led to the establishment of a product development team. The team was intended to focus on business innovation involving system development for both custody and custody-related products. The team included project managers drawn from the product and client relationship teams.

The business project team remained part of an operational structure, although it had more autonomy. It had two distinct sub-units, a main business project team and a business support team. The main team included project managers. The function of the team was to facilitate a market initiative by adapting the business for the implementation of the initiative. A manager described it as, “enabling the change of the market, [by] enabling the environment to gear up for the change” (C3 26:79, 148). The function included being involved in market forums, interpreting market requirements for market initiatives such as major strategic initiatives, and facilitating systems development and implementation. A manager put it like this:

To be involved on those forums and see what impact that [those initiatives] will have on this environment. To come back and ensure that we do the necessary gearing from our perspective, to be ready for that new [model] when it does come forward in the future. Then at the same time, if there's any technology impact, for you to facilitate that technology being rolled out in the environment; the design [and] the roll-out going forward. (C3 26:78, 144)

An important part of the function was to be involved at the start of a major initiative and to investigate potential market impact and any barriers that might be encountered in implementing the initiative. A manager noted: "It's getting involved ... at idea conception stage [to become aware of potential] market impact [and any] barriers that we need to investigate and then bring forward" (C3 26:79, 148). As market requirements for an initiative became more detailed, operational managers also participated in the forums.

The business support team reported into the business project team. Business analysts in the support team had operational specialist expertise. They were involved in system enhancements and in project implementation; for example, system testing. The team also provided support to the business including resolution of system-related problems. Resources in the business support team were seen to be better utilised than at the time of the CSD implementation. A manager noted: "Processes are documented. Experiences are shared. Knowledge is shared" (C6 22:52, 310).

When a system change was made, time spent on planning was found to be more productive in the long run than hastily executing the change process. A manager pointed out: "Rather take a lot more time doing that [planning] and doing that thoroughly, than rushing through the process, [and] creating a lot more work eventually" (C4 27:14, 64). Different people were drawn into planning workshops for a system change to obtain different viewpoints and more fully understand the implications of a change. In particular, IT consultants were found to contribute to an operational process discussion by asking questions about the rationale for the change and facilitating more extensive process automation. A manager explained:

We draw in a few more people around the discussions of the change, so that it's not simply just changed.... So that you have different views, and not only the one single view where you're so caught up in this specific [problem], because you may have experienced a problem in that and want

to solve that, that now what you've changed or introduced on this end, you haven't realised the risk of the danger that side that you're creating. The planning, we've learnt [how] to do that a lot better. (C4 27:15, 70)

Although IT consultants continued to help prepare business requirement specifications, they were more often prepared by business analysts in-house. Implementation planning was found to make the execution of the process easier. Since the CSD implementation, experience had been gained in implementation planning. A project implementation plan template was used and revised on a regular basis. A manager noted that the planning document was “an ever-living document” (C6 22:55, 334). The implementation experience of other markets that had undertaken a major initiative was suggested to be better applied in the local market in undertaking a similar initiative. A manager explained:

The planning is key [important] to any implementation. We didn't have that retrospectively. We didn't have the guidance [or] maturity to put that in place.... We couldn't read it from any other models where this had happened [before]. Because [a comparative CSD implementation] had taken place, but we couldn't really draw from that implementation, because our [local] market is so different. (C6 24:53, 217)

Planning was also applied to the resolution of system implementation problems to minimise operational disruption. Problem-solving ideas were discussed and assessed in a workshop to determine an appropriate solution. For example, when a problem unexpectedly occurred during a recent major market implementation, teams of two to three people with expertise in different areas were assigned to different problem-solving tasks without disrupting business operations. A manager noted: “That's the maturity level, that we're able to delegate and say, “Now we've got the three teams, business carries on, we will look for the problems”” (C6 22:48, 298). In contrast, during the CSD implementation, although there were good ideas on how to solve implementation problems, they were not jointly discussed and evaluated. A manager explained:

Today that experience has made us mature, and also able to say, “Time out. Take a step back” and “Let's look at it differently.” Whereas, then we were clouded. We had no idea how to do it.... Everyone had an idea [how to solve the problem], but no-one sat down around [a] table and said, “Let's put all these ideas [on the table], and see which one optimises this process.” There were good ideas but just because it wasn't planned – “Come around this table, do it on the whiteboard, and do the pictures” and say, “Does this work? Can we pull ten people in and do that?” (C6 22:49, 298)

Managers had gained experience in implementing system changes and knew what to expect. Whereas then, at the time of the CSD implementation, they had been unprepared for the impact of the implementation on the business. A manager reflected:

At that time, we all knew it [equities dematerialisation] was going to happen. But [none] of us were prepared for the actual impact of what was going to happen. Now we we're more 'au fait' with it; we know what to expect. Whereas then, we didn't.... now, we're treading in familiar waters. (C1 24:47, 193)

In reflecting on the market transition made to electronic equities settlement, managers realised that had they had a better idea of what was going to happen they might have waited for the transition instead of first reorganising the business in the physical environment. A manager noted, "Had we had [some foresight] that this was going to happen, we could have just stopped the whole changing of the business, the reorganising of the business, [and] done it with [the CSD implementation]" (C2 19:49, 22). In addition, they realised that it would have been less costly to have purchased the same custody system as organisations A and B. Further, the market transition might have been faster had the three major custodians in the market shared a common IT vendor and agreed more readily on the way development was done. A manager put it like this:

Had we ... gone together, our costs would have been a lot less [than they were]. It would have been fewer headaches, because we all [would have] agreed because the development would have been done by [the same IT vendor] anyway. And things would have been faster from a market ... perspective. (C2 20:87, 495)

The business was an active participant in market forums where debate was ongoing about major market initiatives. In particular, to improve market efficiencies an equities settlement model was debated whereby a level of client data was held at the CSD in a 'securities ownership register'. At the time of the CSD implementation, the custodians had retained their client data in order to protect it. Subsequently, during the debate, the business had proposed a variation of the settlement model to separate "commodity and competitive advantage" (C10 5:8, 113). In the proposed model, certain common aspects of settlement processing would be done by a central body while value-added services, such as reporting, would be retained by the custodians. A manager recounted:

Then we said to them, “to bring efficiency into the market, why don’t you look at an alternative settlement model (ASM) where you’re taking this development out of all the [custodian systems], and putting it into one house? You charge us for one development, and we leverage off your system.”... We initiated that. We proposed that ASM model to them. (C5 21:51-52, 124-128)

Managers continued to promote a similar type of settlement model in the market forums. They anticipated that such a model could reduce the extent to which computer system infrastructure was duplicated among custodians and thereby reduce the cost of maintaining it. They also recognised that such a model could reduce the level of communication that took place between the custodians and the CSD and its concomitant cost. A manager put it like this:

Your total overheads could be reduced by having a central body do all the upgrading and all the system changes ... and then providing their system as part of a service to the rest of the users. Also, thereby reducing cost to the country ... and costs internationally ... [to a point] where they can deliver, at a very cost-effective way, to the market and to the individual. And to do that, there needs to be a lot less costly communication that happens. (C4 27:48, 183)

From a competitive perspective, managers realised that the local market needed to be globally competitive and not just locally competitive. Relatively good international ratings helped attract foreign investors. A manager explained.

What is good for the [local] market, where are we now ... versus what is good for the international market, of where we’re going. And we want to be the number one in terms of international ratings, and we are not necessarily geared now for that number one status that we want. (C3 24:37, 171)

They realised that long term market competitiveness was dependent on aligning the market with international trends. Another manager noted: “If you look at it long-term, then you will have to say ... “What’re the international trends? How are markets moving?”” (C8 28:32, 166).

In terms of market collaboration to improve competitiveness, managers recognised a greater need for initiatives to be evaluated from a country perspective as opposed to perspective of any one participant. Because the different components of the market affected its overall competitiveness, they recognised that more relevant information could help participants to determine the market impact of an initiative. A manager explained:

“What is the impact for this country going forward?” because there is country impact. And because there’s country impact a lot more visibility and transparency needs to take place in this market. We cannot just look at one component because everything is intertwined. (C3 26:74, 258)

Differentiation in the local market was found to be in corporate actions and in the information content and timing of reporting. Although settlement was seen to be largely commoditised, clients expected a specialised service including a fast response to queries. A manager observed:

And they [clients] are fairly spoilt at this point in time, where the expectation is that you give them service. It is not negotiable. It’s right across the board. We’re now just fighting in terms of content and timing. (C3 26:22, 38)

From a market perspective, discussion was taking place to consolidate the main custody financial instruments, equities, bonds, and money market, on a single settlement platform at the CSD. Managers expected the electronic money market settlement initiative to be completed. They anticipated that it would be comparatively easy to adapt to the implementation because they had experienced the benefits of an electronic environment. A manager noted: “We’ve been running with equities for a couple of years, so we know exactly what it is. We also know how much better it is having a paperless environment” (C7 23:55, 226).

An equities strategic initiative under discussion was a move from a T5 to a T3 settlement cycle. The initiative was seen as a market priority that would align the local market with international markets and improve its global competitiveness. To some extent, the custody system had already been customised to cater for a shorter settlement cycle. Other implications of the initiative identified were potential problems with certain types of corporate event, and a requirement to obtain information from other parties within the timeline.

Another strategic equities initiative under discussion was a move to a ‘securities ownership register’ held at the CSD. As noted above, the initiative had been debated in the market for sometime. Managers held a view that to gain efficiencies in the local market, it was likely that a central operation, such as the CSD, would play a larger role. A constraint identified was that although the CSD

could settle securities, it could not settle cash because it was not licensed as a bank. A manager explained:

Probably a bigger role is envisaged for [a] central operation within the country ... where trading could happen via a broker ... direct to a CSD, rather than having all these intermediaries involved, other than [for] the settlement. Up to now, settlement needs to happen via a bank ... because of the licensing. (C4 27:46, 183)

The initiative was seen as a part disintermediation threat to custodians by the CSD. However, managers anticipated that it would happen once there was a business case showing that it would benefit the market in its lifecycle stage and reduce costs. Managers realised that any international settlement model adopted would have to be adapted to the local market conditions. An implication identified was that the type of model would require a change from net settlement to more costly gross settlement. In addition, it was expected that some of Organisation C's domestic clients would continue to rely on its technological investment to support them because they were not technologically enabled with direct system links for straight-through-processing.

With greater insight into the strategic direction of the market compared to the time of the CSD implementation, managers realised that they needed to be able to sustain the business in a changing environment in order for it to survive. Assuming that the custody business would be partly disintermediated, the business focus was on preparing to be able to handle market changes. A manager put it like this:

“What’s going to distinguish us from our competitors ... on ... the assumption that the market goes this route?”... In the old days, people where not so insightful in terms of where the market was moving.... But now, the market [participants] understand that change is a reality and ... change is going to happen. [The question is,] “How are we going to gear ourselves to deal with that change?” That’s going to be the key thing for ourselves to determine whether the [custodians] will be something that we can still talk about in five to ten years from now.

Managers questioned whether custody would continue to be the main source of revenue in the business model. They assumed that a future single settlement platform at the CSD would be based on ‘securities ownership register’ type of model, implying that the market would adopt such a model for equities settlement. Given the assumption, and the associated threat of part disintermediation, they

anticipated that the custodian business model across the market would change, whereby equities settlement and corporate actions would no longer be the main revenue source. A manager explained:

Understanding that [the CSD] is going to go to [a] single settlement platform ... a couple of our revenue streams might come under pressure. So with that in mind, we're thinking, "Are there avenues of revenue growth?" [because] the [custodian business] model will be changing across the board. (C3 26:51, 162)

The intention was to diversify the business to ensure that the business model was sustainable in a changing market. More specifically, it was to grow other revenue streams which were based on custody. A manager explained:

We're trying to diversify on our side also, to say that, "We're still going to be relevant going forward. We've got a sustainable business model that will be derived from what the core business is. (C3 24:30, 166)

To differentiate the business in the competitive local market, managers anticipated providing a broader combination of products. Because custody was largely commoditised, they expected more of a business focus on service rather than on pricing. A manager noted: "To differentiate yourself you'll have to have a better service level that you're maintaining, and your suite of products that you are offering is the ideal ... type situation" (C4 27:52, 187). To maintain client relationships, the intention was to develop products and services targeted to suit the client base. A manager explained:

One of the things ... is the way we're structuring our business ... with, "What do we want to offer our client base?" We're thinking 'client' now. And whatever the client is dictating, [that's] going to drive our revenue streams, market share, [and] sustainability going forward. We're then going to venture into those markets, and then we design for accordingly here. And whatever aspects [the CSD] contributes towards, we'll get involved in those, but we'll be positioning ourselves very differently. (C3 26:50, 162)

Three-year planning, a norm in the bank in contrast to the time of the CSD implementation, was seen to have largely contributed towards managers' longer term view of the business in the context of a changing market. They saw the diversification strategy as a significant shift in focus from the current custody business to ensuring a sustainable business in the future. A future view of the

business guided investment decisions made in the business. A manager explained:

That three-year window has forced us as [a custodian] to now start looking forward ... and say, "... what is the market space going to look like, and what role will we play there in that space?" And everything that we do now is with that in mind. So whatever investment ... staffing [and] ... product decisions we make, are with that in mind, [to ensure that] we've got a sustainable business bottom line. (C3 24:44, 187)

Going forward, managers anticipated "taking into account the inevitable change within the market" (C4 27:43, 183) when replacing a system. For example, replacement of the custody system was expected to be largely influenced by the CSD's move towards a common custody processing platform for equities, bonds, and money market instruments. In addition, they also expected systems to be designed for considerably more automated operational processing, including straight-through-processing with clients and other parties in the market.

Product development projects that were underway included developing a web-based custody reporting service for clients to enable them to access up-to-date transactional information, and replacing the in-house unit trust system with a new system from an external IT vendor. The unit trust system was being replaced due to growth in unit trust services as well as in investment administration. The new system catered for both custody-related products.

Given the changing environment, managers realised that the business needed to respond to the changes to remain competitive. In particular, they identified a need to ensure that project management teams could address new types of market and business requirements. For example, they were aware that trading in new styled financial instruments was being explored in the local market and might lead to requirements that the business was not familiar with. A manager put it like this:

Those markets that are being explored would demand that you operate at another level. [There are] new styled products from a financial point of view which may have different requirements; new [products] coming that you may never have been accustomed to or equipped for. So ... as it develops you and your teams may have to be appropriately equipped to handle that type of thing. (C4 27:47, 183)

Further, a need was identified for managers in the teams to be more broadly focused, aware of what was happening in the market, and recruited at a more

senior level. The manager explained: “[You need] to be more broadly focused.... having an understanding of what’s happening in the market out there. [And to] recruit at a more senior level ... to equip [the business] appropriately for what’s to come” (C4 27:45, 183). A similar need was also identified for a greater involvement amongst staff within the industry.

The business was seen to be continually affected by changes in the environment because it was part of large globally interconnected community. In particular, managers realised that to sustain the business they needed to continuously analyse opportunities and threats in the rapidly changing environment. A manager explained:

You’re just not working in your own space. You are part of a larger international community, and there’re so many things that are happening that are impacting you. And you need to continuously do your SWOT [strengths, weaknesses, opportunities and threats] analysis ... to keep your business sustained all the time, which is there [in your head]. (C3 26:62, 222)

Organisation C was taking steps to enable a more proactive response to market changes. These included systems investment in new custody services and in custody-related products, as well as developing a greater awareness of the market and assessing its impact on the sustainability of the business.

5 CHAPTER: WITHIN CASE ANALYSES

This chapter presents the study findings in terms of the within case analyses. The findings for each organisation are presented in terms of five basic business functions relevant to technological innovation: product investment, project management, market collaboration, technical development, and operations. Within each business function there are one or two innovation processes.

5.1 Organisation A

5.1.1 Product investment

Market models and business models

In *Organisation A*, managers developed explicit ideas on the market model. Their idea was that adopting international best practice can add value to the market model. A manager explained:

Everybody acknowledges that the idea is that 'we want to move the market forward'. We want to attract investors to [the country]. It's in our own interests to do so. Everybody accepts that this is an ongoing process and that we move forward. (A4 2:79, 437)

Referring to certain standards, the manager further explained, "we'll take what they do and see if we can use international best practice in [the local] market. We're very conscious of that" (A4 2:84, 465). The ideas on viable market and business models evolved as the business invested in initiatives. Its investment objectives were related to its predominantly foreign client base with a growth in the proportion of its local client base. At the outset, its investment in the electronic equities initiative ahead of the other two custodians was largely because managers sensed a market opportunity based on an informed conjecture. A manager explained:

We wanted to get the risk of paper out of the market, we really did. We had seen how well it worked in the bonds environment, and we wanted to

move to electronic settlement because we knew that it was going to take a huge amount of risk out of the market. (A4 7:32, 241)

At that stage, they also had a conception of a viable business model. The manager elaborated on the conception:

We wanted to move forward into international best practice.... We knew that we wanted settlement certainty.... That was what we were aiming for. And we had to find a way within the confines of the [local] market ... to get there. (A4 7:12, 65)

The events suggest that entrepreneurial managers helped to lead the market forward. A manager described the effect of the initiative on the business model:

The whole nature of the business changed. We went through the whole exercise of right-sizing, of selecting the correct people for the new environment; of not just changing technology, [but] changing process, [and] putting people through training courses. That was radically different; it wasn't just a technology change. (A4 7:20, 137)

Subsequently, they found that investing in custody services and related products helped to differentiate the business. Managerial and organisational capabilities developed were based on the idea of advancing the market. For example, managers expected global markets to continually evolve and that the business would need to keep pace. A manager noted, "We've got to be realistic that the world market is evolving all the time and you've got to try and deliver the goods at the cheapest possible rate ... to grow the volumes" (A6 10:55, 117). In addition, the business deliberately evaluated market initiatives in terms of advancing the market; for example, the controversial 'SOR equities' initiative. Interestingly, managers knew that the business had options for future growth in custody-related products in the event that the controversial initiative resulted in some disintermediation.

5.1.2 Project management

Project management teams

The way *Organisation A's* three innovation teams evolved suggests that managers' ideas on the team configuration were evolving from separating teams by analytical discipline to separating them by project time horizon. A product

development team was the first team established after the equities dematerialisation in the second stage to retain business analyst project resources. A manager explained, “To get that bridge between an end-user and the IT department you had to get that user that [knows] IT but also knows what’s going on in the business” (A6 10:29, 69). It was deliberately separated from operations because the market was seen to be changing, and, “so that your end-user could focus on client service, and not be distracted in other meetings [by] what’s going on in the market; to separate that completely” (A6 10:29, 69). Notably, Organisation A was unique in establishing a product development team at an early stage suggesting that entrepreneurial managers anticipated more strategic change in the market and promoted more explorative learning shaping resource development in the team. Nevertheless, the team also performed more operational enhancements, as suggested by its regular meetings with client-facing staff which helped to develop operational expertise in the team.

The second team, a corporate action support team, was intended as an interim project team. The team is suggested to have been kept when managers realised that the operational expertise developed in the team as consequence of its close proximity to operations, was required on an ongoing basis in the dynamic market. A manager explained: “They’re in close liaison because of the [specialist] expertise [required] in the area. We keep their direct liaison on working committees with [the CSD] as well” (A6 10:65, 73). The third team, an IT project team, evolved from a dedicated support team in the bank IT area. Likewise, the team is suggested to have been integrated into business, separate from operations, when managers realised that it helped to maintain system design continuity in the dynamic market. A manager noted, “That’s what [the IT project] team is really there for, to get that continuity when the [IT vendor] developers change” (A7 13:8, 33). Despite a debate on an apparent duplication of the business analyst role in the product development and corporate action support teams, managers intended to keep the corporate action team within operations because they anticipated further automation of the relatively risky operational processes. Because the product development team could focus on more strategic corporate action initiatives at the same time, such as aligning to international messaging standards, the team configuration enabled the business to pursue both mature and emerging market strategies.

Project management process

In *Organisation A*, more structured project management procedures were developed due to an emphasis on continuously improving the business model in the competitive electronic equities settlement market. Formal procedures were introduced by more experienced analysts in the electronic equities project team. For example, formal 'gap' and 'impact' documents were used to adapt settlement processes for the initial 'oiling' electronic settlement model. Notably, system implementations were planned to meet market deadlines and minimise operational disruption. In particular, the equities dematerialisation was planned to take place as fast as possible due to a threat of tainted scrip in the market. A manager explained:

We took a conscious decision that it was in our interests to dematerialise as fast as possible in case there was tainted scrip out there, and we needed ourselves to claim against the Dispossessed Members Fund. (A4 2:26, 119)

The threat is suggested to have been sensed by entrepreneurial managers based on an informed conjecture. The fast dematerialisation was seen to achieve its intended effect. A manager noted that: "Going into the dematerialised environment ... was a much more controllable type of change.... than the excessive volume growth in the physical side" (A4 7:9, 57). In contrast to the well planned implementation by more experienced resources in the project team, the less experienced corporate action support team formed later in the business learnt to use more structured procedures through experience. A manager explained:

Now it's more structured. Up front we really played around with anything and everything that we could [to] make it work.... It was a quick work-around, a quick win. We were getting automation that we didn't have before, but there're always pitfalls.... It's a lot more formalised. (A3 6:19, 119)

Joint planning was found to be especially helpful in sharing the knowledge of more experienced resources. The business is suggested to have developed an operational enhancement capability. A manager explained: "It just makes it easier to change a process now, because there're people that have historical experience in this to make sure that the same problems don't reoccur" (A2 5:31, 217).

5.1.3 Market collaboration

Market collaboration process

Managers in *Organisation A* were closely involved in market workshops from the outset and appeared to form the most explicit theory. The main purpose of being closely involved was seen to help correctly interpret market requirements, thereby enabling them to be effectively addressed by the business in system development. The theory underpinned a focus of sending competent people to market workshops. A manager explained:

There're quite a lot of joint market initiatives that lead to internal system changes.... And that's why we have this focus of sending people to the meetings, and sending the right people to the meetings to gather the correct information, so that we can feed it back into our own internal workshops to say, "How're we going to address this?" (A4 7:18, 113)

Based on their ideas, the consequences of not being closely involved were recognised. A parallel was drawn between two major initiatives where the business requirements of certain parties had not been adequately addressed resulting in rework for the market. In referring to the electronic equities initiative, a manager explained that broker trading practice requirements were not adequately addressed, "because [members of] the broking community themselves ... had not being closely involved in the working sessions" (A4 7:3, 21). A similar situation was observed with the issuers in the electronic money market initiative.

Organisation A developed capabilities on market collaboration including deliberately involving different people in market workshops to gain experience in reviewing and commenting on papers, and in contributing to discussions. A manager noted: "We do try to and get other [people] involved, and try and grow them in the process.... of being involved in market initiatives" (A4 7:46, 306).

Managerial capabilities developed included an awareness of some more subtle market influences on collaboration, such as constraints in other custodians' technology. A manager observed, "There're patterns that come out, [of] how people think and you start getting a sense also [of] how people's systems work" (A7 13:26, 113).

Major market initiative requirements

Although time-consuming, the purpose of critically analysing market models and practices was seen by *Organisation A* to help determine basic or 'real' market requirements. A manager noted that, "in these market initiatives, sometimes it takes quite a lot of time to establish what the real market requirement is" (A4 2:3, 17). Knowing the requirements enabled managers to evaluate the market need in terms of A's development cost, suggested to be the basis of its development decision. Referring to market initiatives, a manager explained:

What we do have is 'show us the business case'. That's a [Bank A] philosophy. So we're not against doing any of these things, but we want to prove that there's a need to do it and that whatever we spend in doing it is justified in terms of what the markets require and clients are expecting, because you can't do these things in isolation and in a vacuum. (A4 2:86, 471)

Their ideas on the analysis stemmed from a focus on establishing the main requirements of market initiatives. The focus was intended to provide the main business benefit which could later be enhanced. A manager explained: "You can enhance afterwards, but get the bulk of the [requirements] out of the system" (A6 10:64, 137). The analysis appeared to be consistently applied from the outset of the conceptual planning stage of the electronic equities initiative. Notably, a manager was noted to help clarify requirements in workshops, suggesting that the manager played an entrepreneurial role in promoting learning and shaping market development. Notably, in the electronic money market initiative an end product was seen to help participants understand the basic market requirements. A manager observed, "And sometimes until people see the actual finished product in front of them.... that's when you get down to the real bottom of the requirements" (A4 2:3, 17). The observation was comparable to an earlier use by the business of the CSD front-end tool in the electronic equities initiative as a type of prototype solution to help understand market requirements. Based on their knowledge of market requirements, managers could anticipate the market strategic direction. For example, they envisaged that the failed implementation of the electronic money market initiative would lead to a better product; that the T3 equities and SOR equities initiatives could use the same settlement model; and that an earlier

equities settlement model which had not been feasible might be feasible given an increase in market volumes.

5.1.4 Technical development

Business initiative requirements

In *Organisation A*, the purpose of the analysis was seen to help analysts frame business requirements more broadly and hence enable them to design more flexible processes. A manager explained:

Rather think a bit [more] broadly and say, "How can I make it more flexible, although it's going to cost me slightly more now?" But in two or three year's time, when that scenario occurs, the system does cater for that. (A7 13:41, 181)

In addition to business practices, *A* also critically analysed the design of its custody system. In particular, the value of report writing was seen to help in understanding the basic structure of the system - the database structure - thereby enabling the development effort of a system change to be estimated. A manager noted: "When we specify a change, we know what's possible, what's not possible, [and] more or less what it's going to cost" (A7 13:6, 29).

Similar to its analysis of market practices, *Organisation A's* analysis of business practices is suggested to stem from much the same development strategy - a focus on automating the main requirements to obtain a business benefit which could later be enhanced. The development strategy was influenced by time and cost constraints. For example, manual workarounds were used in early settlement processes and the initial design of corporate action processes provided "a core to work with and it was sufficient to get us going" (A3 6:27, 179). The business found that short term workaround system solutions tended to be costly due to rework. A manager explained, "It's going to 'bite' you somewhere or later if you make a quick fix" (A7 13:41, 181). For example, corporate action processes were redesigned.

Critical points in managers' learning of the analysis include both entrepreneurial and expert learning. More systematic analytical methods, such as streamlining business practices to avoid piecemeal solutions, were learnt by "trial and error" (A2 5:12, 53) from more experienced business analysts. Notably, system analysts

sought an in-depth understanding of the system design from the outset. For example, they deliberately questioned the IT vendor's developers during the electronic equities initiative when they were on site. The benefit of gaining such an understanding of the system was not clear at that stage and only became apparent later, suggesting that it was based on an entrepreneurial intuition. Subsequently, analytical methods evolved and became more systematic, such as report writing. However, by promoting learning at an early stage the analysts shaped the system customisation and developed managerial capabilities based on their system knowledge.

Organisation A developed managerial capabilities in analysing its business requirements. For example, analysts found that they could resolve problems more quickly because they knew where to start looking for the cause. The business also developed organisational capabilities. For example, analysts deliberately evaluated design options in terms of feasibility and knew the risk of making a short term change. A manager explained: "We'll take the risk and take a shortcut. But then everybody's aware of it. It's not a case of like in the past, it was just done" (A7 13:6, 29). They also deliberately maintained a level of system design continuity, previously highlighted as the main reason for integrating IT project team into the business. In turn, the capability was found to improve management of the IT vendor relationship. In addition, managers knew that they had at their disposal a reference database on system changes and problem resolutions, and that corporate action processes, for example, were flexibly designed and could be leveraged. Referring to the processes a manager noted, "If you had to look at the system now compared to what the initial corporate action core was, [it's] very different" (A3 6:27, 179).

Custody system technology

Organisation A's custody system configuration consisted of a main equities system and a former bonds system. A new custody system was implemented in the first stage for physical equities settlement and in preparation for the transition to electronic settlement. Organisation A was unique in implementing its new system for equities only, and retaining its former bonds custody system. The implementation is suggested to be in line with its development strategy to obtain the main business benefit as soon as possible. It was also suggested to minimise operational disruption, given the business awareness of the risk of tainted scrip in

the market, as previously noted. Notable at the time, the system implementation appeared to achieve its intended effect for both physical equities and electronic equities settlement. Subsequently, the business appeared to take a similar approach during the electronic money market initiative. Interestingly, a consolidation of bonds on to the same custody system was deliberately stopped when managers became aware of a market initiative to move bonds to a new electronic settlement model. The approach is again suggested to be in line with the development strategy and to not preempt market requirements. The custody technology appeared to be broadly aligned with the market settlement model requirements.

5.1.5 Operations

Business processes

In *Organisation A*, benchmarking analysis of business processes was suggested to help achieve two consistent operational features intended to provide both an efficient and flexible service offering. First, an emphasis on efficient processes to prevent losses arose from strict process control in the physical environment introduced by new management in the first stage. In the electronic environment, the emphasis included strict adherence to market timelines which was largely due to regulatory penalties if timelines were not met. The second feature, a simultaneous focus on improving client service, remained consistent from the outset. It was initially intended to retain clients that the business was losing in the first stage. Managers' learning about the benefits of business process analysis stemmed from both internal benchmarking, including process monitoring measures also introduced in the first stage and external benchmarking, based on market ratings; in particular, the annual *Global Custodian* client survey of both foreign and local clients. Organisation A was the first custodian in the market to be re-rated in the survey since the physical settlement market was overwhelmed by an increase in volumes due to electronic trading. It was also the only custodian rated in the physical environment. Notably, a self-reinforcing effect of process improvement was found in the electronic environment. More comprehensive and more efficient processes were found to further enable client service improvement initiatives. For example, "more comprehensive, [and] more efficient reporting" (A5 2:68, 331) was found to further reduce client queries. Based on knowledge of business processes, managerial capabilities included identifying knowledge that

could be leveraged. For example, comparing the electronic with the physical environment a manager noted, “Control stays with us, just in a different format” (A6 10:48, 109). They also anticipated that a new market survey would provide an additional process improvement tool.

Innovation investment

In *Organisation A*, a critical turning point identified in its scale economies was when the business became profitable and managers felt confident to undertake more comprehensive system changes. A manager explained, “Now that we’ve turned it around, it is easier to justify spending a bit more money, because you do have those funds available” (A7 13:42, 189). Operational expansion led to the formation of an operating alliance with a global custodian. Based on their knowledge of business operations managers could identify basic characteristics of the business. For example, a manager noted, “It is a volume-driven business” (A6 10:55, 117).

5.2 Organisation B

5.2.1 Product Investment

Market models and business models

In *Organisation B*, managers developed explicit ideas on the business model. Notably, they saw the effect of the electronic equities initiative on the business model as breaking constraining path dependencies of physical settlement and enabling the business to grow. A manager explained: “Once [the CSD] was in place - that was just one of the building blocks.... we were able to add ... value-added type of products and services which we’d never, ever been able to offer” (B3 43:57, 287). Their idea of the business model was that products and services were ‘building blocks’ in adding value. Managers’ ideas on a viable business model evolved as the business invested in initiatives. A consistent investment objective was to retain clients. The objective is not surprising given that Organisation B appeared to maintain the largest market share for both foreign and local clients. A manager described the reconfiguring effect of the electronic equities initiative on the business model and on market competitiveness:

The way we did the business changed but our business never changed. We still made money from settling trades and assets under custody. So from a market perspective, the market became a lot more efficient. Which is probably [the reason the country] became a more attractive destination for indirect investment through the markets. (B3 43:52, 283)

Subsequently, custody services and related products were found to differentiate the business. In particular, the benefit of custody-related products was unexpectedly “discovered” (B3 25:27, 177) and led to the idea of ‘building blocks’ in the business model.

A critical turning point in managers’ conception of the business model from ‘custody as the main business to custody as a platform for other businesses’ arose from a market threat. A SOR equities initiative under discussion was sensed to be a disintermediation threat to the local client base. The threat was based on an informed conjecture that it could gain market support. Although an element of denial was identified in the business, likened to that prior to the electronic equities initiative, the threat prompted managers to rethink the business model. The events suggest that entrepreneurial managers helped to lead the business forward to a new business model. A manager explained:

“What else can we offer our clients to keep that relationship with our clients?” Then we started looking at other products that we can offer to clients and looking at custody differently to what it is now.... That’s a total paradigm shift. (B6 29:8, 63-67)

Managerial capabilities developed are reflected in the investment strategy. The main business investment strategy of product diversification was underpinned by the idea of ‘building blocks’ in the business model. A manager described the strategy, “‘Moving up the value chain’ would be the main focus, given that these other businesses are essentially built around custody” (B3 25:30, 185). In addition, managers could identify potential efficiency improvements in the equities market settlement model, such as more exception-based communication processes.

Changing market

In *Organisation B*, the purpose of the market scenario analysis was seen to help “to understand the virtual impact to the business [of a market initiative] and how you manage around that” (B2 43:39, 233). The idea was that the business investment strategy could be aligned with the changing market. A manager

explained, "Given that scenario, and given what's happening in the market, where do we position ourselves?" (B1 20:23, 125). The analysis was an outgrowth of a more recent focus on positioning the business to meet future targets. A realisation that the business needed to grow in order to meet the demanding targets led to a shift in focus away from current operations. A manager noted: "We've moved away from small efficiencies into a real future scenario" (B1 20:19, 89). In addition, managers realised a more proactive response to market initiatives was required in the dynamic market. Referring to the business response to the electronic equities initiative, a manager noted that, "in the past it was [very] much reactive. Now you have to be more proactive" (B1 20:25, 137). A critical turning point in terms of analysing market scenarios was a realisation that the investment strategy needed to be adapted to the changing market. A manager explained, "Strategy is not something you solve [once]. It unfolds, and it changes, and it re-emerges, and we need to be positioned to cater for the flux" (B1 20:20, 93).

Further, a need for greater awareness of the interconnected global market was identified. As a manager described, the breadth of understanding required can be likened to that of an entrepreneurial manager in sensing business opportunities and threats:

You have to put more research in. You have to be more aware of what's happening globally. You have to know what's happening with the bank globally. Your antenna has to be out there.... It's about the quality of the awareness. (B1 20:24-25, 129-137)

A managerial capability developed was to identify threats and opportunities of market initiatives under discussion. For example, the T3 equities initiative was seen as an opportunity to align with international custody markets and, as noted, the SOR equities initiative was seen as a part disintermediation threat.

5.2.2 Project management

Project management teams

Managers in *Organisation B* evolved explicit ideas on a configuration of three innovation teams. The value of creating separate teams was seen to enable them to focus on initiatives with different time horizons. A manager explained:

We're putting things in place to create that facility to focus. So structurally ... you can separate the two. You've got your operational [focus] and your future focus. From a structural perspective you can reflect that in the way that you have your people's minds focused. (B1 20:27, 149)

Their idea on the innovation team configuration was that future-oriented teams with broad experience can better lead strategic change in the business compared with more operationally-oriented teams. The way the three teams evolved suggests that managers broadened their views on the configuration from having one main team to having several teams focused on initiatives with different time horizons in the context of a dynamic market. Two of the teams that were separate from operations, an IT project and a business support team, evolved from an existing IT support team in the business which was unique to Organisation B. The original team formed part of early project teams together with external consultants. The third team, a custody support team, emerged within operations soon after the equities dematerialisation early in the third stage, seemingly as an interim team to assist with operational enhancements because the IT support team was preoccupied. The team is suggested to have been kept because managers realised that the operational expertise developed was required on an ongoing basis in the dynamic market.

A critical chain of events then followed that led managers to broaden their conception of the team configuration. New managers questioned the apparent duplication of the IT project team and the custody support team; in the case, specifically the need for the IT project team. The capability of the more experienced IT project team became apparent when a major implementation problem occurred in the market, probably due to the failed electronic money market implementation. A manager explained: "Just through the foresight, insight and knowledge that was available in the collective brains of [the] team.... The value was really seen ... in being able to contain [the problem]" (B2 24:45, 105). Managers then saw that role conflict problems between two similar teams in the bank IT area were largely resolved by separating the teams based on the type of initiatives focused on. A manager explained: "They went through all the problems and the troubles. We saw of all this. And they separated their teams and called them a [support] team and a [project] team" (B2 24:49, 109). The observation prompted them to question how to reorganise the three innovation teams which required a 'balancing act' between more strategic and more operational innovation in a dynamic market. A manager observed:

The market is moving at this rapid pace, and we need to keep track with that and keep this balancing act of continuously servicing the clients and making the revenue and keeping the business afloat. (B2 43:41, 233)

Besides the organisational capability of the combined teams, managerial capabilities developed included proactively organising the teams. Managers intended to completely separate the focus of the teams into future and current operational initiatives. More specifically, they intended to move the operational components of the IT project and business support teams into operations, and to form a new more strategic product development team to help grow the business.

Project management process

More structured project management procedures were applied in *Organisation B* due to an emphasis on continuously improving operations in the competitive electronic settlement market. The emphasis was an outgrowth of Bank B's culture of developing best business practices to maintain a leading market position. In B, formal project and change management procedures were introduced by external consultants for the electronic equities initiative. The business requirements for the initiative were prioritised to meet market deadlines and the intended effect seemed to be achieved albeit system performance problems. Over time, organisational capabilities developed included deliberately managing projects to minimise operational disruption. Referring to a more recent project, a manager noted: "We've learnt that you need to create a proper project for it and be cognisant of the change impact on people" (B1 20:37, 237). An operational enhancement capability was developed, known as a 'change fit' capability. A manager noted: "If there're small changes we are a 'change fit' company; part of our culture is change" (B8 36:30, 177). Because they knew that learning costs were controllable, the capability as well as some experience in major initiatives was seen to give managers greater confidence to pursue more strategic change in the business. Referring to the electronic equities initiative, a manager observed: "It's just been easier, as a result of that huge change to where we are right now" (B3 25:23, 161). In addition, the manager noted: "And probably having gone through change we're quite 'change fit'" (B3 43:65, 336). Interestingly, an adaptation of the project management methodology to align with intended innovation teams was intended. The more fine-grained adaptation suggests that managerial project management capabilities were developed.

5.2.3 Market collaboration

Market collaboration process

In *Organisation B*, the main purpose of being closely involved in market workshops was suggested to help create awareness of the market dynamics, so that the business implications could be assessed. A manager noted: “There’s a lot of dynamism in the system that needs to be constantly reviewed” (B1 43:62, 310). Managers in *B* did not seem to actively participate in market forums initially, but once they did they changed their ideas on being closely involved. A critical turning point was when managers realised that sharing process information was necessary to standardise certain components. A manager explained:

[There] also was the collaborative component in terms of what is standard practice. In the past, it was seen as a competitive advantage not to share information around the process. Post [the CSD] it became a necessity to standardise at least a settlement component. That required more market participation, and that kind of conversation has taken the market further. (B1 43:51, 279)

Part of organisational market collaboration capabilities developed included deliberately sharing process information of interest, such as by drawing attention to the off-market settlement component particularly relevant to *Organisation B*’s foreign client base. Managerial capabilities developed included an awareness of more subtle market influences on collaboration, such as trends in market support of an initiative under discussion, and a shift in market relationships. For example, a manager questioned whether the custodian relationship with the CSD was undergoing change: “Are they [the CSD] partner or is the whole relationship with the market infrastructure also undergoing change? And [it] has from its inception” (B1 43:62, 310).

Major market initiative requirements

In *Organisation B*, the purpose of systematically researching and analysing market models and practices was seen to help become aware of market conditions that might affect the requirements. Knowing the market conditions enabled managers to evaluate the requirements based on their likely

implementation success, suggested to be the basis of its development decision. A manager explained:

You research. You might find markets that have gone that route and [can] also enquire in terms of what their experience is.... That helps to set the scene to say, "We're better off approaching this problem this way, because there are markets that have gone that route. They're successful." Instead of just going blindly and then we end up with the ones that couldn't pull it through because there's some things that they didn't think of. (B6 29:13, 95)

Managers' ideas on the usefulness of the research and analysis were learnt through the experience of two major market initiatives. The analysis was based on a focus of establishing the effect of market conditions on the requirements of initiatives to ensure implementation success. Although the focus remained consistent, a critical turning point in terms of the analysis was when the electronic money market implementation failed in the market and its development was found to have been costly because the requirements were not properly understood. At that point, managers realised that a more rigorous problem-solving strategy was required to prevent a failed implementation. A manager explained:

We went and developed the system, based on the perception of what could be achieved in the market. And then down the line, as it was pointed out, there was a big gap [in the requirements] which couldn't just be fulfilled within months.... In future, there's more [work to be done] to ascertain that the initiative that's being triggered has at least some accountable body. (B6 29:6, 51)

The turning point was preceded by accumulated experience in the electronic equities initiative. For example, managers found that delays resulted because certain market conditions were not fully considered up front. For example, although they drew attention to off-market settlement in the electronic equities initiative, a complicated process had to be developed to handle the settlement component. Not surprisingly, an organisational capability developed was to deliberately draw attention to off-market settlement conditions in market initiatives under discussion, such as regulatory differences between markets in the T3 equities initiative. In addition, by comparing the two major market initiatives, managers could identify some minimum relevant market conditions.

Further, critical analysis was applied to emerging issues in the market and was seen to help determine the underlying cause. In referring to some issues, a

manager explained: “Those are realities that are emerging. And that’s what we have to drive [to] the back of to say, “What’s the way forward?”” (B6 29:14, 31). For example, as a result of increased pricing pressure analysts examined billing practices. They found an anomaly in the electronic equities settlement model carried over from the physical model which was suggested to be the underlying cause of the issue.

5.2.4 Technical development

Business initiative requirements

Analysts in *Organisation B* are suggested to have critically analysed business practices in order to achieve a development strategy of extensively automating business processes to reduce operational risk. The strategy was based on an idea that the way the system was customised could provide a competitive advantage. A manager explained:

The system has always been seen, and even up to now, is always still seen as a competitive advantage, because it depends on the approach [that] you’ve taken. How much of link up you do with your external points and the interfaces that you’re automating. (B2 24:12, 45)

More specifically, the system could enable operational efficiencies by minimising the risk of manual intervention, given Organisation B’s relatively large size of workforce. A manager noted: “We went and we chose the greater level of integration [with the CSD] to ensure that we had as little disruption as possible” (B2 24:14, 49).

The development strategy was influenced by time constraints. For example, processes were automated rather than re-engineered. A manager explained: “Automation has always been a key feature. It’s because of the rapid change that we’ve been going through. There isn’t time for total reengineering” (B2 24:58, 137). The development focus remained consistent. A manager noted: “[For a] system process, we still look at saying, “Let’s automate to the nth degree”, so [that] we take away the pain of the operations” (B2 24:59, 137). However, a critical turning point in terms of a more rigorous analysis occurred early on when analysts recognised that a sustained competitive advantage could be achieved by the analysis. The turning point occurred during the analysis of corporate action

processes regarded as a particularly risky area of the business. A manager explained:

The thinking that went into that [system], and the level of automation that we put into that system.... There's a lot of IP [Intellectual Property].... We had some foresight in the process. Foresight was there. Whether it was intentional or stumbled upon, it could be argued, but it was certainly there. (B2 24:36, 77)

The turning point is suggested to have been based on an entrepreneurial intuition where a more strategic benefit was recognised. The strategic benefit became clearer later at a later stage. For example, corporate action processes were seen to have “some of the highest levels of automation on the corporate actions side in the market” (B5 37:20, 141). The way the analysis was done is suggested to have had the effect of shaping the custody system customisation. For example, a similar considerable investment was made in the electronic money market initiative. The business also developed organisational capabilities in system development. For example, analysts deliberately designed more comprehensive system changes, described by a manager as, “being able to take these smaller initiatives and constant change and bring it together and deliver a meaty parcel” (B2 24:45, 105).

Custody system technology

Organisation B's custody system configuration also consisted of two custody systems. Its systems were separated by the underlying technology of the market settlement model into physical and electronic settlement. A dual system implementation was designed in the first stage to help facilitate a stock reconciliation in the second stage. The stock reconciliation during the transition from physical to electronic equities settlement was expected to be problematic. A manager explained:

We did the separate implementation ... because we went [with] the electronic [system] as much as to say, "[the CSD] is going there", when we didn't know [the operating model]. So we took a calculated risk because we knew we could operate the business like that (B2 24:38, 81).

The novel configuration is suggested to have been deliberately designed by entrepreneurial managers based on an informed conjecture. Subsequently, the dual custody system configuration was found to not only achieve its intended

effect, but a more strategic benefit of enabling analysts to focus on the new electronic processes without the distraction of the old physical processes, thereby facilitating the transition. A manager explained:

We kept the two [systems] together, but separate.... And [it] allowed us the ability to communicate with [the CSD] a lot quicker, and [to] get that whole project moving in a quicker manner because now we were focused on one thing. We were not getting rid of any physical [stock which] continued on the [physical] system and it still exists now on the [physical] system for the unlisted [equities]. (B2 24:27, 61)

The same approach appeared to be used for the electronic money market initiative, suggesting that the system configuration was deliberately aligned with the type of settlement model technology.

5.2.5 Operations

Business processes

In *Organisation B*, managers highlighted explicit ideas on benchmarking analysis of business processes. For example, the purpose of analysing operational errors was seen to help determine and correct an underlying cause, such as a system processing problem, or a client or staff training issue. The resulting reliable business practices were seen to be a pre-requisite for improving client service. A manager explained:

Being an operational area is simple. We need to get the basics right every single time, and if we do that, clients will be happy. If we do that then we can evolve and move forward.... That's just the basic premise. (B8 36:27, 165)

In addition, the value of interviewing clients on their survey comments in a probing fashion was seen to help to understand process shortcomings. A manager explained:

Through the process of interviewing and searching and trying to understand what were the shortcomings.... Those were benchmarks that were used from the market... And that process of determining, understanding, [and] questioning, there're gems that come out [to] say, "Here's something that you're doing wrong." So we need to fix that. (B2 24:53, 125)

Further, continuous measures as a result of the analysis were seen to enable problems to be identified as they arose. A manager explained: “Now there’re continuous measures during the course of the year and then we know if we’re dropping the ball or not” (B8 36:24, 157).

The analysis was an outgrowth of two operational features that evolved and changed over time, in contrast to those in A that remained fairly consistent. First, an emphasis on reliable basic practices to enable client service improvement evolved from an emphasis on avoiding market regulatory penalties introduced with electronic equities settlement. Second, a focus on improving client service to retain clients in the competitive market evolved from a focus on improving the business rating in the *Global Custodian* survey. The latter focus was driven by rivalry with Organisation A and was initially viewed in terms of success or failure. The rivalry is partly explained by Organisation B only being rated in the survey two years after Organisation A and then it was the first custodian to be top rated in the market the subsequent year. A key factor in the evolving focus was a finding that more efficient electronic processes had a self-reinforcing effect. Over time, managers changed their conception of the business. A manager observed that a “paradigm shift [took place] ... from ‘processing shop’ to ‘client centred [service]’” (B1 43:46, 257).

Managers’ learning about the benefits of the analysis stemmed from a combination of internal and external benchmarking measures and their corresponding analysis. Routine error reporting and trends analysis which led to ongoing system enhancements evolved from a ‘learning’ workshop. The workshop was initially introduced in the second stage to analyse errors and over time the scope of analysis broadened to include interdepartmental process impacts. Two critical turning points contributed to the change in focus from the survey rating to improving client service. The annual survey was found to be more useful as a tool to engage clients than as a marketing tool leading to more frequent client surveys. Secondly, the annual survey was found to be a barometer of innovation responsiveness rather than a measure of business success. A manager noted: “What it [the survey rating] does indicate ... [is] how quickly we are able to get to market around those changes” (B4 34:9, 53). Based on their knowledge of business processes managers could identify basic operational disciplines, such as exception-based management and responsive client service; as well as client

service trends, such as a shift in the nature of queries from transaction to information requests.

Innovation investment

Secondly, increasing operational scale economies contributed towards managerial learning on business operations, expressed by more confident business expectations. Notably, managers in both Organisations B and C developed explicit theories on the strategic benefit of increasing scale economies. Scale economies were the result of operational expansion in all three cases; in turn, largely attributable to a self-reinforcing cycle of innovation and improved operational proficiency. For example, both Organisations A and B offered global custody services through an operating alliance with a global custodian. In B's case, the alliance was a long-standing one. Similarly, spurred on by confidence in its operational proficiency, Organisation C grew its foreign client base, with its joint venture partner in the equities electronic initiative becoming one of its first foreign clients.

In *Organisation B*, scale economies were seen to affect the performance contribution of the business to the bank. In turn, a higher profile in the bank as a result of a more significant performance contribution was seen to help engender a better appreciation of the business among bank managers. A manager noted: "There's greater understanding of our contribution and a better appreciation of our business" (B3 43:55, 283). Organisation B appeared to have an operating alliance with a global custodian that was maintained from the outset. Managers' ideas about operational scale economies evolved as they saw the effect of innovation initiatives. A manager explained:

We saw the scale of our operation coming through by having the system in place.... And from our position within the bank, that's changed how we're seen.... From a profitability perspective within the bank, the profile of our division has been escalated. (B3 43:55, 283)

A critical turning point was when they realised that a higher business profile in the bank was due to business performance rather than to the survey rating, the subject of an earlier 'passion' in business. At about the same time, a critical turning point was reached by the business in terms of its operational expansion. The business was reclassified from a cost centre to a revenue-generating product

area due to heightened performance expectations. Based on their knowledge of business operations, managers could identify basic characteristics of the business, such as custody was a “game of scale” (B3 33:1, 14). Further, they expected business commoditisation to drive more strategic innovation. A manager pointed out: “It’s a commoditised product.... So that would drive innovation for us to be open to change” (B3 43:65, 336).

5.3 Organisation C

5.3.1 Product Investment

Market models and business models

Managers in *Organisation C* developed explicit ideas on the market model. Notably, they saw the effect of electronic equities on the market model suggesting that it reconfigured the components of the model and transformed the market. The effect was described by a manager to have “pulled apart and put back together” (C10 5:5, 25) the components of the old physical settlement model. Their’ ideas on viable market and business models evolved as the business invested in initiatives. Organisation C’s investment objectives appeared to relate to its client base, which was predominantly local with a growth in the proportion of its foreign client base. Its market investment objective evolved from an immediate threat of survival to a long term strategy, reflected in its managerial capabilities. A critical turning point was recognition, based on exposure to foreign clients, of the extent to which market ratings attracted foreign investors. A manager explained:

What is good for the [local] market, where are we now ... versus what is good for the international market, of where we’re going. And we want to be the number one in terms of international ratings, and we are not necessarily geared now for that number one status that we want. (C3 24:37, 171)

Notably, managers saw the value of electronic compared with physical settlement processes in the market model, after the electronic equities initiative. A manager noted: “We’ve been running with equities for a couple of years, so we know exactly what it is. We also know how much better it is having a paperless environment” (C7 23:55, 226). Like the other custodians, the business found that custody services and related products helped to differentiate the business.

A market threat led to a critical turning point in managers' conception of the business model. The proposed SOR equities initiative was also sensed to be a disintermediation threat to the local client base. The threat was based on an informed conjecture: "Probably a bigger role is envisaged for [a] central operation within the country ... where trading could happen via a broker ... direct to a CSD, rather than having all these intermediaries involved" (C4 27:46, 183). In C's case, a deep conviction of the threat prompted the business model to be questioned: "What's going to distinguish us from our competitors ... on ... the assumption that the market goes this route?"... Change is going to happen" (C3 24:41, 175). As a result it, the business intended to diversify into more custody-related products. A manager explained:

We're trying to diversify on our side also, to say that, "We're still going to be relevant going forward. We've got a sustainable business model that will be derived from what the core business is." (C3 24:30, 166)

The events suggest that entrepreneurial managers helped to lead the business forward to a new business model. Managerial capabilities developed are reflected in the product diversification strategy. The strategy anticipated that the custodian business model would change across the market, and that products and services targeted to client needs would be required to differentiate the business. Managers also expected the market to continually align with international trends. A manager noted: "If you look at it long-term, then you will have to say ... "What're the international trends? How are markets moving?" (C8 28:32, 166).

Changing market

In *Organisation C*, the purpose of the analysis was seen to help understand how a market initiative might change the market so that the business plan can be adapted accordingly. A manager explained:

That three-year window has forced us as [a custodian] to now start looking forward ... and say, "... what is the market space going to look like, and what role will we play there in that space?" And everything that we do now is with that in mind.... [to ensure that] we've got a sustainable business bottom line. (C3 24:44, 187)

The analysis was due to a focus on three-year business planning to sustain the business. The particular focus, although it became a norm in Bank C, is

suggested to have occurred because the reactive response of the business to the electronic equities initiative was found to have been costly and lead to delays. As a result, managers realised a need to better understand the market direction. A manager reflected, “Had we had [some foresight] that this was going to happen, we could have just stopped the whole changing of the business, the reorganising of the business, [and] done it with [the CSD implementation]” (C2 19:49, 22). A critical turning point in terms of the focus was when managers realised that it should be on preparing for an initiative rather than on its timing because the market was dynamic. A manager explained:

[The question now is,] “How are we going to gear ourselves to deal with that change?” That’s going to be the key thing for ourselves to determine whether the [custodians] will be something that we can still talk about in five to ten years from now. (C3 24:41, 175)

In terms of analysing market scenarios, an ongoing need for individual managers to analyse the potential impact of market changes in their minds was identified. A manager explained:

You’re just not working in your own space. You are part of a larger international community, and there’re so many things that are happening that are impacting you. And you need to continuously do your SWOT [strengths, weaknesses, opportunities and threats] analysis ... to keep your business sustained all the time, which is there [in your head]. (C3 26:62, 222)

The analysis can be likened to sensing opportunities and threats based on an entrepreneurial intuition. Notably, based on their insight into market dynamics, managers intended to align future technology investment more closely to the market settlement model. More specifically, they expected their investment to depend on the CSD’s move to a common platform. In addition, managers identified opportunities and threats related to market initiatives under discussion, such as an opportunity in the T3 equities initiative to align with international custody markets and, a part disintermediation threat in the SOR equities initiative.

5.3.2 Project management

Project management teams

Managers' ideas on the configuration of the three innovation teams in *Organisation C* seemed to be evolving. *Organisation C* formed a joint venture with an international partner to see it through the transition from physical to electronic equities settlement. As intended, the business was found to benefit from access to the expertise of its more experienced partner. A manager noted:

Their experience played a vital role to us. And we always found [that] if we were stuck with a solution on [the CSD], we would bounce it off the [joint venture] people.... we would find some bright idea coming out of that, to get a solution. (C2 20:71, 379)

In particular, the venture was found to help with joint problem-solving and in implementing new systems for custody-related products. *Organisation C* also retained external IT consultants who had been part of the electronic equities project team on an ongoing basis. They might have been retained because the business lost some more experienced project resources after the project team disbanded, despite a deliberate attempt to build and retain expertise within the team. A manager noted: "We don't want to re-skill people as we go along. It's quite difficult" (C2 19:17, 46). The resource discontinuity became apparent during the subsequent major market initiative of electronic money market when some in-depth knowledge on the development, which had to some extent already been done by the project team, was thought to have been lost.

Following the project team disbandment, a business support team was established in the business. The team was integrated within operations. While the business undertook predominantly operational initiatives in the third stage, it did not appear to be at a disadvantage to its peers, given that the earlier project team had already undertaken some development of the major electronic money market initiative. However, the organisational effect on shaping the resource development of the team is suggested once more strategic initiatives were contemplated in the dynamic market in the fourth stage, when a need for a greater breadth of knowledge in the teams was recognised. A manager explained:

Those markets that are being explored would demand that you operate at another level. [There are] new styled products from a financial point of

view which may have different requirements; new [products] coming that you may never have been accustomed to or equipped for. So ... as it develops you and your teams may have to be appropriately equipped to handle that type of thing. (C4 27:47, 183)

The business support team evolved into two separate teams which became more autonomous although they remained part of operations; a more strategically focused business project team that was involved in major market initiatives and a more operationally focused business support team. The value of expertise developed in the teams came to the fore when the major implementation problem occurred in the market. In contrast to earlier implementation problems experienced, the teams were able to quickly contain and resolve the problem. A manager noted: "That's the maturity level, that we're able to delegate and say, "Now we've got the three teams, business carries on, we will look for the problems"" (C6 22:48, 298).

The third team, a product development team separate from operations, was more recently established. It was intended to help the business to diversify into custody-related products. It was established separate from operations suggesting that managers' ideas on the team configuration were evolving from separating the teams based on project roles to separating them based on the strategic or operational nature of an initiative. A manager explained:

One of the things ... is the way we're structuring our business ... with, "What do we want to offer our client base?"... We're then going to venture into those markets, and then we design for accordingly here. (C3 26:50, 162)

Similar to the other custodians, the organisational capability developed included two teams with a more strategic focus, the product development and the business support teams, and one team with more of an operational focus, the business support team.

Project management process

More structured project management procedures were developed in *Organisation C* as a result of continuously improving operations in the competitive electronic settlement market. They were introduced by experienced project managers from the bank IT area for the electronic equities initiative as part of Bank C's culture. A manager noted: "[Bank C] is a very process-driven organisation" (C2 20:96, 567).

Prioritising business requirements for the initiative helped to meet market deadlines, but development still lagged the market and implementation resulted in considerable operational disruption. Although a comprehensive methodology was applied from an early stage it was suggested to be adapted to market conditions only when process interdependencies were recognised. Where joint planning was applied from an early stage, joint planning in C was learnt by experience. It was found to prevent design and implementation problems, and to coordinate problem resolution.

Three critical turning points in applying joint planning can be identified. First, because users motivated operational enhancements they became more involved in jointly planning and assisting with system implementation. For example, because users were involved in testing they could adapt operational processes and conduct training, thereby minimising operational disruption. Second, joint planning in resolving system implementation problems was identified as a missing step in coordinating problem resolution. A manager noted that, “There were good ideas [to solve problems] but just because it wasn’t planned” (C6 22:49, 298). Third, the design stage of system development was adapted to jointly plan a system change prior to writing the specification rather than after. A manager noted: “Today, when we look at ... any development that happens, we have all the stakeholders around the table and have their input, then do the specification” (C6 24:49, 207).

Managers’ familiarity with operational enhancement suggests that an organisational project management capability was developed. A manager noted: “Now we we’re more ‘au fait’ with it; we know what to expect. Whereas then, we didn’t.... now, we’re treading in familiar waters” (C1 24:47, 193). In addition, managers knew that templates developed could be applied to in future projects, such as a project implementation plan noted to be “an ever-living document” (C6 22:55, 334).

5.3.3 Market collaboration

Market collaboration process

Managers in *Organisation C* saw the main purpose of being closely involved in market workshops to help gain awareness of both the market dynamics and

potentially problematic requirements of an initiative thereby enabling the business to effectively implement it. A manager explained: “It’s getting involved ... at idea conception stage [to become aware of potential] market impact [and any] barriers that we need to investigate and then bring forward” (C3 26:79, 148). Managers in C did not seem to actively participate in market forums initially because they were preoccupied with system implementation problems. Once they did actively participate, a critical turning point in C’s case was when managers realised that effective interaction was necessary in order to negotiate market requirements, leading to a focus on selecting competent people to attend the forums. A manager explained:

We learnt how to position things better.... how to interact at industry level and come out ... winning the argument. That was a big learning. It taught us that, in future when there’s these industry programmes, just make sure you select the people with the right competencies to go to them. (C2 20:100, 595)

Overtime, a need for greater staff involvement to gain a broader focus was recognised. Managers could also identify trends in market support of an initiative under discussion suggesting a market collaboration managerial capability was developed.

Major market initiative requirements

In *Organisation C*, informally evaluating market models and practices was suggested to help determine the market feasibility of an initiative. The analysis was due to a focus on establishing the impact of market requirements of initiatives. The focus is suggested to have been the result of a somewhat preemptive investment in custody technology to solve internal performance problems in the first stage. During the subsequent electronic equities initiative, managers found the assumptions on which the investment was made to have been flawed. Hence, during the implementation they deliberately used the CSD front-end tool as a prototype solution to help understand market requirements. A manager explained: “we could figure out from the daily transactions which were coming through, how this thing was really working.... There was a strategy behind it” (C2 19:30, 98). Nevertheless, development was found to be costly and lead to delays.

Their experience in the electronic money market initiative may have led Organisation C to promote a more centralised market model to separate “commodity and competitive advantage” (C10 5:8, 113) in order to reduce market infrastructure costs. The idea suggests that entrepreneurial managers intuitively recognised and promoted a way in which market models could be analysed in terms of their feasibility. The idea in turn, is suggested to have prompted the informal evaluation of market models and practices based on market infrastructure costs. Interestingly, managers recognised that such an evaluation could help to better understand the feasibility of market models and practices. However, it was suggested to be complex given the interconnected market and depended on the availability of relevant data. A manager explained:

“What is the impact for this country going forward?” because there is country impact. And because there’s country impact a lot more visibility and transparency needs to take place in this market. We cannot just look at one component because everything is intertwined. (C3 26:74, 258)

The recognition could lead to a more rigorous analysis of market models and practices in C. For example, in comparing the two major electronic equities and money market initiatives, managers suggested that latter implementation failed because the nature of the money market instrument had not been fully taken into account in the requirements.

Based on their knowledge of market requirements, managers could anticipate the market strategic direction. For example, they expected the market to move towards a more centralised model when it was feasible, suggesting a perceived trade-off between market and business competitiveness would be reached.

5.3.4 Technical development

Business initiative requirements

In *Organisation C*, the purpose of the critical analysis which was part of joint planning in process design was seen to help analysts frame business requirements more broadly to better understand the consequences. A manager explained: “We draw in a few more people around the discussions of the change, so that it’s not simply just changed.... So that you have different views and not only the one single view” (C4 27:15, 70). The analysis was also seen to help

determine common transaction requirements thereby enabling re-use of existing system components. A manager explained:

You've got to say, "What is the commonality? How often am I going to have them? And if I combined this and that in the system, can it work?" And those are your challenges. Therefore, you've got [to] have knowledgeable staff, experienced staff, but also staff that can think out of the box.... People that can from a knowledge perspective say, "... by doing this, the system will give me the same result as any normal situation without going to build it." (C5 21:38, 104)

The analysis stemmed from Organisation C's development strategy of automating processes to streamline the main transactions and manage exceptions. The strategy was based on an idea that the way the system was customised could provide a competitive advantage. In this case, the system could enable operational efficiencies by streamlining transaction processing and operational effectiveness by managing exceptions. The idea to manage exceptions at an early stage in the electronic equities development might have been influenced by its access to a more experienced joint venture partner. The deep conviction associated with the business opportunity suggests that it was based on an informed conjecture and compelling vision of entrepreneurial managers. A manager noted: "We believed it. That the solution we were putting in was going to be our differentiator" (C2 19:37, 134).

Despite market deadlines and cost constraints, Organisation C was most concerned about the quality of development and deliberately re-engineered processes. Its explicit focus on sustainable development was due to a costly lesson learnt early in implementing its new custody system. A manager explained:

If we had achieved the [market] dates, we would have sacrificed on quality, and that would have had a long term impact on us. We would have had to have done substantial rework, and we were going to lose our first-to-market advantage. So let's rather push the timelines a bit further out and make sure what we're going to deliver is of quality. The big focus was on sustainability. (C2 19:40, 142)

The focus resulted in a more systematic analysis of business requirements. A manager explained: "We just decided, "We've learnt our lesson." And having an expensive vendor ... "We'd best understand our requirements first"" (C2 19:23, 7). In particular, an analyst was noted to help integrate the business requirements.

The analyst is suggested to have played an early entrepreneurial role in promoting learning and shaping the technology customisation.

After the electronic equities initiative, the development strategy became more selective focusing on only automating the main transaction requirements in the custody system due to time and cost constraints. A manager explained:

It's those complexities... To try and keep a system updated the whole time with that, the enormity is just too big. You've got to say, "I'll cater for the norm. Anything outside the norm becomes an exception." (C5 21:37, 96)

The focus on sustainable development however, remained consistent, and led to the analysis of common transaction requirements. Further, a similar lesson to that learnt by the early project team on understanding business requirements prior to system development to avoid rework, was learnt by other less experienced analysts in the innovation teams. A manager explained: "Rather take a lot more time doing that [planning] and doing that thoroughly, than rushing through the process, [and] creating a lot more work eventually" (C4 27:14, 64). Less experienced analysts also learnt from more experienced analysts, in this case the IT consultants.

The business developed organisational capabilities in system development. For example, analysts deliberately designed processes to re-use common transaction components, and managers knew that as a result system development was more sustainable. A manager explained that common components "will cater for the norm ... cover the [common] aspects, and ... make the system more efficient and better in its use" (C5 21:43, 112). Managerial capabilities were developed to the extent that managers expected common requirements of the last release designed for the electronic equities initiative but not developed at that stage due to cost constraints, would in time, be addressed. Although the market had evolved considerably since then, they realised that the underlying basic requirements that formed part of the design would be separated out. The expectation suggests that analysts had developed a clear idea of the type of knowledge that could be leveraged.

Custody system technology

Organisation C's custody system configuration was a third configuration consisting of two custody systems. Its systems were separated by the type of requirement into transaction and information systems. Notably managers developed explicit ideas about the system configuration. The value of the information system – known as alternative solutions to custody system – was as enabling rapid feedback on business requirements developed enabling the requirements to be refined. A manager explained, "The flexibility comes with the alternative solutions that have been implemented, which just give us more time and more 'hands on' in terms of exception management" (C6 22:24, 142). The combination of both systems was also seen as to provide strategic flexibility because it enabled parallel development of transaction and information requirements. A manager explained:

While the [custody system] specification is still in development, more enhancements [alternative solutions] are put in, so that by the time the [custody] system is installed and implemented, it is on a par with what we're doing, and not behind. (C6 24:49, 207)

The configuration evolved to solve an operational problem and its strategic benefit was subsequently recognised. Organisation C implemented a new custody in the first stage ahead of market to help solve an operational problem. The implementation appeared to have its intended effect; however, the implementation pre-empted market requirements for electronic equities settlement in the second stage, and for that reason among others was found to be costly, as previously noted. The custody system became the main transaction system, also previously noted. The information system of alternative solutions evolved from workaround solutions that were introduced during the equities dematerialisation to alleviate staff workload pressure. The workaround solutions are suggested to have been spontaneously introduced as temporary improvisation measure rather than purposefully designed because they initially caused technical problems. Subsequently, more robust alternative solutions were found to help keep pace with exception management reporting requirements, one aspect of Organisation C's development strategy. A manager explained:

That's why we did these offshoot systems so that we could do the management exception reporting.... Because we were going at such a fast pace on the market that our system development was not keeping ...

pace.... And we weren't able to [go faster], because we had financial constraints. (C6 24:49, 207)

The business developed an organisational capability in its system configuration in that managers knew that the two systems were complementary – alternative solutions were seen as enhancements to the custody system. The custody system technology is suggested to have been deliberately aligned with the type of requirement – transaction and information.

5.3.5 Operations

Business processes

Managers in *Organisation C* highlighted explicit ideas on the value of benchmarking business processes. For instance, the purpose of analysing operational errors was also seen to help determine and correct an underlying cause of an error. The analysis was due to an emphasis on managing operational risk to prevent losses. The emphasis was part of Bank C's culture where risk was explicitly managed. Interestingly, managers' idea about the emphasis and analysis was that it enabled the business to ensure that performance was satisfactory. A manager explained:

The [management and supervisory] calibre and the [staff] competency levels ensure that those [market] timelines are kept in check, because of the visibility and the emphasis on it, and the [business process] analysis. (C3 26:48, 130)

The emphasis was reinforced by basic operational disciplines introduced in the first stage, including more stringent processes embodied in new the custody system; and reconciliation and exception management of corporate action claims. Similar to the other two custodians, it was entrenched due to the relatively high cost of market regulatory penalties. A manager noted: "The [most useful] purpose of the penalties, was to ensure that all our systems did what they had to do and that all the staff were properly trained" (C7 23:32, 206).

A focus on improving client service to retain clients evolved over time. A critical turning point leading to a shift in focus occurred due to growth in *Organisation C's* foreign client base and exposure to the more demanding clients. Foreign clients were found to be interested in service rather than challenges. A manager

explained: “International clients are not concerned about the challenges that you’re going through. They’re used to first-class service.... And that was a differentiator” (C3 26:21, 38).

Improved operational proficiency was found to be self-reinforcing. Managers’ learning about the benefits of process analysis stemmed from a combination of internal and external benchmarking measures and their corresponding analysis. A milestone for Organisation C was when the *Global Custodian* survey introduced a domestic rating, and the business was rated by its local clients three years after A had been re-rated. The rating was found to put the business “on the map” (C8 28:17, 110) in terms of providing visibility. Subsequently, a cross border rating was achieved five years after Organisation A was first re-rated. Notably, foreign clients were found to set a new benchmark in client service. A manager explained:

We had to gear ourselves up in order to accommodate the international clients who set up a new benchmark in this country. They set up a new benchmark, and once we got that edge then we sold the same to the local client base. (C3 26:21, 38)

Meanwhile, routine error reporting and trends analysis and corporate event scenario analysis led to ongoing system enhancements, staff training and team collaboration. Based on their knowledge of business processes managers could predict when errors would occur. A manager noted: “We know why things happen. We never have a penalty that’s a surprise” (C7 23:31, 198). They could also identify operational knowledge that could be leveraged. For example, they could identify basic operational disciplines, such as efficiency and control; as well as trends in client service. A manager noted: “We’re now just fighting in terms of content and timing [of reporting]” (C3 26:22, 38).

Innovation investment

In *Organisation C*, the business was seen to be better understood in the bank because the business had a critical effect on the bank’s risk profile. Managers highlighted a change in the bank managerial conception of the business and outlined a theory as to why it occurred. Typical of custodians at the time of physical settlement in the first stage, managers saw that the business was not well understood in bank. A manager noted: “This was one area of the market that very few people were ‘au fait’ with from a bank perspective” (C3 26:11, 14). A

change in the visibility of the business in the bank was attributed to regular risk reporting coupled with increasing scale economies. The manager further noted: “There’s a lot of visibility and transparency that wasn’t there before” (C3 26:43, 106). Organisation C grew its foreign client base, with its joint venture partner in the equities electronic initiative becoming one of its first foreign clients. Based on their knowledge of business operations, managers highlighted the importance of operational efficiency.

6 CHAPTER: CROSS CASE ANALYSIS

This chapter presents the study findings in terms of the cross case analysis. In general, managers developed theories on technological innovation to improve operational capabilities. Managerial theories were developed both on innovation features - the 'what' of strategy and on ways to innovate - the 'how' of strategy. The theories were aimed at interpreting and responding to environmental changes in order to be competitive. The theories on innovation features provided a broad yet targeted context for strategic action. The theories on ways of innovating included more detail on how a way or particular sensemaking practice could help learning, as well as the particular knowledge that could be developed as a result, and the effect of accumulated knowledge at various levels of dynamic capabilities.

The findings are presented in terms of technological and organisational problem solving strategies. The sensemaking practices are summarised for each group of strategies, and then the findings are illustrated in a visual map in the form of a table for each innovation process within a business function. A common template is used to describe the patterns found in each table for expert learning and for entrepreneurial learning, including the managerial theories developed as a result.

6.1 Technological problem solving strategies

Technological sensemaking practices were employed based on the innovation feature or the focus of a problem solving strategy. Strategies tended to focus on predicting the environment, such as positioning the business, business planning, and establishing the effects of initiatives. Alternatively, they tended to focus on controlling the environment, including establishing the main requirements of initiatives and operational reliability. Interestingly, the same type of practices could be employed for different purposes to help identify different types of specific knowledge. The sensemaking practices tended to involve some form of systematic analysis and research of a technology. They helped learning by widening the scope of managers' thinking; for example, scenario analysis helped think ahead and critical analysis helped think more broadly. Notably, the specific knowledge developed as a result related to the focus of the problem solving

strategy. A focus on control led to more basic and fundamental knowledge determined, such as basic market requirements, the system structure, common transaction requirements, and generic types of process errors. Where the focus was on prediction, the sensemaking practice led to the identification of particular environmental effects, such as the virtual impact and effects of an initiative. Thus, the cumulative effect of the knowledge developed and the associated dynamic capability depended on the focus of the strategy.

6.1.1 Product investment

Expert learning

A significant shortcoming led to the identification of a cause. In C, the reorganisation of the business prior to 'electronic equities' was found to be significantly costly because the impact of the initiative had been unknown.

A significant expected shortcoming led to the determination of a need or goal and a corresponding technological problem solving focus. In B, a need to grow the business to meet business targets in the face of pricing pressure led to a focus on positioning the business. In C, a need to comply with bank requirements and culture led to a focus on three-year business planning. Both the focus on positioning the business and the focus on business planning led to analysis of the impact of market initiatives under discussion.

The problem solving focus led to a search aimed at preventing the cause from recurring. In B and C, learning efforts included analysing the impact of market initiatives under discussion to understand their potential impact and to help look forward, respectively.

After engaging in the search for a while, a method or tool was recognised to help provide a benefit other than that intended. In C, analysis of market scenarios forced a forward view of the business.

A gradual process of small related recognitions led to a sudden and unexpected recognition of an opportunity. The opportunity was associated with a need or goal in order to achieve business targets. It led to a change in thinking. In B, a need to respond proactively rather than reactively to market initiatives was recognised. In

C, a need to prepare for an initiative rather than wait for an initiative was discovered. Thus, both organisations changed their problem solving focus in stage 4 from what it was in stages 1 and 2.

Table 6.1 Learning about the changing market

	Organisation B	Organisation C
Way (how)	Analysing market scenarios	Analysing market scenarios
Managerial theory – Purpose of way	Helps understand virtual impact of a market initiative	Helps look forward to envision future market landscape
Technological innovation capabilities	Can align strategy to changing market	Can align business plan to changing market Can ensure business is sustainable
Feature (what) – Focus on	Positioning the business	Three-year business planning
Evolution of feature – Contextual influences	Dynamic market Pricing pressure	Dynamic market Bank culture
Entrepreneurial learning	B4 – saw need for a better quality of market awareness	C4 – saw need for a continuous mental assessment of market changes
Expert learning	B3 – realised need to grow business to meet targets B4 – discovered need to respond proactively vs. reactively to a market initiative	C4 – saw need for more visibility and transparency in market C2 – found prior reorganisation of business costly when market initiative impact unknown C4 – discovered need to prepare for vs. wait for market initiative
Evolution of way – Entrepreneurial learning	B3 - analysed impact of market initiatives under discussion	C3 - analysed impact of market initiatives under discussion
Expert learning		
Managerial knowledge and capabilities	Could identify threats and opportunities of market initiatives under discussion	Intended to align investment with market changes Could identify threats and opportunities of market initiatives under discussion

Entrepreneurial learning

The need envisaged tended to be vague. In B, a need was seen for a better quality of market awareness, and in C, a need was seen for a continuous mental assessment of market changes. In addition, in C, a need was seen for more visibility and transparency in the market which was suggested to aid in understanding the impact of a market initiative at the market level.

6.1.2 Market collaboration

Expert learning

A shortcoming was recognised in terms of meeting business targets or compliance requirements, given the contextual demands of the changing environment, such as compliance with major market initiatives and in C, cost constraints. A significant and recurring shortcoming led to the identification of a cause. In B, system development for the 'electronic equities' initiative was found to be delayed due to market conditions not fully considered, and subsequently for the 'money market' initiative, it was found to be costly when market conditions had not been properly taken into account. In C, system development in terms of implementing the new custody system was subsequently realised to have been costly when market requirements had been largely assumed.

The problem solving focus led to a search aimed at preventing the cause from recurring. Learning efforts involved the use of methods and tools. In B, attention was drawn to the effect of market conditions causing delays to 'electronic equities' because they were not fully taken into account.

A particularly significant shortcoming or failure led to a more adapted search based on a sudden recognition of the cause and a realisation that more systematic methods and tools were required to better understand the cause and prevent it from recurring. In B, the failure of the implementation of the 'money market' initiative led to recognition that more thorough research and analysis rather than a casual assessment of relevant market conditions was required to prevent costly system development. The rationale for the research and analysis

was to enable the effect of relevant market conditions to be predicted to ensure successful implementation.

Once an opportunity was discovered, the respective problem solving strategy or focus was adapted accordingly. In B, the feature was adapted to focus on establishing the effect of market conditions on market requirements.

Table 6.2 Learning about major market initiative requirements

	Organisation A	Organisation B	Organisation C
Way (how) Managerial theory – Purpose of way Technological innovation capabilities	Critically analysing market models and practices Can determine basic market requirements Can ensure development cost is justified by market need	Systematically researching and analysing market models and practices Can predict effect of relevant market conditions Can ensure successful implementation of requirements	Critically analysing market models and practices
Feature (what) – Focus on	Establishing main requirements of market initiatives	Establishing effect of market conditions on market requirements	Establishing requirements of market initiatives
Evolution of feature – Contextual influences Entrepreneurial learning Expert learning	Major market initiatives A4 – saw it took a long time to establish real market requirement	Major market initiatives B2 – saw market conditions not fully considered led to delays B3 – found system development costly when market conditions not taken into account	Major market initiatives Cost constraints C2 – realised need for sustainable development C2 – found system development costly when market requirements assumed
Evolution of way – Entrepreneurial learning Expert learning	A1-3 – clarified requirements by examining rationale A2 – used front-end tool to help understand requirements A3 – saw end product helped participants understand basic market requirements	B2 – drew attention to effect of certain market conditions B3 – realised need more thorough research and analysis vs. casual assessment of market conditions	C2 – deliberately used front-end tool to help understand requirements C2 – integrated business requirements
Managerial knowledge and capabilities	Anticipated market strategic direction Deliberately evaluated initiatives in terms of market benefit	Deliberately drew attention to effect of relevant market conditions	Anticipated market strategic direction Could compare market initiatives in terms of requirements

Entrepreneurial learning

A constraint recognised, where articulated, was associated with how a business or market function was performed. In A, a constraint was the lengthy time taken in market workshops to establish the basic requirements of a major market initiative.

The need envisaged tended to be vague. In addition, there was a conviction and a belief associated with the need. In C, a need was seen for more sustainable system development based on a better understanding of the requirements of an initiative. The need was based on experience gained from the costly business reorganisation and system development in the first stage. It was believed that more sustainable system development would provide a competitive advantage and was actively lobbied for in the face of market deadlines and cost constraints.

Once a way was observed to help achieve a need, it created an impression, although the way itself was not suitable. In A, the failed 'electronic money market' implementation helped in understanding in-depth market requirements, suggesting that the finished product acted as a form of prototype solution.

A method or tool deemed to contribute towards the need was deliberately used. In A and in C, an understanding of market requirements was helped by clarifying and integrating them, as well as by the use of a front-end tool. The tool can be likened to a prototype solution, similar to a finished product. Further, the rationale for the usefulness of the method or tool was associated with the need. In C, the front-end tool helped in understanding how the system as a whole was working. The use of tool was a deliberate strategy to help understand requirements and achieve the need of more sustainable development.

Over time, the rationale for the usefulness of a way was more fully articulated in a managerial theory and related to a high level innovation capability. For example, in A, critical analysis of market models and practices enabled basic market requirements to be determined. In turn, the development cost of an initiative could be justified in terms of the need.

6.1.3 Technical development

Table 6.3 Learning about business initiative requirements

	Organisation A	Organisation B	Organisation C
Way (how)	Critically analysing business practices and system design	Critically analysing business practices	Critically analysing business practices
Managerial theory – Purpose of way	Helps think more broadly about requirements		Help broaden views on business requirements
Technological innovation capabilities	Helps understand system structure Can estimate development effort Can design more flexible processes Can maintain system design continuity Can better manage IT vendor relationship		Can determine common transaction requirements Can re-use existing system components Can develop more sustainably
Feature (what) – Focus on	Automating main requirements to obtain business benefit	Automating processes extensively to reduce operational risk	Streamlining main transactions and managing exceptions
Evolution of feature – Contextual influences	Time and cost constraints	Time constraints Workforce size	Time and cost constraints
Entrepreneurial learning	A3 - found rework costly due to work-around solutions		C3 – realised need to better understand requirements
Expert learning			C3 – found rework costly C3 – adapted strategy to more selective focus to keep pace with market
Evolution of way – Entrepreneurial learning	A2 – sought better understanding of system A3 – experimented with methods to analyse system	B2 – realised more thorough analysis could help determine longer term requirements	C3 – learnt from more experienced analysts
Expert learning	A2-3 – learnt from more experienced analysts		
Managerial knowledge and capabilities	Could resolve system problems more rapidly Deliberately evaluated process design options in terms of feasibility	Deliberately designed more comprehensive system changes Knew corporate action processes embodied intellectual capital	Deliberately designed processes to re-use common system components Knew system development more sustainable

Expert learning

A shortcoming was recognised in terms of meeting business targets or compliance requirements, given the contextual demands of the changing environment, such as time and cost constraints and in B, the size of the workforce. A significant or recurring actual shortcoming led to the identification of a cause. In A and C, rework due to work-around solutions was found to be costly.

The problem solving focus led to a search aimed at preventing the cause from recurring. Learning efforts involved the use of methods and tools. In both A and C, novice analysts learnt from more experienced analysts.

After engaging in the search for a while, a method or tool was recognised to help provide a benefit other than that intended. The recognition tended to be sudden, unexpected, and stumbled upon. It typically led to a change in thinking on the usefulness of the way. In B, more thorough analysis of requirements to reduce operational risk was seen to help determine longer term requirements which offered a more sustainable competitive advantage. The recognition was described as either being 'intentional or stumbled upon'. Given the context of reducing operational risk it is suggested to have been stumbled upon.

Once an opportunity was discovered, the respective problem solving strategy or focus was adapted accordingly. The strategy was honed to become more targeted and long term oriented. In C, a realisation of the enormity of keeping a system updated the whole time with all the complexities of the changing market led to a focus on streamlining only the main transactions and on identifying common transaction requirements and system components that could be re-used, while meeting the (entrepreneurial) need for more sustainable development.

Entrepreneurial learning

The need envisaged tended to be vague. In C, a need was seen for a better understanding of the requirements of an initiative, based on experience acquired in terms of costly rework.

The search for a method or tool to achieve the need was purposive and intensive. In A, for no clear reason, managers sought a better understanding of the system

design by questioning the supplier and then experimenting with different methods until report writing was found to meet the need.

Over time, the rationale for the usefulness of a way was more fully articulated in a managerial theory and related to a high level innovation capability. In A, the use of a report writing tool helped to understand the system structure and enabled the development effort of an initiative to be estimated. In turn, system design continuity could be maintained, and the IT vendor relationship could be better managed. In C, critical analysis of business practices helped to broaden views on business requirements and meet the need of better understanding them.

6.1.4 Operations

Expert learning

The problem solving focus led to a search aimed at preventing a cause from recurring. Learning efforts involved the use of methods and tools. In A, process monitoring measures were introduced to help ensure processes were reliable. In B and C, analysis of operational errors and event scenarios was done to avoid regulatory penalties. The search was adapted and broadened due to significant and recurring shortcomings. In B, difficulty in maintaining market ratings based on a strategy of achieving a top rating, led to engagement with clients, initially for marketing purposes. In B and C, the analysis of operational errors was extended to include interdepartmental effects.

After engaging in the search for a while, a method or tool was recognised to help provide a benefit other than that intended. The recognition tended to be sudden, unexpected, and stumbled upon. It typically led to a change in thinking on the usefulness of the way. In B, the annual survey was found to be a tool to engage clients rather than a marketing tool, and the annual survey was found to measure innovation speed rather than business success. In C, foreign clients were found to set a service level benchmark.

Positive effects were recognised in the business as a result of learning efforts. These effects tended to self-reinforcing. In B, the new electronic equities processes were found to make more time available for clients service. In C, the processes in the new custody system were found to be more stringent and

reliable. Further, after some time, improving staff proficiency by means of learning efforts, such as analysing operational errors, was found to be self-reinforcing.

A gradual process of small related recognitions led to a sudden and unexpected recognition of an opportunity. The opportunity was associated with a need or goal in order to achieve business targets. It led to a change in thinking. The most marked changes in thinking were in B which had dominated the industry prior to the equities dematerialisation. In B, the business was discovered to be about client service rather than processing which was described as a paradigm shift. In C, it was discovered that foreign clients were interested in service rather than in the challenges of the business.

Once an opportunity was discovered, the respective problem solving strategy or focus was adapted accordingly. The strategy was honed to become more targeted and long term oriented. In A, process control measures were introduced early on. In B, the strategy was adapted from achieving a top rating in the market to improving client service and reliable business practices.

Over time, the rationale for the usefulness of a way was articulated in a managerial theory leading to an innovation capability. The theory was adapted to achieve the discovered need and became more control rather than prediction oriented. In B, the basic premise was that the use of benchmarking processes helped to identify process shortcomings and in turn, ensure that basic practices were reliable and could be improved upon.

Table 6.4 Learning about business processes

	Organisation A	Organisation B	Organisation C
Way (how)	Benchmarking business processes	Benchmarking business processes	Benchmarking business processes
Managerial theory – Purpose of way		Can determine type of error	Can determine type of error
Technological innovation and operational capabilities		Can identify process shortcomings Can identify problems as they arise Can ensure basic practices are reliable Can improve processes	Can ensure that performance is satisfactory
Feature (what) – Focus on	Improving client service	Improving client service	Improving client service
Focus on	Controlled processes to prevent losses	Reliable basic practices	Managing operational risk
Evolution of feature – Contextual influences	Regulatory penalties Market ratings	Regulatory penalties Market ratings	Regulatory penalties Market ratings
Entrepreneurial learning	A1 – introduced process control measures	B3 – found new processes made more time available for client service B3 – found annual survey rating difficult to maintain B3 – discovered business was about client service vs. processing	C1 – found new system had more stringent processes C3 – found improving staff proficiency self-reinforcing C3 – discovered foreign clients interested in service vs. business challenges
Expert learning			
Evolution of way – Entrepreneurial learning	A1 – introduced process monitoring measures	B2 – introduced workshop to analyse errors B3 – found annual survey was tool to engage clients vs. marketing tool B3 – found annual survey measured innovation speed vs. business success	C3 – analysed errors and operational event scenarios C3 – found foreign clients set a service level benchmark
Expert learning			
Managerial knowledge and capabilities	Could identify basic operational disciplines Intended to use new market survey as an improvement tool	Could identify basic operational disciplines	Could identify basic operational disciplines

6.2 Organisational problem solving strategies

Similarly, organisational sensemaking practices seemed to be employed based on the emphasis of a problem solving strategy. An emphasis on control or prediction was less evident, but where apparent it led to different types of general knowledge developed and associated capabilities. For example, a strategy emphasising control was being closely involved in market workshops to negotiate and to effectively address market requirements; and a strategy emphasising prediction was collaborating in market workshops to enable a review of market dynamics.

Organisational sensemaking practices tended to involve allocating and grouping together resources and assets in different types of structures and activities. As a result, different types of general knowledge were developed. Certain practices integrated resources by bringing them together in frequent, intense activities, such as joint planning and workshop participation, as well as by regular client reporting and business reporting. These practices enabled rapid environmental feedback and business visibility and transparency. The general knowledge developed was greater awareness and a broader appreciation of the particular subject. In addition, certain practices separated and aligned complementary resources, such as products in the business model, project management teams, sending competent people to market workshops, the system structure, and a structured project management process. These practices enabled focus on a particular subject and led to the development of expertise, such as being able to lead strategic change in the business and to correctly interpret market requirements. The cumulative effect of the knowledge developed seemed to be improved coordination and business and market growth.

6.2.1 Product investment

Expert learning

Shortcomings and threats recognised related to responding to environmental changes in order to meet business targets and compliance requirements. In B and C, a threat identified was part disintermediation as a result of the 'SOR equities' market initiative that was under discussion.

Table 6.5 Learning about market models and business models

	Organisation A	Organisation B	Organisation C
Way (how)	Using international best practice	Adding related products	Adding related products and services
Managerial theory – Purpose of way	Adding services	Can add value to business model like 'building blocks'	
Organisational innovation capabilities	Can move market forward Can attract investors to market		
Feature (what) – Emphasis on	Adopting international best practice in market	Diversifying business	Diversifying business
Evolution of feature – Contextual influences	Market ratings Physical settlement problems		Market ratings
Entrepreneurial learning	A1 – sensed risk of paper scrip in market	A2 – saw electronic processes significantly improved market competitiveness	C3 - promoted more centralised market model
Expert learning	A1 – realised market opportunity to adopt best practice A1 – realised need for settlement certainty A3 – found added services helped differentiate business	B3 – discovered business opportunity in adding related products B4 – realised threat of part disintermediation	C2 – saw value of electronic vs. physical processes C3 – found added services and related products helped differentiate business C4 – realised threat of part disintermediation
Evolution of way – Entrepreneurial learning	A1 – sought a way to achieve settlement certainty		C3 – sensed market opportunity to separate commodity and competitive advantage
Expert learning	A2 – found electronic equities changed the nature of the business	B2 – saw electronic equities changed way business was done but not the business B3 – saw electronic equities as a 'building block' that enabled business growth B4 – questioned what else to offer clients B4 – saw custody as a platform for related products vs. core business	C4 – saw new business model could be derived from core custody business C2 – saw electronic equities reorganised market model
Managerial knowledge and capabilities	Expected market to continually advance Deliberately investigated use of international best practice Knew business had future growth options	Intended to diversify into custody-related products Could identify some anomalies in current market model	Intended to diversify into custody-related products Expected market to continually align with international trends

More adapted or prolonged search efforts led to the recognition of the differentiated nature of resources and assets and their unexpected benefit in

terms of responding to contextual demands. It typically led to a change in thinking about the way. In A, 'electronic equities' was found to have changed the nature of the business. Similarly, in B, the initiative was seen to have changed the way business was done but not the business itself; and in C, the initiative was seen to have reorganised the market by pulling it apart and putting it back together again. In other words, all three organisations recognised that the initiative had a reconfiguring effect on the market and/or the business.

More adapted or prolonged search efforts also led to the recognition of a benefit of a combination or configuration of resources and assets other than that intended. The recognition tended to be unexpected and surprising. It typically led to a change in thinking. In B, as a result of the threat identified, managers questioned what else could be offered to clients. Based on their experience of custody-related products and also their knowledge of how global custodians operated, they recognised custody as a platform for related products rather than the core business. The recognition was described as a paradigm shift.

Positive effects were recognised in the business as a result of learning efforts, which tended to be self-reinforcing. In this process, learning was about the business and market models. All three organisations recognised that value-added services and custody-related products helped to differentiate the business. In B, 'electronic equities' was seen to significantly improve market competitiveness and in C, the benefit of electronic over physical processes was seen.

A gradual process of small related recognition of ways and positive effects led to a change in thinking on a resource or asset strategy. The discovery of an opportunity was sudden, unexpected, and typically associated with a need. The most marked changes in thinking were in B. In B, after taking over a custody-related product from another business unit to comply with bank requirements, an opportunity in related products was discovered.

Once an opportunity was discovered, the respective asset or resource strategy was adapted accordingly. The strategy was aligned with the changing environment. Strategies became more targeted and long term oriented. In B, the strategy of diversifying the business was aligned with the platform strategy.

The rationale for the way that was recognised to lead to an innovation capability tended to be articulated in a managerial theory. Over time, the theory became more abstract and general. In B, 'electronic equities' was seen to have been a basic 'building block' in the business model that had enabled business growth, and custody-related products and services were generally seen to be 'building blocks' in the business model.

Entrepreneurial learning

A constraint identified or threat sensed related to a general lack of competency or a problem within the business or market that was impeding performance. In A, the risk of paper scrip in the market was sensed to be a threat to the market and the business. In addition, an opportunity of adopting international best practice was recognised based on previous experience of 'electronic bonds'.

A need envisaged related to a general competency associated with overcoming the constraint or threat. It was based on a certain principle and associated with conviction. In A, a need was seen for settlement certainty in the market ridding it of the risk of paper scrip.

Identification of the need tended to lead to a purposive and intensive search for a way to achieve it, given contextual constraints. In A, a way was sought to achieve settlement certainty within the confines of the market, and described by a manager as "we had to find a way ... to get there" (A4 7:12, 65).

An opportunity designed was a way to achieve the respective need, and related to a particular spatial or temporal design principle. In C, an opportunity designed was a market model that separated commodity and competitive advantage.

An opportunity recognised tended to be deliberately implemented or seized, suggesting an associated conviction. Where an opportunity could not be implemented it was promoted seemingly to obtain consensus to implement it. In C, a more centralised market model based on the design principles was promoted in the market.

The managerial theory or rationale associated with an opportunity, where it was articulated, tended to be related to achieving a high level innovation capability. In A,

adopting and using international best practice was seen to move the market forward and attract international investors.

6.2.2 Project management teams

Expert learning

Shortcomings and threats recognised related to responding to environmental changes in order to meet business targets and compliance requirements. In B, role conflict problems between the custody support team and the IT project and business support teams were recognised.

A significant threat tended to lead to the introduction of various resources or assets as a result of adapting the strategy accordingly. In B, consultants were brought into the business during 'electronic equities'. In C, consultants and bank resources were brought into the business for the initiative and a joint venture was formed with an experienced partner. After the initiative, a business support team was established when the project team resources left.

Recurring shortcomings led to a search to establish and prevent the cause. In B, ongoing role conflict problems led to the apparent duplication of teams being questioned.

More adapted or prolonged search efforts led to the recognition of the differentiated nature of resources and assets and their unexpected benefit in terms of responding to contextual demands. It typically led to a change in thinking about the way. In B and C, the value of more experienced teams in resolving a major problem due the failed 'money market' implementation was seen. In A, one project team was seen to provide specialist expertise and another to help maintain system design continuity. In C, when the project team disbanded and left, a loss in business analyst continuity was subsequently recognised, and the value of access to venture partner was seen over an extended period.

A strategy emerged or evolved based on the emergence or evolution of a resource or asset typically in response to learning and coping efforts. In B, the custody support team emerged to assist with business initiatives because the

existing project team was preoccupied; and in B and C, project teams evolved based on more specialised functions.

Table 6.6 Learning about project management teams

	Organisation A	Organisation B	Organisation C
Way (how) ----- Managerial theory – Purpose of way ----- Organisational innovation capabilities	Separating teams by discipline and project time horizon ----- -----	Separating teams by project time horizon ----- Enables simultaneous focus on initiatives ----- Future oriented teams can better lead strategic change	Separating teams by more strategic and operational focus ----- -----
Feature (what) – Emphasis on	Retaining expertise	Retaining expertise	Retaining expertise
Evolution of feature – Contextual influences ----- Entrepreneurial learning ----- Expert learning	Dynamic market ----- A2 – saw need for team to bridge business and IT A2 – established product development team ----- A3 – kept corporate action project team A3 – brought IT project team into business	Dynamic market ----- B4 – saw need for balancing act to track market pace and continuously keep business afloat ----- B3 – custody support team emerged B3 – IT project and business support teams evolved from IT support team B3 – found role conflict problems between teams	Dynamic market ----- C4 – saw need to operate at a broader level ----- C1 – formed joint venture C2 – established business support team C3 - business project team evolved from business support team C3 – established product development team
Evolution of way – Entrepreneurial learning ----- Expert learning	A2 – planned separate team from operations ----- A3 – saw value of specialist corporate action expertise A3 – realised IT project team helped maintain system design continuity A4 - debated apparent duplication of team roles	B4 – questioned how to reorganise teams B4 – saw value of separating teams by project time horizon ----- B3 – questioned apparent duplication of teams B3 – saw value of experienced team when major problem occurred	----- C1-C3 – saw value of access to venture partner experience C3 – recognised some loss in business analyst continuity C3 – saw value of experienced teams when major problem occurred
Managerial knowledge and capabilities	Intended to keep corporate action support team	Intended to reorganise teams based on a future or current focus	

The strategy was adapted to align with the changing environment. Over time, all three organisations realised the value of retaining more experienced resources and of specialist expertise and adapted their strategies accordingly.

Entrepreneurial learning

A need envisaged related to a general competency associated with overcoming a constraint or threat. It was based on a certain principle and associated with conviction. A need was seen in A, for a team to act as a bridge between the business and IT department; in B, for a balancing act between tracking the pace of market change and keeping the business afloat in terms of ongoing improvements; and in C, to operate at a broader level.

Identification of the need tended to lead to a purposive and intensive search for a way to achieve it, given contextual constraints. In B, managers questioned how to reorganise teams.

A way recognised when observed provided an opportunity to achieve the respective need. In B, separating project teams in terms of project time horizon was seen, in another business unit, to enable simultaneous focus on initiatives with different time horizons and resolve role conflict problems.

An opportunity designed was a way to achieve the respective need, and related to a particular spatial or temporal design principle. In A, a product development team completely separate from operations was seen to prevent distraction of operations where focus was required on new electronic equities processes.

An opportunity recognised tended to be deliberately implemented or seized suggesting an associated conviction. Its enactment tended to involve some risk. In A, a product development team was established well ahead of competitors.

The managerial theory or rationale associated with an opportunity was related to achieving a high level innovation capability. In B, separating project teams based on project time horizon enabled simultaneous focus on future and current operational initiatives.

6.2.3 Project management process

Table 6.7 Learning about the project management process

	Organisation A	Organisation B	Organisation C
Way (how)	Joint planning and structured project management	Joint planning and structured project management	Joint planning and structured project management
Managerial theory – Purpose of way			Joint planning can prevent problems
Organisational innovation capabilities			Can coordinate problem resolution
Feature (what) – Emphasis on	Continuously improving business model	Developing business best practices	Continuously improving operations
Evolution of feature – Contextual influences	Market deadlines Tainted scrip in market Competitive market	Market deadlines Workforce size Bank culture Competitive market	Market deadlines Bank culture Competitive market
Entrepreneurial learning	A2 - sensed threat of tainted scrip in business		C1-2 – experienced project managers and consultants introduced formal procedures
Expert learning	A1-2 – experienced analysts introduced formal procedures	B1-2 – experienced consultants introduced formal procedures B3 – discovered need to continuously improve vs. once off	C1-2 – found operational disruption C3 – found development lagged market C3 – adapted process to keep pace with market changes
Evolution of way – Entrepreneurial learning	A2 - planned fast equities dematerialisation		
Expert learning	A2 – found planned implementation more controllable A3 – found structured vs. ad hoc procedures more reliable A3 – found joint planning helped to share knowledge	B3 – found huge change in electronic equities made change easier	C3 – found joint planning helped to prevent problems C3 – recognised process interdependencies
Managerial knowledge and capabilities	Knew had operational enhancement capability	Intended to align project management teams and process methodology Knew had operational enhancement capability	Knew had reusable project management templates Knew had operational enhancement capability

Expert learning

Shortcomings and threats recognised related to responding to environmental changes in order to meet business targets and compliance requirements. Contextual influences included time constraints, such as deadlines on major market initiatives and competitive pressure. In C, disruption to operations was found when the new custody system was implemented and when 'electronic equities' was implemented. In addition, development on market initiatives was found to lag the market, and described as 'battling to keep pace'.

A significant threat tended to lead to the introduction of various resources or assets as a result of adapting the strategy accordingly. In all three organisations, experienced resources were brought into the business for 'electronic equities'.

Recurring shortcomings led to a search to establish and prevent the cause. In particular, significant shortcomings in terms of meeting competitive demands led to extended learning and coping efforts. In C, failing to keep pace with market initiatives led to joint planning efforts in the project management process.

More adapted or prolonged search efforts led to the recognition of the differentiated nature of resources and assets and their unexpected benefit in terms of responding to contextual demands. It typically led to a change in thinking about the way. In A, novice analysts found that structured rather than ad hoc project management procedures were more reliable, and joint project planning was found to enable knowledge sharing which in turn, helped to prevent problems. In C, joint planning was found to help prevent problems for similar reasons.

More adapted or prolonged search efforts also led to the recognition of a benefit of a combination or configuration of resources and assets other than that intended. The recognition tended to be unexpected and surprising. It typically led to a change in thinking. In C, process interdependencies were discovered that reversed the order of certain activities.

A gradual process of small related recognition of ways and positive effects led to a change in thinking on a resource or asset strategy. The discovery of an opportunity was sudden, unexpected, and typically associated with a need. The

most marked changes in thinking were in the organisation B, such as a need to continuously improve rather than on a once-off basis which resulted in a mindset change.

The rationale for the way that was recognised to lead to an innovation capability tended to be articulated in a managerial theory. Over time the theory became more abstract and general. In C, joint planning was seen to prevent problems and enable coordinated implementation planning and problem resolution when problems did occur.

Entrepreneurial learning

A constraint identified or threat sensed related to a general lack of competency or a problem within the business or market that was impeding performance. In A, a threat to the business of potentially holding tainted scrip was sensed prior to the equities dematerialisation.

A way recognised when observed provided an opportunity to achieve the respective need. In A, the planned implementation was recognised to be more controllable.

An opportunity designed was a way to achieve the respective need, and related to a particular spatial or temporal design principle. In A, a fast dematerialisation process was actively planned to minimise the risk of any tainted scrip found.

6.2.4 Market collaboration

Expert learning

More adapted or prolonged search efforts led to the recognition of the differentiated nature of resources and assets and their unexpected benefit in terms of responding to contextual demands. It typically led to a change in thinking about the way. In B, sharing process information in market workshops was found to help to standardise processes rather than compromise competitive advantage.

Positive effects were recognised in the business or market as a result of learning efforts. These effects tended to be self-reinforcing. In B, market collaboration was seen to help advance the market.

Table 6.8 Learning about the market collaboration process

	Organisation A	Organisation B	Organisation C
Way (how)	Sending competent people to market forums	Actively participating in market forums	Selecting competent people to attend market forums
Managerial theory – Purpose of way	Can correctly interpret market requirements	Can become aware of market dynamics	Can become aware of market requirements
Organisational innovation capabilities	Can effectively address market requirements	Can review market dynamics	Can investigate barriers and negotiate market requirements
Feature (what) – Emphasis on	Being closely involved in market workshops	Being involved in market workshops	Being involved in market workshops
Evolution of feature – Contextual influences	Market initiatives	Market initiatives	Market initiatives
Entrepreneurial learning	A1 – involved competent people in conceptual planning of technology transition	B2 – found market collaboration helped to advance market	C2 – realised need effective interaction to negotiate requirements
Expert learning			
Evolution of way – Entrepreneurial learning	A3 – drew parallel between two major initiatives where some participants had not been closely involved	B2 – realised sharing process information helped to standardise processes vs. compromise competitive advantage	C2 – found competent people required to effectively interact C4 – recognised need for greater staff involvement to help broaden their focus
Expert learning			
Managerial knowledge and capabilities	Could identify subtle effects of market dynamics Deliberately involved different people in forums to gain experience in contributing to discussions	Could identify subtle effects of market dynamics Deliberately shared process information of common interest	Could identify subtle effects of market dynamics Deliberately became involved in forums at the beginning of an initiative

Once an opportunity was discovered, the respective asset or resource strategy was adapted accordingly. The strategy was aligned with the changing environment. In B and C, experienced resources became involved in market

forums at the start of an initiative, contrary to what had happened in 'electronic equities'.

The rationale for the way that was recognised to lead to an innovation capability tended to be articulated in a managerial theory. Over time the theory became more abstract and general. In B, participating in market forums was seen to increase awareness of market dynamics and enable the dynamics to be reviewed.

Entrepreneurial learning

A need envisaged related to a general competency associated with overcoming a constraint or threat. It was based on a certain principle and associated with conviction. In C, a need was seen for effective interaction in market workshops in order to be able to negotiate requirements.

A way recognised when observed, provided an opportunity to achieve the respective need. Similarly, a pattern was recognised on how not to achieve a particular need. In A, a parallel was drawn between two major, market initiatives where, for certain participants, appropriately competent people had not been closely involved in the workshops, leading to delays.

An opportunity recognised tended to be deliberately implemented or seized suggesting an associated conviction. Its enactment tended to involve some risk. In A, competent people were involved in a long, and drawn out market planning stage of the conceptual phase of 'electronic equities'.

The managerial theory or rationale associated with an opportunity tended to be related to achieving a high level innovation capability. Over time, the rationale for the way was explained more fully. In A, close involvement of competent people in workshops enabled market requirements to be correctly interpreted, and in turn, effectively addressed. Similarly, in C, selecting competent people to attend workshops enabled them to become aware of market requirements, enabling barriers to be investigated and requirements to be negotiated.

6.2.5 Technical development

Table 6.9 Learning about custody system technology

	Organisation A	Organisation B	Organisation C
Way (how) ----- Managerial theory – Purpose of way ----- Organisational innovation capabilities	Separating equities and bonds custody systems	Separating physical and electronic settlement custody systems	Separating transactional and reporting custody systems ----- Reporting system enables rapid feedback on client requirements ----- Can develop systems in parallel
Feature (what) – Emphasis on	Minimal operational disruption	Facilitating technological transition	Keeping pace with market change
Evolution of feature – Contextual influences ----- Entrepreneurial learning ----- Expert learning	Time constraints ----- A1 – implemented main custody system for equities only A3 – deliberately stopped system consolidation	Time constraints Workforce size ----- B1 - implemented dual custody systems -----	Time and cost constraints ----- C2 – spontaneously introduced novel work-around solutions ----- C1 – implemented main custody system C3 – alternative solutions evolved from work-around solutions C3 – implemented robust reporting system for alternative solutions
Evolution of way – Entrepreneurial learning ----- Expert learning	-----	B1 - designed novel system configuration B2 – found separate system enabled focus on new electronic processes -----	----- C3 – found alternative solutions enabled faster development
Managerial knowledge and capabilities			Knew two systems were complementary

Expert learning

Shortcomings and threats recognised related to responding to environmental changes in order to meet business targets and compliance requirements. Contextual influences included time constraints, such as deadlines on major

market initiatives. In A and in C, a new custody system was implemented prior to 'electronic equities'.

More adapted or prolonged search efforts led to the recognition of the differentiated nature of resources and assets and their unexpected benefit in terms of responding to contextual demands. It typically led to a change in thinking. In C alternative system solutions to the main system were found to enable faster development.

A strategy evolved based on the emergence or evolution of a resource or asset typically in response to learning and coping efforts. In C, alternative solutions evolved from work-around solutions.

Once an opportunity was discovered, the respective asset or resource strategy was adapted accordingly. The strategy was aligned with the changing environment. In C, the strategy was adapted to keep pace with the changing market and a robust reporting system was implemented to upgrade and cater for alternative solutions.

The rationale for the way that was recognised to lead to an innovation capability tended to be articulated in a managerial theory. Over time the theory became more abstract and general. In C, the reporting system was seen to enable rapid feedback on client requirements allowing parallel development of the two main systems.

Entrepreneurial learning

A way recognised when observed provided an opportunity to achieve a respective need. In B, the dual custody system implementation was found to enable focus on electronic processes, which in turn facilitated the technological transition to electronic equities.

An opportunity designed was a way to achieve the respective need, and related to a particular spatial or temporal design principle. In B, in response to an anticipated constraint in the equities dematerialisation, a novel dual custody system configuration was designed to facilitate the technological transition.

An opportunity recognised tended to be deliberately implemented or seized, suggesting an associated conviction. Its enactment tended to involve some risk. In B, a calculated risk was taken in implementing dual custody systems.

An example of an improvised opportunity was work-around solutions spontaneously introduced in C, to alleviate intense work pressure overload during the equities dematerialisation. The solutions resulted in short term network communication problems, but were later adapted to alternative solutions for long term benefit.

6.2.6 Operations

Expert learning

More adapted or prolonged search efforts led to the recognition of the differentiated nature of resources and assets and their unexpected benefit in terms of responding to contextual demands. It typically led to a change in thinking about the way. In A, improved business profitability was found to enable investment in more comprehensive system changes. In B, a higher business profile in the bank was realised to be due to business performance rather than market ratings.

Positive effects were recognised in the business as a result of learning efforts. These effects tended to be self-reinforcing. In A, investment in client service initiatives was found to be reinforcing. In B, investment in market and business initiatives was seen to help achieve technological scale economies, and as a result, the business was reclassified in the bank due to raised expectations. In C, investment in initiatives was found to grow the foreign client base.

A gradual process of small related recognition of ways and positive effects led to a change in thinking on a resource or asset strategy. The discovery of an opportunity was sudden, unexpected, and typically associated with a need.

Once an opportunity was discovered, the respective asset or resource strategy was adapted accordingly. The strategy was aligned with the changing environment. In B, the strategy was adapted to increase scale economies.

Table 6.10 Learning about the business value of investment in innovation

	Organisation A	Organisation B	Organisation C
Way (how) ----- Managerial theory – Purpose of way ----- Technological innovation and operational capabilities	Regular business reporting to bank -----	Regular business reporting to bank ----- Bank managers can better appreciate the business ----- Can raise business profile in bank	Regular business reporting to bank Critical effect of business on bank risk profile ----- Enables business visibility and transparency Bank managers can better understand the business ----- Can garner bank support for the business
Feature (what) – Emphasis on	Expanding business operations	Increasing scale economies	Managing operational risk
Evolution of feature – Contextual influences ----- Entrepreneurial learning ----- Expert learning	----- ----- A3 – found client service initiatives self- reinforcing A3 – formed operating alliance with global custodian	----- ----- B1-3 – retained operating alliance with global custodian B3 - found innovation initiatives enabled business to achieve scale economies on its technological platforms B3 – found bank reclassified business due to raised expectations	International risk management standards ----- C1 – saw business not well understood in bank ----- C3 – found foreign client base grew
Evolution of way – Entrepreneurial learning ----- Expert learning	----- A3 – found could justify more comprehensive system changes once business was profitable	----- B3 – realised higher business profile in bank due to performance vs. survey rating	C3 – recognised regular business risk reporting enabled greater business visibility in bank -----
Managerial knowledge and capabilities	Could identify basic business characteristics	Could identify basic business characteristics Expected business commoditisation to drive innovation	Could identify basic business characteristics

The rationale for the way that was recognised to lead to an innovation capability tended to be articulated in a managerial theory. Over time, the theory became more abstract and general. In B, regular business reporting reflecting increasing scale economies enabled bank managers to better appreciate the business, which in turn, raised the business profile in the bank.

Entrepreneurial learning

A constraint identified or threat sensed related to a general lack of competency or a problem within the business or market that was impeding performance. In C, in an early stage, a constraint was seen that the business was not well understood in the bank because of its highly specialised nature.

A way recognised when observed provided an opportunity to achieve the respective need. In C, regular business reporting, and in particular, the critical effect of the business on the bank risk profile was seen to enable greater business visibility in the bank.

The managerial theory or rationale associated with an opportunity tended to be related to achieving a high level innovation capability. Over time, the rationale for the way was explained more fully. In C, greater business visibility and transparency was seen to enable a better understanding of the business by bank managers, which in turn, enabled support for the business to be garnered.

7 CHAPTER: DISCUSSION

The case study investigated the development of dynamic capabilities from an organisational learning perspective. More specifically, it investigated the development of innovation capabilities in information system technology development in the securities custodian businesses of three banks. The findings show that the three organisations developed both technological and organisational innovation capabilities to some extent. They learnt what technologies to invest in and how to respond to environmental changes in the short and long run. To achieve a high level of performance an organisation needs to respond fast as well as appropriately (Prahalad & Bettis, 1986).

The process analysis aimed to find similarities in learning across the three organisations. Common patterns were found in managerial theories on learning and in learning processes that led to development of the theories. These patterns are summarised and discussed in the two sections of this chapter.

7.1 Managerial theories on learning

The findings show that in a dynamic environment, managers develop theories on learning, specifically on technological innovation to improve ordinary capabilities. The term 'managerial theories' is used to broadly refer to managers' beliefs and ideas in the form of their reasoning, arguments, premises, and conjectures. Managerial theories were developed both on innovation features - the 'what' of strategy and on ways to innovate - the 'how' of strategy. The theories were aimed at interpreting and responding to environmental changes in order to be competitive.

The theories on innovation features provided a broad yet targeted context for strategic action. Innovation features relate to strategies on competitive content, including the focus of technological problem solving strategies and the emphasis of organisational problem solving strategies. An example of a theory was: product investment focusing on the adoption of international best practice to advance the market and make it more attractive to investors or clients.

Notably a common structure of relatively simple managerial theories on ways of learning in the dynamic environment was found across organisations, although the details of the theories were idiosyncratic to each organisation. Over time, greater emphasis seemed to be placed on ways to innovate rather than on innovation features. The common structure shows that the theories on ways of learning provide insight on how a way or sensemaking practice could help learning, as well as the particular knowledge that could be developed as a result. In turn, the particular knowledge could accumulate and result in the development of one or more innovation capabilities or dynamic capabilities. The theories suggest that different levels of dynamic capabilities could be developed, ranging from relatively low to high levels; for example, from aligning the business plan to the changing market to ensuring that the business was sustainable.

The findings are consistent with those of Bingham and Eisenhardt (2011) where managers learnt portfolios of heuristics or simple rules as they gained process experience in internationalisation. The findings suggest that the development of managerial cognition in dynamic capabilities is similar to its development in capabilities resulting in a common structure in shared managerial understandings or simple theories across firms in an industry. The emphasis of the shared understandings on ways to innovate rather than on innovation features supports Bogner and Barr's (2000) argument on the development of common cognitive frameworks in hypercompetitive environments. They argue that organisational and industry frameworks emphasise process over content due to prolonged use of adaptive sensemaking practices required to interpret and help keep pace with the changing environment. Shared understandings among managers are suggested to be based on strategic processes rather than on competitive content because content can become rapidly outdated. Shared content oriented beliefs are suggested to remain general enough to guide action with new technological standards serving as focal point for their development.

Further, a process oriented emphasis in the managerial theories on learning enables an organisation to adjust its content oriented strategies as it learns to better interpret and respond to the environment. The self-adjusting process may occur through a series of learning cycles that are adaptive in content, responsive to new conditions and to endogenous learning, but structured in process (Doz,

1996). In this way, more global innovation theories on ways of learning may guide the constant renewal of local innovation features as the environment changes.

7.1.1 Nature of dynamic capabilities

The structure of the managerial theories on ways of learning shows that dynamic capabilities can result from knowledge accumulated in interpreting and responding to a changing environment, with the intention of being competitive in the environment. The purpose of both the innovation feature and way of innovating was to build and achieve the intended innovation capabilities. The intended technological innovation capabilities related to an ability to interpret the changing environment; for example, to align the investment strategy to the changing market, and to ensure that the development cost of a market initiative invested in is justified by the market need. Similarly, the intended organisational innovation capabilities were associated with an ability to respond to the changing environment. These included: teams to lead strategic change in the business, and the ability to effectively address market requirements.

The findings shed light on the nature of dynamic capabilities. First, they suggest that a dynamic capability is a capacity that can be enacted. A capacity refers to knowledge that can be brought to bear on a particular situation. It implies a more dynamic view than that of a process. The embodied knowledge includes managerial theories on learning, which are part of managerial cognition. The embodied knowledge in a capability can be seen as the 'ostensive aspect' (Feldman & Pentland, 2003) of the capability.

Second, dynamic capabilities may embody intent to be competitive in a dynamic environment. They are learning capabilities that may be essential to the evolutionary fitness of an organisation in a dynamic environment. The findings are consistent with a view that dynamic capabilities comprise high level routines oriented towards specific objectives (Winter, 2000). The implication is that a dynamic capability relies on patterned activity and indicates behaviour that is learnt and somewhat repetitious (Winter, 2003). In this respect, it may employ several processes and other resources that can be interchanged in order to achieve its objectives.

Third, dynamic capabilities may rely on sensemaking practices. Besides a common structure of managerial theories on ways to learn, most similarity across the organisations was found in the sensemaking practices used in a particular function. These sensemaking practices are ways to build and accumulate knowledge which can result in a dynamic capability. They can be seen as common features or 'best practice'. The implication is that dynamic capabilities are equifinal (Eisenhardt & Martin, 2000) to some degree. Notably, similar sensemaking practices were found to be used for different purposes and to result in different levels of dynamic capabilities. For example, analysis of market models and practices was used to determine basic market requirements, and to predict the effect of relevant market conditions on requirements. As discussed in the following section, the purpose for which a sensemaking practice was used was found to determine the level of dynamic capability developed. The purpose may also affect the timeliness of dynamic capability development. In a dynamic environment, these factors may be particularly significant in achieving any competitive advantage as a result. Because widely adopted practices cannot alone enable an organisation to achieve a competitive advantage, dynamic capabilities are unlikely to be made up by adopting best practice (Teece, 2007).

Finally, both technological and organisational dynamic capabilities seem to be required in a dynamic environment. Technological dynamic capabilities involve interpreting changes in the environment. Consistent with an evolutionary emphasis on selection in a highly dynamic environment, interpretation of the environment involves selecting new operational technologies. In addition, organisational dynamic capabilities may be required to respond to environmental change, and to integrate and coordinate new technologies in the knowledge base. In this respect, an 'evolutionary with design' perspective of dynamic capabilities (Teece, 2009) is suggested where both selection and orchestration of new operational technologies are emphasised.

The managerial theories on learning can be likened to 'simple rules' (Eisenhardt & Martin, 2000) that can inform the strategic expectations, intentions, and actions of managers. The technological and organisational knowledge and capabilities of managers suggests that although the managerial theories on learning were relatively simple, they were underpinned by a deep experiential knowledge base. Managers' knowledge was reflected in their expectations of the environment and the business, as well as in their understanding of the business. For example, they

could identify threats and opportunities based on their knowledge of technological trends and anticipate the market and business response to the trends. They also understood the basic operational disciplines of the business and its future growth options. Further, managers' capabilities were evident in terms of their problem solving abilities and decision making intentions. For example, managers could compare initiatives at a deeper level of analysis, detect anomalies in the market model, and detect subtle effects of market dynamics. They also intended to align technological investment with market changes, and to allocate resources to more explorative activity. The knowledge and capabilities of managers suggests that they developed a level of absorptive capacity enabling them to recognise the value of absorptive capacity (Cohen & Levinthal, 1990).

Notably, managers made explicit and deliberate efforts to sustain the dynamic capabilities shown in the managerial theories on ways to learn. These efforts involved deliberately using the respective sensemaking practices in the theories to build knowledge. They suggest that the managerial theories reflect the explicit learning of the underlying processes by managers enabling the processes to be repeatable (O'Reilly & Tushman, 2008). For example, managers deliberately investigated the adoption of international best practices in the local market by critically analysing market models and practices, and they deliberately allocated competent resources to be involved in local and international market forums. They also actively captured and retained knowledge, including maintaining system design continuity and maintaining resource continuity.

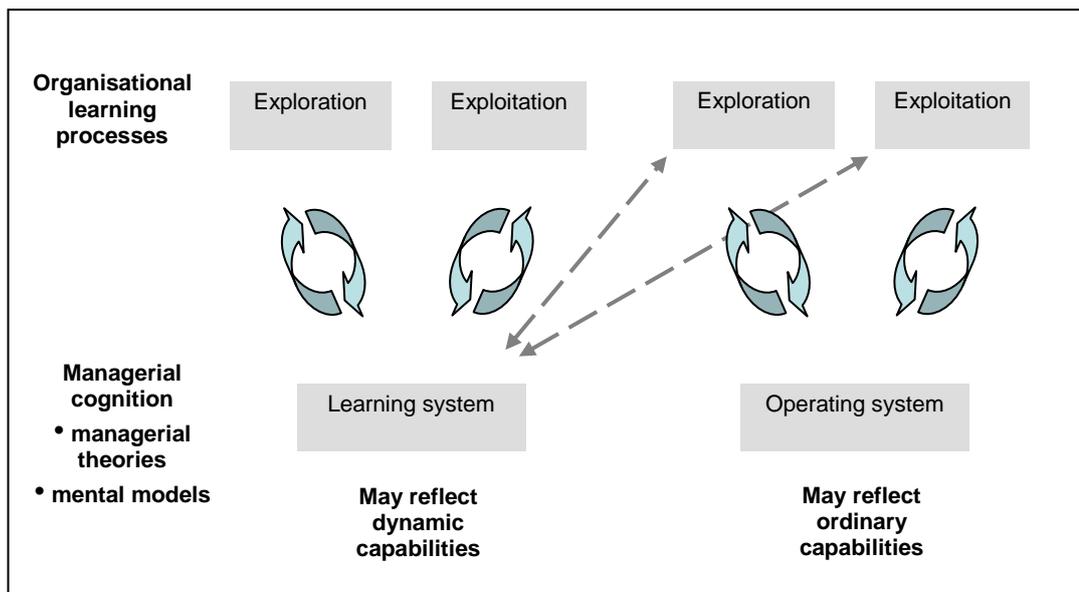
These efforts to sustain dynamic capabilities suggest that the processes underpinning them are more fragile in a highly dynamic environment and can easily dissipate due to their improvisational nature (Eisenhardt & Martin, 2000). Together, the knowledge and capabilities of managers, including their deliberate efforts to sustain dynamic capabilities, suggests that they developed dynamic managerial capabilities. Dynamic managerial capabilities reflect three components: managerial cognition, individual knowledge and skills, and managerial social capital (Adner & Helfat, 2003). In situations where organisational capabilities related to a new technology do not exist and investment incentives are low, managerial cognition can compensate to help reorient an organisation (Kaplan, 2008a). In such situations, dynamic managerial capabilities might rely on managerial cognition. Thus, explicit managerial theories on learning

which are part of managerial cognition may be required to build and sustain dynamic capabilities.

7.1.2 Learning to learn

If managerial theories on learning are required to develop and sustain dynamic capabilities, then understanding how the theories might develop is important to understand the development of dynamic capabilities. Indeed, understanding how capabilities evolve cannot neglect the role of managerial cognition (Tripsas & Gavetti, 2000). A learning to learn model is proposed to explain the development of the theories and is shown in Figure 7.1. The model depicts the development of managerial theories on learning which may reflect dynamic capabilities.

Figure 7.1 Learning to learn



The explicit nature of the managerial theories on learning found suggests that managers learnt to learn in the dynamic environment. In an increasingly dynamic and competitive environment, organisations can learn to learn because competence in learning tends to accumulate and drive slower learners to other procedures (Levitt & March, 1988). Organisations engage in exploration and exploitation in organisational learning (March, 1991) to improve ordinary capabilities. They engage in exploitation of existing operational technologies and ways of organising to refine them, and may also engage in exploration of new alternatives. As they engage in exploitation and exploration managers start to

form mental models and theories on learning. These managerial theories are part of managerial beliefs that together with the underlying mental models constitute managerial cognition. That part of managerial cognition that relates to learning can be seen as the learning system, while the part that relates to operating can be seen as the operating system. In turn, the learning system guides learning of operational or ordinary capabilities. In other words, managerial theories on learning guide the exploitation and exploration of operational technologies and ways of organising them.

Further, managerial theories on learning are themselves developed through organisational learning processes that involve the exploitation and exploration of learning technologies and ways of organising them. Learning how to learn requires creating variation in learning and selecting appropriate ways to learn, where learning itself is a technology (Levitt & March, 1988). For example, sensemaking practices were refined by extending the scope of analysis of scenarios and involving more experienced analysts in joint planning workshops. In addition, better alternatives of sensemaking practices were identified by experimenting with methods to analyse the system and designing a new system configuration.

Exploitation is likely to result in single-loop learning or paradigm constrained learning (Argyris & Schön, 1996) leading to the refinement of mental models. A change in mental models and in managerial cognition is likely to require exploration which may result in double-loop learning or paradigm breaking learning (Argyris & Schön, 1996). In particular, in a dynamic environment, new knowledge often requires exploratory learning to discover how it can be organised (Kogut & Zander, 1992). In other words, exploration may be required to find a way of organising a new technology, which in turn may require double-loop learning leading to a change in managerial cognition. Double loop learning that discovers and modifies the learning system that conditions prevailing patterns of organisational enquiry is critical because an organisation's learning system enables it to learn how to learn and enhances its capability for both single and double-loop learning (Argyris & Schön, 1996). Thus, exploration in alternative learning technologies and ways of organising them, or experimentation in sensemaking practices, may be required for double-loop learning leading to a change in the learning system.

Capabilities that may be reflected in the operating and learning systems of managerial cognition can be described in terms of a capability hierarchy (Winter, 2003). Managerial theories on operating that are part of the operating system may reflect ordinary capabilities or zero order capabilities. Managerial theories on learning that are part of the learning system may reflect dynamic capabilities or first order capabilities, as argued above. In addition, managerial theories on learning may reflect learning capabilities of the 'learning to learn' variety or second order capabilities. Such learning capabilities may involve the use of sensemaking practices to achieve specific objectives. Second order capabilities, suggested to be a function of managers based on their more global strategic insights, can help overcome the path dependence associated with the development of the original, lower order capabilities (Collis, 1994). In this respect, learning capabilities that are second order capabilities can be seen as dynamic managerial capabilities that can help reorient an organisation.

Explicit managerial theories on learning suggest that managers understand to some extent how the embodied sensemaking practices help learning, the type of knowledge developed as a result, and its cumulative effect. It is possible that managers may even form more global theories on 'learning how to learn' related to the sensemaking practices, which may form part of a broader learning system (not included in Figure 7.1). There is always a logically prior explanation for the origin of any capability and competitive advantage in the form of a higher level capability (Collis, 1994), provided investment in higher order capabilities is warranted in the context of environmental dynamism (Winter, 2003). The next subsection discusses these sensemaking practices in terms of facilitating cognition.

7.1.3 Sensemaking practices

Most similarity in the managerial theories on ways of learning was found in the sensemaking practices employed. Similar practices tended to be employed even where they were not part of an explicit theory, with the rationale elaborated. Different types of sensemaking practices were used to build and accumulate technological and organisational knowledge and to develop the associated innovation capabilities. These practices are referred to as technological and organisational sensemaking practices respectively. The patterns found relating to

the two types of sensemaking practice are described and then a model is proposed for each type of practice to explain how it can facilitate cognition.

Technological sensemaking practices were employed based on the innovation feature or the focus of the problem solving strategy. Strategies tended to focus on predicting the environment, such as positioning the business, business planning, and establishing the effects of initiatives. Alternatively, they tended to focus on controlling the environment, including establishing the main requirements of initiatives and operational reliability. Interestingly, the same type of practices could be employed for different purposes to help identify different types of specific knowledge. The sensemaking practices tended to involve some form of systematic analysis and research of a technology. They helped learning by widening the scope of managers' thinking; for example, scenario analysis helped think ahead and critical analysis helped think more broadly. Notably, the specific knowledge developed as a result related to the focus of the problem solving strategy. A focus on control led to more basic and fundamental knowledge determined, such as basic market requirements, the system structure, common transaction requirements, and generic types of process errors. Where the focus was on prediction, the sensemaking practice led to the identification of particular environmental effects, such as the virtual impact and effects of an initiative. Thus, the cumulative effect of the knowledge developed and the associated dynamic capability depended on the focus of the strategy.

Similarly, organisational sensemaking practices seemed to be employed based on the emphasis of the problem solving strategy. An emphasis on control or prediction was less evident, but where apparent it led to different types of general knowledge developed and associated capabilities. For example, a strategy emphasising control was being closely involved in market workshops to negotiate and to effectively address market requirements; and a strategy emphasising prediction was collaborating in market workshops to enable a review of market dynamics.

Organisational sensemaking practices tended to involve allocating and grouping together resources and assets in different types of structures and activities. As a result, different types of general knowledge were developed. Certain practices integrated resources by bringing them together in frequent, intense activities, such as joint planning and workshop participation, as well as by regular client reporting

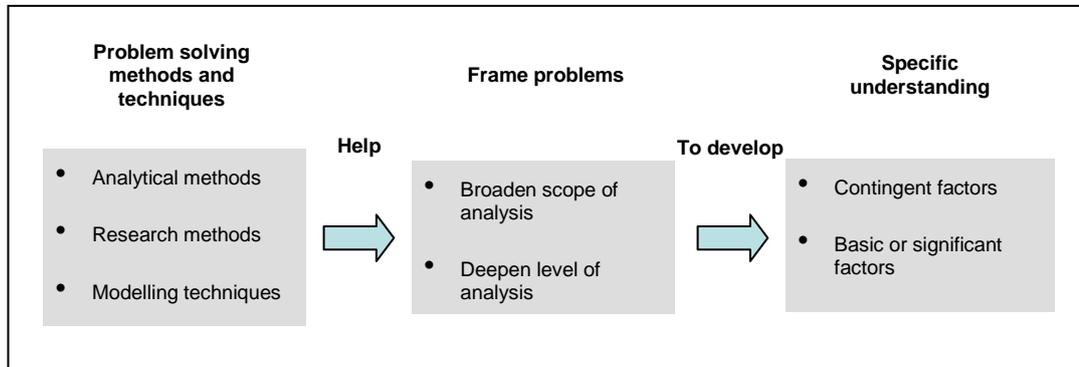
and business reporting. These practices enabled rapid environmental feedback and business visibility and transparency. The general knowledge developed was greater awareness and a broader appreciation of the particular subject. In addition, certain practices separated and aligned complementary resources, such as products in the business model, project management teams, sending competent people to market workshops, the system structure, and a structured project management process. These practices enabled focus on a particular subject and led to the development of expertise, such as being able to lead strategic change in the business and to correctly interpret market requirements. The cumulative effect of the knowledge developed seemed to be improved coordination and business and market growth.

Technological and organisational sensemaking practices that focus on and emphasise reliability may improve mindfulness (Weick, 2002; Weick & Sutcliffe, 2006). Mindfulness involves paying more attention to and becoming more aware of the environment. It involves remembering an intended object in the present (Weick & Sutcliffe, 2006), and alertness and viewing problems from multiple perspectives (Dane & Pratt, 2007). In addition, it involves encoding environmental events and responding to them (Levinthal & Rerup, 2006), and discriminating between previous and current conditions and adapting experience (Rerup, 2005). Assuming that reliable, perception-based knowledge is required for effective collective action, mindfulness helps direct the focus of attention and can improve its quality in terms of stability and vividness (Weick & Sutcliffe, 2006). Mindfulness of an environment can facilitate implicit learning by enriching cognitive complexity and domain relevance (Dane & Pratt, 2007).

Technological sensemaking practices can facilitate cognition and lead to development of a specific understanding as shown in Figure 7.2. These practices include problem solving methods and techniques, such as analytical and research methods, and modelling techniques. They help to direct attention by deepening the level and broadening the scope of problem analysis. In other words, they help to frame or set the boundaries of a problem. Framing refers to creating meaning that is not a necessary or factual aspect of a situation, which helps direct attention to features on the object of interest in a subtle way (Edmondson, 2003). It can improve the quality of attention in terms of vividness (Weick & Sutcliffe, 2006) by directing attention to basic or significant factors, such as an underlying cause, or contingent factors, and in turn, facilitate their cognition. For example, scenario

planning can focus managers' thinking by providing a conceptual framework that allows pattern recognition (Schoemaker, 1993).

Figure 7.2 Facilitating cognition in terms of technological sensemaking

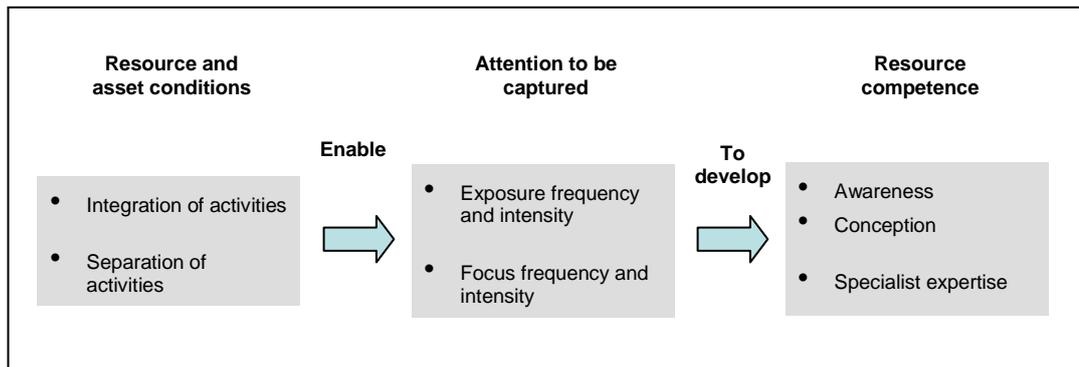


Framing affects how actors perceive the possibilities for creative action (Kaplan, 2008b). A common frame can help build consensus enabling collective action (e.g. Davidson, 2002; Edmondson, 2003; Fiol, 1994). A deep frame can facilitate the cognition of basic or significant factors, such as primary process variables (Jaikumur & Bohn, 1992) and structural cause-effect relationships; whereas, a broad frame can facilitate the cognition of contingent factors, such as secondary process variables with more subtle effects (Jaikumur & Bohn, 1992), and more superficial cause-effect relationships. In turn, an understanding of basic knowledge can make it easier to absorb related knowledge (e.g. Pisano, 2000). Cumulative knowledge can be applied and leveraged in dynamic capabilities. For example, analytical methods and techniques, such as scenario planning, can facilitate cognition and help sensing (Teece, 2007).

Organisational sensemaking practices can facilitate cognition and lead to development of a more general resource competence as shown in Figure 7.3. The practices result in resource conditions that increase the integration or separation of activities. They help to capture attention by enabling frequent exposure to specific factors through activity integration, or by enabling frequent focus on specific factors through activity separation. First, frequent and intense exposure to specific factors may improve the quality of attention in terms of vividness, and serve to highlight certain factors. For example, regular business reporting to the bank highlighted increasing scale economies in the business, and the critical effect of the business on the bank risk profile. In addition, involving experts in decision making enables the transfer of tacit knowledge (Grant, 1996b). Focused

attention on the stimulus environment facilitates implicit learning, and deliberate practice and relevant feedback from the environment facilitate explicit learning (Dane & Pratt, 2007). As a result, a general awareness or conception of contextual dependencies can be developed, such as a general appreciation of the business.

Figure 7.3 Facilitating cognition in terms of organisational sensemaking



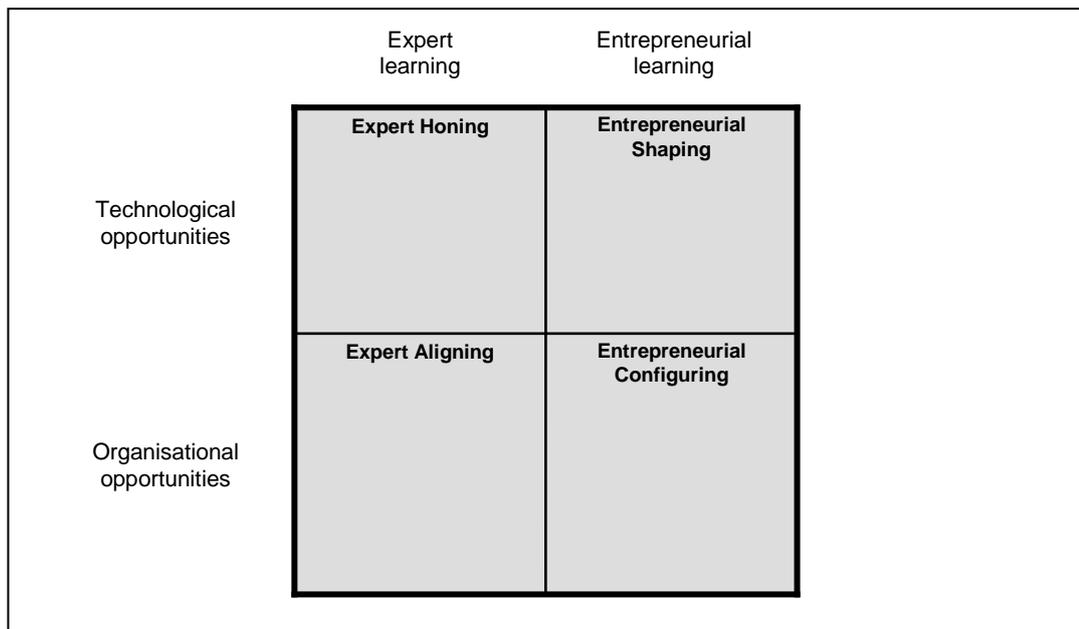
Second, the quality of attention can be improved by organising for reliability to enable more stable attention, such as by loosely coupling systems and deferring decisions to experts who can focus (Weick & Sutcliffe, 2006). The suggestion is that enabling focus on specific factors may improve the quality of attention in terms of stability. As a result, specialist expertise can be developed. Ways of organising may result in a spatial separation of assets, such as the way technologies are organised in a market or business model, or a temporal separation, such as the way technologies are introduced into the business. Organisational sensemaking practices relate to orchestrating assets. Asset orchestration involves aligning complementary assets to obtain synergies in value, while separating different sets of complementary assets and managing them through loosely coupled interfaces.

Technological and organisational sensemaking practices can be likened to the three processes underpinning dynamic capabilities referred to by Teece et al. (1997) - learning, coordination/ integrating, and reconfiguring – which are asset orchestration processes (Teece, 2007). The next section discusses the learning patterns found that led to the managerial theories on ways to learn.

7.2 Learning patterns

The learning patterns found in terms of the evolution of the innovation feature (what of strategy) and the evolution of the way of innovating (how of strategy) can be grouped into four distinct sets. The four distinct patterns form an analytical framework of dynamic capability learning shown in Figure 7.4. The framework helps to analyse the complex concepts of organisational learning, dynamic capabilities, and entrepreneurship. It helps to operationalise the concepts and guides what to look for when analysing these concepts. An important contribution of this thesis is captured in the framework. It enables learning experiences related to dynamic capability development to be captured by using the framework as a tool to analyse data.

Figure 7.4 Dynamic capability learning framework



The first dimension of the dynamic capability learning framework distinguishes between expert learning and entrepreneurial learning. The terminology derives from a distinction in the 4I organisational learning framework (Crossan et al., 1999) between entrepreneurial intuition and expert intuition. As previously noted, Crossan et al.'s (2009) clarification that a true intuitive insight cannot be driven by rationale and is outside current mental models, suggests that expert 'intuition' can rather be seen as insight. The reference to two distinct learning patterns follows Dutta and Crossan's (2005) argument that the different views of entrepreneurial

opportunities as existing or enacted can be reconciled by seeing the phenomenon as a learning process.

The second dimension of the framework distinguishes between technological and organisational opportunities. The terminology of 'shaping' and 'configuring' derives from the definition of dynamic capabilities as "the particular (nonimitability) capacity business enterprises possess to shape, reshape, configure, and reconfigure assets so as to respond to changing technologies and markets and escape the zero-profit condition" (Teece, 2009, p. 87). This 'evolution with design' view of dynamic capabilities focuses on the design role of managers in strategy processes aimed at developing ordinary capabilities. The author suggests that the entrepreneurial role of managers is closer to Schumpeter's entrepreneur than to Kirzner's and largely depends on how managers identify and pursue opportunities. Finally, the terminology of 'honing' and 'aligning' are chosen to best describe the nature of these processes in the expert learning pattern.

In this section, each of the four patterns in the framework is broken down into its main steps which are described with summary reference to the findings. See the analysis in Chapters Five and Six for more detail. The characteristics of expert learning and entrepreneurial learning are then proposed to explain the patterns found. Finally, suggestions are made on the benefit of entrepreneurial learning in a dynamic environment.

7.2.1 Expert honing

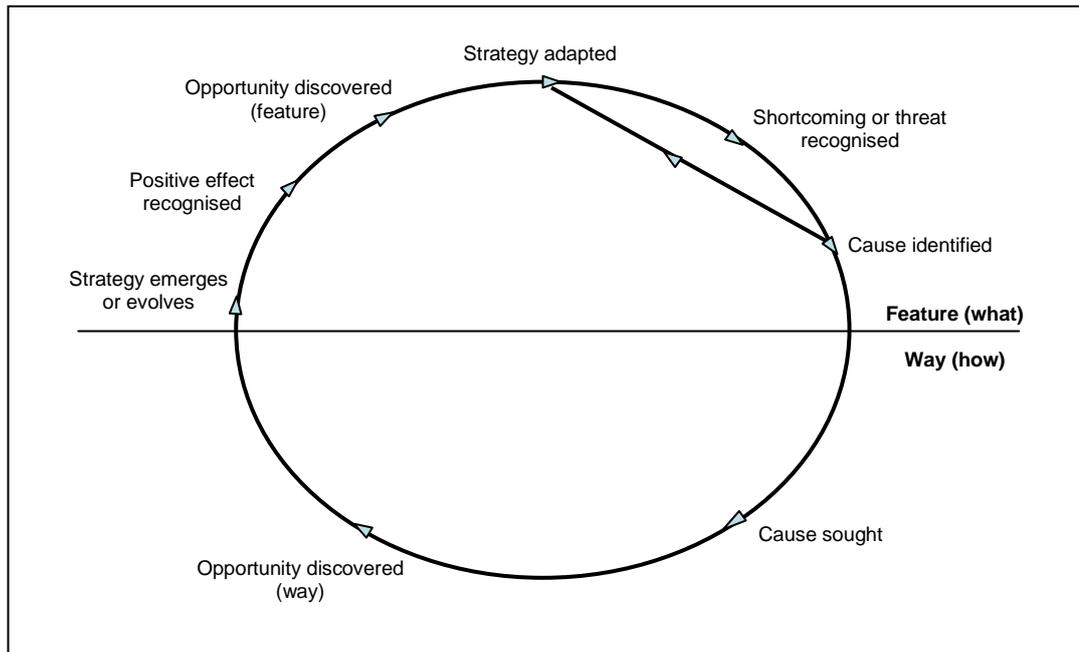
A description of the expert honing pattern found in terms of expert learning and technological opportunities follows. The pattern is described in terms of the steps outlined in Figure 7.5 and the managerial theory on the way of learning. The strategy refers to the technological problem solving strategy – the 'what' of strategy.

Shortcoming or threat recognised and cause identified

A shortcoming was recognised in terms of meeting business targets or compliance requirements, given the contextual demands of the changing environment. Contextual influences included competitive pressure and regulatory penalties. A significant or recurring actual shortcoming led to the identification of a

cause. The caused tended to relate to a lack of understanding of the effect of environmental conditions. Examples included a costly business reorganisation when the impact of an initiative was largely unknown; and delayed and costly system development due to market conditions not considered, and market requirements assumed or not well understood.

Figure 7.5 Expert learning pattern



A significant expected shortcoming led to the determination of a need or goal and a corresponding technological problem solving focus. The need was aimed at achieving a specific effect in terms of meeting business targets or compliance requirements. The need was based on an implied cause of the expected shortcoming. For example, a need to grow the business to meet business targets in the face of competitive pressure led to a focus on positioning the business, and a need to comply with bank requirements led to a focus on three-year business planning. Both the focus on positioning the business and the focus on business planning led to analysis of the impact of market initiatives under discussion.

Cause sought

The problem solving focus led to a search aimed at preventing the cause from recurring. Learning efforts involved the use of methods and tools. Examples included analysing the impact of market initiatives under discussion to understand

their potential impact, drawing attention to the effect of market conditions causing delays to an initiative because they were not fully taken into account, and analysing operational errors and event scenarios to avoid regulatory penalties. The search was adapted and broadened due to significant and recurring shortcomings; for example, difficulty in maintaining market ratings led to engaging with clients to determine the cause of process shortcomings, and ongoing regulatory penalties led to an extended analysis to prevent operational errors.

A particularly significant shortcoming or failure led to a more adapted search based on a sudden recognition of the cause and a realisation that more systematic methods and tools were required to better understand the cause and prevent it from recurring. Initially, the rationale for the usefulness of a method or tool tended to be for predictive purposes in order to achieve the need. For example, a market initiative that failed on implementation led to recognition that more thorough research and analysis rather than a casual assessment of relevant market conditions was required to prevent costly system development. The rationale for the research and analysis was to enable the effect of relevant market conditions to be predicted to ensure successful implementation.

Opportunity discovered (way)

After engaging in the search for a while, a method or tool was recognised to help provide a benefit other than that intended. The recognition tended to be sudden, unexpected, and stumbled upon. It typically led to a change in thinking on the usefulness of the way. For example, analysis of market scenarios forced a forward view of the business, more thorough analysis of business requirements to reduce risk enabled longer term requirements to be determined to achieve a more sustainable competitive advantage, the annual survey was a tool to engage clients rather than a marketing tool, the annual survey measured innovation speed rather than business success, and foreign clients set a service level benchmark.

Positive effect recognised

Positive effects were recognised in the business as a result of learning efforts. These effects tended to self-reinforcing. For example, new processes implemented as a result of market and business initiatives were found to make more time available for client service and to be more stringent, and improving the level of staff proficiency through learning efforts was found to be self-reinforcing.

Opportunity discovered (feature)

A gradual process of small related recognitions led to a sudden and unexpected recognition of an opportunity. The opportunity was associated with a need or goal in order to achieve business targets. It led to a change in thinking or paradigm shift in terms of the 'what' of strategy or problem solving focus. Interestingly, the most marked changes in thinking were in the organisation that had dominated the industry prior to the technological transition. Examples of opportunities discovered were: a need to respond proactively rather than reactively to market initiatives; a need to prepare for rather than wait for a market initiative; that the business was about client service rather than processing; and that foreign clients were interested in service rather than in the challenges of the business.

Strategy adapted

Once an opportunity was discovered, the respective problem solving strategy or focus was adapted accordingly. The strategy was honed to become more targeted and long term oriented. For example, operational strategies on improving business processes were adapted to focus on improving client service from achieving a top market rating and from no particular client strategy.

Managerial theory on the way of learning

Over time, the rationale for the usefulness of a way was articulated in a managerial theory leading to an innovation capability. The theory was adapted to achieve the discovered need and became more control rather than prediction oriented. An example of a theory was: the use of benchmarking processes to identify process shortcomings and in turn, ensure that basic practices were reliable enabling them to be improved upon.

7.2.2 Expert aligning

The expert aligning pattern found in respect of expert learning and organisational opportunities is described. Similar to expert honing, the pattern is described in terms of the steps outlined in Figure 7.5 and the managerial theory on the way of learning. The strategy refers to the resource or asset strategy in terms of organisational problem solving – the 'what' of strategy.

Shortcoming or threat recognised

Similar to expert honing, shortcomings and threats recognised related to responding to environmental changes in order to meet business targets and compliance requirements. Contextual influences included time constraints, such as deadlines on major market initiatives, market dynamism, cost constraints, international standards and best practice, and competitive pressure. Shortcomings recognised included: role conflict problems between project management teams, as well as system development that lagged the market and implementation that resulted in considerable operational disruption. An example of a threat identified was part disintermediation as a result of a market initiative that was under discussion.

Cause identified

A significant threat tended to lead to the introduction of various resources or assets as a result of adapting the strategy accordingly. The implied cause was a lack of a competency to respond to environmental changes in order to meet business targets or compliance requirements. Examples included: bringing experienced bank resources or consultants into the business and forming a joint venture with an experienced partner prior to the technological transition, as well as establishing a business support team after the transition.

Cause sought

Recurring shortcomings led to a search to establish and prevent the cause. Learning efforts involved questioning and debating the usefulness of resources and assets. For example, ongoing role conflict problems led to the apparent duplication of teams being questioned; and a part disintermediation threat led to questioning on what other products or services could be offered to clients. A significant shortcoming in terms of meeting competitive demands led to extended learning and coping efforts involving learning from more experienced resources and the use of more systematic procedures. For example, failing to keep pace with market initiatives led to joint planning efforts in the project management process, and costly rework led to the use of more structured procedures in the process.

Opportunity discovered (way)

More adapted or prolonged search efforts led to the recognition of the differentiated nature of resources and assets and their unexpected benefit in terms of responding to contextual demands. It typically led to a change in thinking about a particular resource or asset in the way it helped respond to market changes. Examples of ways recognised included: the technological transition changed the way business was done but not the business itself and it provided a building block enabling growth, more experienced teams enabled major problems to be resolved, one project team provided specialist expertise and another helped to maintain system design continuity, structured rather than ad hoc project management procedures were more reliable, joint project planning enabled knowledge to be shared and helped to prevent problems, sharing process information in market workshops helped to standardise processes rather than compromise competitive advantage, and alternative system solutions to the main system enabled faster development.

More adapted or prolonged search efforts also led to the recognition of a benefit of a combination or configuration of resources and assets other than that intended. The recognition tended to be unexpected and surprising. It typically led to a change in thinking on the combination or configuration or way of learning and responding to market changes. Examples of ways recognised were: the custody product was a platform for other products rather than the core business in the business model, process interdependencies in the project management process, and business performance rather than market ratings led to a higher bank profile.

Strategy emerges or evolves

A strategy emerged or evolved based on the emergence or evolution of a resource or asset typically in response to learning and coping efforts. For example, a project team emerged to assist with business initiatives because the existing project team was preoccupied, and project teams evolved based on more specialised functions.

Positive effect recognised

Positive effects were recognised in the business as a result of learning efforts. These effects tended to be self-reinforcing. For example, investment in related

products and services helped differentiate the business, market initiatives improved market competitiveness, market collaboration helped to advance the market, client service initiatives were self-reinforcing, market and business initiatives helped to achieve technological scale economies, and the business was reclassified in the bank due to raised expectations.

Opportunity discovered

A gradual process of small related recognitions of ways and positive effects led to a change in thinking on a resource or asset strategy. The discovery of an opportunity was sudden, unexpected, and typically associated with a need. Similar to expert honing, the most marked changes in thinking were in the organisation that had dominated the industry prior to the technological transition. Examples of opportunities discovered included: after taking over a related product from another business unit to comply with bank requirements, an opportunity in related products was discovered; and a need to improve continuously rather than on a once-off basis led to a mindset change.

Strategy adapted

Once an opportunity was discovered, the respective asset or resource strategy was adapted accordingly. The strategy was aligned with the changing environment. Strategies became more targeted and long term oriented. Examples of strategies adapted included: the business investment strategy was adapted to diversify into related products; project teams that provided specialist expertise were retained or brought directly into the business; the project management process was adapted to keep pace with market changes; resources became closely involved in market forums at the start of an initiative; and a robust reporting system was implemented to cater for alternative solutions.

Managerial theory on way of learning

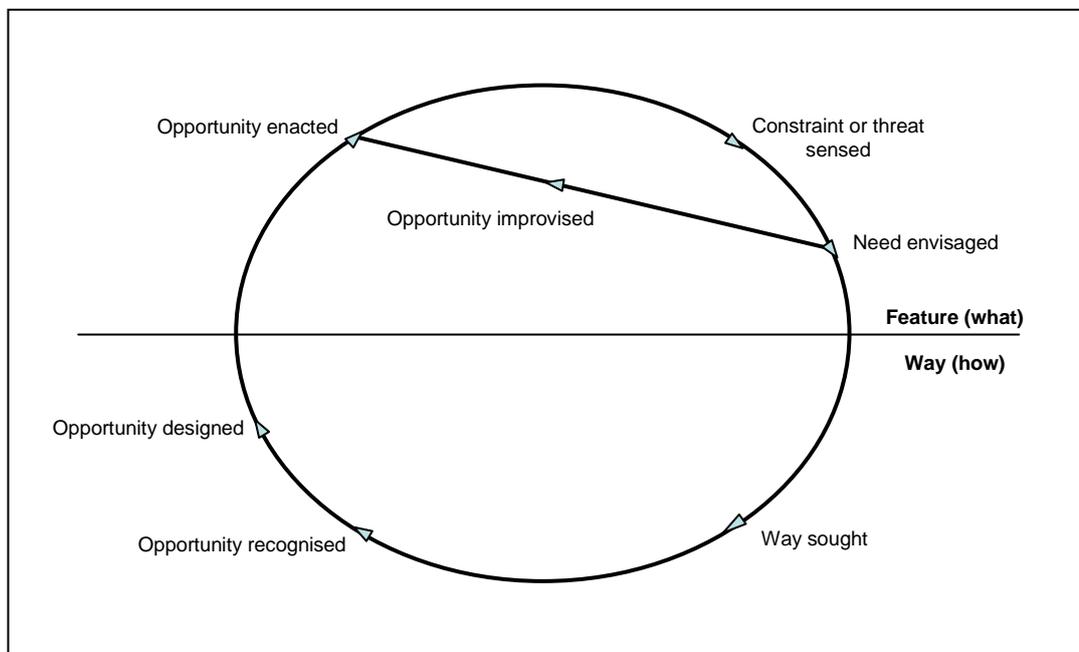
The rationale for the way that was recognised to lead to an innovation capability tended to be articulated in a managerial theory. The way concerned how a particular or combination of resources or assets helped the business to respond to environmental changes. Over time, the theory became more abstract and general. Examples of theories were: products and services could add value to the business model like building blocks, joint planning could prevent problems and enable

coordinated problem resolution, and a reporting system enabled rapid feedback on client requirements allowing parallel development of the two main systems.

7.2.3 Entrepreneurial shaping

The entrepreneurial shaping pattern found in respect of entrepreneurial learning and technological opportunities is described. In general, the entrepreneurial shaping pattern became more evident as resources gained experience. The pattern is described in terms of the steps outlined in Figure 7.6 and the managerial theory on the way of learning.

Figure 7.6 Entrepreneurial learning pattern



Constraint or threat sensed

A constraint recognised, where articulated, was associated with how a business or market function was performed. An example of a constraint was the lengthy time taken in market workshops to establish the basic requirements of a major market initiative.

Need envisaged

When it was articulated, the need envisaged tended to be vague. The need related to a generally better and ongoing understanding of a technological aspect

of the business; for example, a better quality of market awareness, a continuous assessment of market changes to create mental awareness, and sustainable system development based on a better understanding of the requirements of an initiative. In addition, there was a conviction and a belief associated with the need; for example, it was believed that more sustainable system development would provide a competitive advantage and was actively lobbied for.

Way sought

The search for a method or tool to achieve the need was purposive and intensive. For example, a better understanding of the system design was sought based on questioning the supplier and then experimenting with different methods.

Opportunity recognised

Once a way was observed to help achieve a need, it created an impression, although the way itself was not suitable. For example, a failed product implementation helped to understand in-depth market requirements, suggesting that the finished product acted as a form of prototype solution.

Opportunity enacted

A method or tool deemed to contribute towards achieving the need was deliberately used. For example, an understanding of market requirements was helped by clarifying and integrating them, as well as by the use of a front-end tool. The tool can be likened to a prototype solution, similar to the finished product. Further, the rationale for the usefulness of the method or tool was associated with the need; for example, the front-end tool helped in understanding how the system as a whole was working.

Managerial theory on the way of learning

Over time, the rationale for the usefulness of a way was more fully articulated in a managerial theory and related to a high level innovation capability. For example, the use of a report writing tool helped to understand the system structure and enable the development effort of an initiative to be estimated. In turn, system design continuity could be maintained and the IT vendor relationship could be better managed.

7.2.4 Entrepreneurial configuring

A description of the entrepreneurial configuring pattern found in respect of entrepreneurial learning and organisational opportunities follows. Similar to the entrepreneurial shaping pattern, it tended to become more evident as resources gained experience. The pattern is described in terms of the steps outlined in Figure 7.6 and the managerial theory on the way of learning.

Constraint or threat sensed

A constraint identified or threat sensed related to a general lack of competency or a problem within the business or market that was impeding performance. An example of a constraint was that the business was not well understood in the bank. Threats included the risk of paper scrip in the market resulting in the market not being rated, and the threat to the business of potentially holding tainted scrip.

Need envisaged

A need envisaged related to a general competency associated with overcoming the constraint or threat. It was based on a certain principle and associated with conviction. Examples included settlement certainty in the market ridding it of the risk of paper scrip, a bridge between the business and the IT department, a balancing act between tracking the pace of market change and continuously improving the business, operating at a broader level, and effective interaction in market workshops.

Way sought

Identification of the need tended to lead to a purposive and intensive search for a way to achieve it, given contextual constraints. For example, a way was sought to achieve settlement certainty within the confines of the market, and described by a manager as “we had to find a way ... to get there” (A4 7:12, 65). Another example was questioning how to reorganise project management teams.

Opportunity recognised

A way recognised when observed provided an opportunity to achieve the respective need. Examples of opportunities recognised included: separate project teams, seen in another department, enabled simultaneous focus on initiatives with

different time horizons; a planned implementation enabled it to be more controllable; staff involvement in market workshops enabled their focus to be broadened; and regular business reporting enabled greater visibility within the bank. Similarly, a pattern was recognised on how not to achieve a particular need. For example, a parallel was drawn between two major market initiatives where, for certain participants, appropriately competent people had not been closely involved in the workshops leading to delays.

Opportunity designed

An opportunity designed was a way to achieve the respective need. It related to a particular spatial or temporal design principle. Examples included: separating commodity and competitive advantage in the market model; separating product development from operations; a fast dematerialisation process; and separating custody technologies in a novel system configuration.

Opportunity enacted

An opportunity recognised tended to be deliberately implemented or seized suggesting an associated conviction. Its enactment tended to involve some risk. For example, a product development team was established well ahead of competitors; a fast dematerialisation process was implemented ahead of competitors; and a calculated risk was taken in implementing dual custody systems. Where an opportunity could not be implemented it was promoted seemingly to obtain consensus to implement it. For example, a more centralised market model based on separating commodity and competitive advantage was promoted in the market.

Opportunity improvised

An example of an improvised opportunity was work-around solutions spontaneously introduced to alleviate intense work pressure overload. The solutions resulted in short term network communication problems, but were later adapted to alternative solutions for long term benefit.

Managerial theory on the way of learning

The managerial theory or rationale associated with an opportunity, where it was articulated, tended to be related to achieving a high level innovation capability. For

example, separating project teams based on project time horizon enabled simultaneous focus on future and current operational initiatives, and in turn, future oriented teams could better lead strategic change in the business. Over time, the rationale for the way was explained more fully; for example, sending competent people to market workshops enabled requirements to be correctly interpreted, and in turn, effectively addressed.

7.2.5 Expert learning and entrepreneurial learning

Characteristics of expert learning and of entrepreneurial learning are proposed to explain the patterns found. The two patterns are compared across the stages of problem framing, search, opportunity recognition including discovery and design, opportunity realisation, and emergence. In each stage, expert learning is discussed and then entrepreneurial learning. The discussion aims to highlight the differences in the main characteristics of the two patterns and to integrate various concepts in the literature. Table 7.1 summarises the main characteristics identified.

Table 7.1 Comparison of expert learning and entrepreneurial learning characteristics

	Expert learning	Entrepreneurial learning
Problem framing	Aspiration level trigger Specific aspirations Causal reasoning	Detection error trigger General aspirations Effectual reasoning
Search	To establish and prevent cause Prospective sensemaking	For way to clarify and achieve need Retrospective sensemaking
Opportunity recognition	Serendipitous Opportunity discovery Double loop learning Combination of resources	Intentional Opportunity recognition Opportunity design Transformation of resources
Opportunity realisation	Strategy adapted Path dependent Kirznerian view of entrepreneurship	Opportunity seized Path breaking Schumpeterian view of entrepreneurship
Emergence	Emergent outcome Not an opportunity	Improvisation – emergent behaviour Potential opportunity

Problem framing

The fundamental difference between the two learning, or problem solving, patterns depends on the way problems are framed or represented. The problem frame affects the nature of the managerial theories that may be formed as a result. Problem sensing is required for problem solving to take place. Problem sensing involves noticing stimuli, interpreting them by constructing or assigning meaning, and incorporating interpreted stimuli by remembering or retaining them and associating them with other cognitions (Kiesler & Sproull, 1982). Weick (2006) argues that a stimulus may be read through a frame based on fancy or on imagination giving rise to different types of cognitive processing. He further argues that the frame that will dominate the organisational problem solving process depends on the preservation of the quality of links between conceptions and their origins.

A shortcoming or threat recognised in terms of expert learning relates to stimuli associated with aspiration level triggers. The stimuli provide relatively strong signals and the triggers are points at which circumstances fall below a satisfactory level (Kiesler & Sproull, 1982). Aspirations are specific and relatively well defined, such as business targets, compliance requirements, and competitive demands. A shortcoming or threat is event-based and aspirations are exogenous to the system and imposed on it. The frame used to read a potentially problematic stimulus is based on fancy that is associated with the aspirations. A frame based on fancy is a previously used frame that leads to schema driven cognitive processing, categorically-based knowing, and simple associations of adjacency (Weick, 2006). Cognitive processing can lead to an insight or conscious recognition of a cause of the problem. However, the cause is not always identified. In particular, a significant and recurring shortcoming or threat can highlight cause-effect relationships.

Problem framing or representation in expert learning can be associated with causal reasoning. Causal reasoning focuses on controlling the risks of an outcome through prediction (Sarasvathy et al., 1998). Causation is based on specific effects, such as a required goal or decision (Sarasvathy, 2001). Four types of causes of change in phenomena were identified by Aristotle (Sarasvathy, 2001; Van de Ven, 2007). Causation may involve formal, material, and efficient

causes. Aspirations are relatively well defined and provide formal cause - the need. Causation may focus on establishing and preventing the information (material) cause in terms of technological problems – a lack of specific understanding in interpreting changing environment conditions; and the efficient cause in terms of organisational problems - a lack of a specific competency to respond to changing environmental conditions.

In contrast, a constraint or threat sensed in terms of entrepreneurial learning relates to stimuli associated with detection error triggers. Problems relating to detection error triggers go unnoticed because the signals provided by available information are relatively weak and can be obscured by other information (Kiesler & Sproull, 1982). The problems are likely to require expertise to detect them because they are not obvious. Constraints and threats are process oriented, relating to how a particular function is performed within the business or its environment. The frame used to read a potentially problematic stimulus is based on imagination. A frame based on imagination is a postulated rule, created through a process similar to abduction, but it relies on experiential knowledge, and leads to stimulus-driven cognitive processing, perceptually-based knowing, and compound associations of simultaneity (Weick, 2006). Imagination conceives a whole design at once which it then completes and gives body to by particular association based on one organising principle of specific parts (Engell, 1981 in Weick, 2006). Cognitive processing can lead to an intuition or nonconscious recognition of a cause of a problem based on the organising principle, as well as the potential solution in terms of a design. The solution or need is imagined or envisaged. In this sense, goal creation is endogenous and contingent (Sarasvathy, 2001). Managers are not consciously aware of the problem solving process (Hodgkinson et al., 2008), and they are unable to consciously account for the underlying rationale of a judgment (Dane & Pratt, 2007). The holistic nature of an intuition gives rise to the holistic nature of the need in the form of general and abstract aspirations.

Problem framing in entrepreneurial learning relates to effectual reasoning. Effectual reasoning focuses on outcomes that can be controlled (Sarasvathy et al., 1998). The need envisaged provides final cause to the problem solving process. Final cause is referred to as teleology (Sarasvathy, 2001). The need, in terms of general aspirations, is general and abstract. Effectuation may focus on clarifying and achieving the need. It involves achieving a general understanding in

terms of technological problems to interpret changing environmental conditions, and a general competency in terms of organisational problems to respond to changing environmental conditions. Although general, final cause is based on one organising principle.

Search

Aspirations guide learning efforts and determine when to stop. Three categories of contextual factors act as learning incentives by influencing aspirations: need, experience, and learning costs (Winter, 2000). These categories can be likened to the respective need in the learning process, an understanding or information, and an organisational competency.

In expert learning, the search is to establish and prevent the cause. Because formal cause is well defined in terms of specific aspirations, it is based on clarifying and preventing the information (material) cause or efficient cause. The search involves questioning what is required to meet the need – the ‘what’ of strategy. The search is based on satisficing logic and involves selecting between alternative ways or means of development to meet the need. Satisficing logic involves developing a satisfactory process to meet performance needs which can later be improved upon (Winter, 2000). The search involves prospective sensemaking to predict the effects of the cause. It starts with a narrow focus and broadens leading to more adapted actions when the shortcoming or threat is significant and recurring. Notably, more adapted actions help learning because they provide better information about the nature of a strategic problem (Gavetti, 2005).

In entrepreneurial learning, the search is for a way to clarify and achieve the need. It involves questioning how to achieve the need – the ‘how’ of strategy. The search is purposive because the need is based on an intuition which is an ‘affectively charged judgment’ (Dane & Pratt, 2007). It is driven by conviction and involves clarifying an abstract, possibly image- or sensory-based need. It is a search for a way-need match, which can be a technology-market match or a way of organising matched to the market. The search is based on a maximising approach. In contrast to a satisficing approach, a maximising approach aims to maximise contributions so that a synthesis can be developed from the widest possible exploration of alternatives in order to produce the position that is based

on the most complete and valid information (Argyris, 1976). Thus, the search starts broad and becomes more narrow and targeted. It involves retrospective sensemaking - acting in order to think (Weick, 1998) and experimental activity.

Opportunity discovery

Opportunity discovery pertains to expert learning. Opportunity recognition is sudden, unexpected, and stumbled upon because the search is for a different purpose. The search aims to establish and prevent the cause. In this sense, opportunity recognition can be described as serendipitous, only discovered after some time, and requiring alertness to recognise the appearance of a new possibility (Denrell et al., 2003). The discovery of an opportunity in terms of the way happens after a while because the effect of knowledge developed by using the way is only gradually realised. Opportunity discovery leads to a change in thinking on how a way, such as a tool or resource, is used. A new benefit is recognised in terms of meeting the need. It is based on matching logic where the way is matched to the need. It involves a new use for an existing way or tool, in the same situation. Analogical reasoning based on specific analogies is used in matching logic. The opportunity is likely to be part of a complex combination of resources used in a different way (Denrell et al., 2003). Recognition may involve using experience to 'connect the dots' due to well developed prototypes or templates of 'ideal' opportunities (Baron & Ensley, 2006) or may refer more to the evaluation of opportunities (Grégoire et al., 2010).

The associated managerial theory on the way in expert learning is built up one step at a time and focuses on the effect of the way in terms of the knowledge that it develops, and then the cumulative effect. Thus, the dynamic capability relating to the cumulative effect is relatively low level initially and higher level capabilities can be recognised over time. The theory is based on deductive and inductive logic and can be clearly articulated. Initially it focuses more on a predictive effect, but as the need is adjusted to become longer term oriented (referred to as opportunity discovery in terms of the feature), it focuses more on a controlling effect.

Opportunity discovery in terms of the feature is based on a gradual process of self-reinforcing effects recognised and linked with the use of the way to develop knowledge. It is a sudden insight that is unexpected and surprising. It is based on prior knowledge gradually accumulated. The discovery of an opportunity is

suggested to be based on prior knowledge required to recognise it and the development of cognitive schema required to evaluate it (Shane & Venkataraman, 2000). Consistent with the Kirznerian view of entrepreneurship, opportunity discovery involves recognising the value of new information based on prior related knowledge rather than searching for required knowledge (Shane, 2000).

An opportunity discovered results in a change in thinking on the feature or the 'what' or strategy. It can be described as a mindset change or a paradigm shift. It involves double-loop learning involving a change in aspirations or a change in the need. In contrast to single-loop learning which takes place within existing systems of values and the action frames in which values are embedded, double-loop learning involves changes in values and frames and calls for reflective enquiry that goes across incongruent frames (Argyris & Schön, 1996). Opportunity discovery can be likened to changing a dominant logic, which may be more challenging to change the longer it has been in place (Bettis & Prahalad, 1995). Because core and peripheral features of dominant logic are complex and tightly coupled (Lyles & Schwenk, 1992), it is likely to take longer to change in an organisation that dominated an industry prior to a technological transition.

Opportunity recognition and design

Opportunity recognition and design applies to entrepreneurial learning. Opportunity recognition is part of an intentional search for a way that matches the need. It can result in a new use for an existing way or tool. Matching logic matches the principle in the technology, or way of organising, to the principle of the need. The principle underlying a technology is related to a depth or quality of understanding; whereas the principle of a resource or asset is related to a way of organising and may be temporal-, spatial-, or intensity-based. Analogical reasoning is based on more abstract analogies and on structural relations. Because of the holistic nature of the need the match is context dependent. Aligning structural relationships is cognitively more challenging than aligning superficial features, and detecting relevant patterns for opportunities is particularly complex in dynamic industries (Grégoire et al., 2010). Recognition may involve an impression remembered in another context that can then be applied in a new context.

In contrast to expert learning, the associated managerial theory on the way in entrepreneurial learning tends to be built from outside in. The way is linked to a high level capability or need with the intermediate effects not necessarily clear. It focuses on how the way helps learning and may achieve multiple effects depending on the extent of learning. Because the need is envisaged, the theory may not be articulated at all or well articulated. It is based on abduction where postulated rules are synthesised into conjectures (Weick, 2006). The theory is aimed at controlling effects based on its longer term nature. It can be applied to draw parallels between situations where a way is used or not used.

The essential difference between opportunity recognition in terms of the way in expert learning and entrepreneurial learning is whether the opportunity is recognised as part of a search. In addition, the processes differ in terms of how the opportunity is recognised and the nature of the associated managerial theory on the way.

Opportunity design involves applying an opportunity recognised to the current situation. It is context dependent; depending on available resources. Design relates to the choice of boundary values for variables, and control of the design relates to the means to change the boundary values (Venkataraman et al. 2010). In this sense, the effect created or the degree to which the need is achieved depends on setting the boundary values. As previously noted, opportunity recognition involves aligning structural relationships. Design is concerned with relationships between components rather than the components themselves. It involves transforming the resources and concepts found into artifacts which in turn, embody a teleological process because of their contingent nature (Venkataraman et al. 2010). Opportunity design involves applying technological or organisational principles to design a new way to address a problem and match a need. It involves constructionist logic in setting boundary values. Constructionist logic aims to obtain a long run fit with an evolving environment and approaches include analogical reasoning based on more abstract analogies (Farjoun, 2008). It is suggested to be even more cognitively challenging than matching logic based on aligning structural relations. As with opportunity recognition based on matching logic, postulated rules are synthesised into conjectures (Weick, 2006).

Opportunity realisation

Opportunity realisation in expert learning refers to the realisation of recognised and discovered opportunities. In particular, the realisation of a discovered opportunity involves adapting the technological problem solving focus or the organisational problem solving emphasis in terms of the feature or the 'what' of strategy. The feature is adapted to become more targeted and long term oriented. The realisation of an opportunity refers to adapting the way to focus more on controlling effects rather than on predicting effects. Realisation of an opportunity requires flexibility in redirecting efforts (Denrell et al., 2003). It closes gaps in strategy consistent with the Kirznerian view of entrepreneurship, and results in a honing and aligning effect on strategy. Opportunities realised are path dependent and can lead to self-reinforcing effects with increasing returns to adoption.

In entrepreneurial learning, an opportunity enacted is an opportunity designed and applied to address the situation. It is seized in the sense that it is associated with conviction in terms of achieving the need and is deliberately implemented. It involves a calculated risk because it is based on conjecture and applies a new way to a new situation. Notably, the way is not already employed in the situation. In this sense, it is path breaking because it involves changes in contextual relationships, although, the degree of path breaking change may vary. Consistent with the Schumpeterian view of entrepreneurship, an opportunity enacted involves a novel design and results in disruptive change. Seizing an opportunity involves promoting it to garner support from stakeholders in order to enact and implement it. Opportunities enacted result in a modifying effect on strategy in terms of shaping or configuring.

Emergence

In expert learning, a strategy may emerge or evolve. An emergent outcome is an unintended outcome of other actions (Miner et al., 2001). It may be based on deliberate low level coping actions that combine to form a new outcome that is not intended, such as the emergence or evolution of a team. Because the combination is not thought through it can have short term negative consequences. An emergent outcome is not an opportunity; however, it can provoke further adaptation leading to positive longer term effects.

In entrepreneurial learning, an opportunity may be improvised. Improvisation is an emergent behaviour involving unplanned, novel, and orderly actions that are designed and enacted at the same level of analysis (Miner et al., 2001). It lies at the end of a continuum of cognitive processing effort that can be likened to the spectrum from incremental to transformational change, involving progressive demands on imagination and concentration (Weick, 1998). It involves spontaneous actions (Vera & Crossan, 2005; Weick, 1998) and a problem solving intensity that usually takes place under time pressure. Because the broader consequences are not thought through it can cause short term problems in a tightly coupled system. However, it can also have positive longer term learning effects (Miner et al., 2001) because it contains the seeds of an opportunity in the form of design principles matched to a need.

7.2.6 Entrepreneurial learning in a dynamic environment

This subsection highlights some of the implications of entrepreneurial learning in a dynamic environment and suggests how it may be beneficial relative to expert learning. Effective entrepreneurial learning in organisations can lead to entrepreneurial fitness. Entrepreneurial fitness relates to how well dynamic capabilities help achieve evolutionary fitness by shaping the environment and not just by adapting to it (Teece, 2007).

Problem framing

In entrepreneurial learning, problem framing is based on a need envisaged in response to an inherent constraint or threat sensed. It is an intuitive problem solving process. In particular, the complex, domain relevant cognitive structures of experts enable them to make holistic associations on solving ill-defined problems and to integrate disparate components of a problem with relative ease (Dane & Pratt, 2007). The need or solution imagined is a general or abstract aspiration based on a principle. Because it is based on constructionist logic it is suitable when familiar solutions are absent or less relevant (Farjoun, 2008). Notably, the need is a process oriented belief, focused on the 'how' of strategy, rather than a content oriented belief likely to become rapidly outdated in the changing environment.

Cognitive representations of managers in terms of framing a problem can imprint capability development by guiding and constraining search processes. Because aspirations are general, abstract, and principle-based, they enable relatively broad and flexible dynamic capabilities to be developed relatively quickly. The need may be realised to varying degrees and achieved in multiple ways. Higher level dynamic capabilities can be developed relatively quickly. Where managerial theories on ways to learn are explicitly learnt by managers they can be seen as second order capabilities. These capabilities may be a function of managers that “comprises the more metaphysical strategic insights that enable firms to recognise the intrinsic value of other resources or to develop novel strategies before [ahead of] competitors” (Collis, 1994, p. 145). If dynamic capabilities are equifinal as Eisenhardt and Martin (2000) argue then broader, more flexible dynamic capabilities developed more quickly are likely to lead to more sustainable competitive advantages.

Search

Entrepreneurial learning involves a search process that is suited to an environment of rapid technological change. A way is sought to clarify and achieve the need. Learning strategies involve experiential actions that facilitate rapid learning and provide access to real-time information in order to inform intuition about the market (Eisenhardt & Martin, 2000). Because the need is process oriented, concerning the ‘how’ of strategy, the search aims to find and create a technology-market or organisation-market match. It involves effectual reasoning which focuses on the controllable aspects of an unpredictable future (Sarasvathy, 2001).

In a dynamic environment, new knowledge often requires exploratory learning to discover how it can be organised (Kogut & Zander, 1992). In particular, exploratory learning may be required to find a way of organising to enable a new technology to be integrated and coordinated within an organisation; for example, as the main technological transition in the case study illustrates. A maximising approach rather than a satisficing approach is more likely to lead to greater exploration of alternative technologies and ways of organising and in turn, to find a way involving path breaking change rather than discover one. Thus, it is more likely to lead to a change in managerial cognition requiring double-loop learning and to lead to such a change more quickly.

Opportunity design and enactment

The design and enactment of opportunities enable the creation and adoption of new technologies that may disrupt market equilibria. In this sense, the entrepreneurial role of managers is suggested to be important in selecting and assembling complementary assets, as well as in shaping learning processes (Teece, 2009).

Opportunities designed and enacted are context dependent. In more highly dynamic environments where change is non-linear and less predictable, dynamic capabilities rely more on creating situation specific knowledge (Eisenhardt & Martin, 2000). The holistic nature of the opportunities based on structural relationships makes them relatively difficult to imitate leading to more sustainable competitive advantage. The opportunities have a shaping or configuring effect in terms of path breaking change and open up new possibilities for growth.

8 CHAPTER: CONCLUSION

The thesis concludes with a summary of the contributions and implications for both managers and scholars. The implications for scholars suggest avenues for future research.

Contributions

The main claim is that managerial theories on learning are required to develop and sustain dynamic capabilities. These theories embody the explicit and implicit learning of managers. They enable learning efforts to be directed so as to enable knowledge to accumulate that may form dynamic capabilities. Based on these theories, managers make deliberate efforts to sustain and deepen the accumulated knowledge because they realise how it can help in interpreting and responding to the changing environment.

In addition, the theories may form through two types of learning, expert and entrepreneurial. These types of learning enable the recognition of opportunities at multiples levels of analysis concerning the 'what' and 'how' respectively of both technological and organisational problem solving strategies.

The study findings provide evidence to support the claims. In particular, the dynamic capabilities reflected in the managerial theories on ways of learning help in understanding the nature of dynamic capabilities. They provide empirically grounded evidence to suggest that dynamic capabilities are capacities that can be enacted, they are oriented towards strategic objectives, and they rely on sensemaking practices. Further, technological dynamic capabilities help interpret a changing environment and organisational dynamic capabilities help respond to the environment. The managerial theories on learning themselves, form part of managerial cognition, and may be an essential component of dynamic managerial capabilities in helping to reorient an organisation.

An important contribution of this study is the analytical framework on dynamic capability learning that was developed during the case analysis. The framework enabled the findings to be grouped into four distinct patterns: expert honing and

aligning, and entrepreneurial shaping and configuring. It shows variants of expert learning and entrepreneurial learning in terms of recognising technological and organisational opportunities respectively. The framework can be used to discern these patterns in data and enable learning experiences related to dynamic capability development to be captured. It helps to operationalise the complex concepts of dynamic capabilities, organisational learning, and entrepreneurship.

To support the claim, the existing base of theory is extended to propose a model on how managers learn to learn. The model proposes a learning system and an operating system as part of managerial cognition and describes how exploration and exploitation in organisational learning can help develop these systems. The learning system may reflect both dynamic capabilities and dynamic managerial capabilities.

In addition, two models on how sensemaking practices can facilitate cognition are proposed in support of the claim and extending existing theory. The models identify principles embodied in the sensemaking practices that serve to direct attention and influence problem framing, as well as enable attention to be captured. In terms of framing problems, technological sensemaking practices help to broaden the scope and deepen the level of analysis. In terms of capturing attention, organisational sensemaking practices enable frequent and intense exposure to or focus on specific factors. The underlying assumption of the models is that reliable perception-based knowledge is required for effective collective action (Weick & Sutcliffe, 2006).

Further, distinctive characteristics of expert learning and entrepreneurial learning are proposed to help explain how managers learn and recognise opportunities. The characteristics pertain to problem framing, search, opportunity recognition, opportunity realisation, and emergence. Notably, expert learning focuses on the 'what' of strategy and entrepreneurial learning focuses on the 'how' of strategy. Finally, suggestions are made as to how entrepreneurial learning may be beneficial in a highly dynamic environment. In particular, it may enable path breaking change and reconfiguration to remain competitive and open up new avenues for growth.

The study also makes an empirical contribution by providing unique management insight into a highly specialised area of financial markets not often seen. Finally, it

makes a methodological contribution by combining two research strategies, building theory from cases and analysing process data, in the process oriented case analysis. The analysis aims to identify learning patterns and also to explain the patterns in terms of specific characteristics.

Implications for managers

Three implications for managers of organisations operating in a dynamic environment are highlighted. First, retention of domain expertise is important because complex and domain relevant schemas of experts are required for effective intuitive judgments (Dane & Pratt, 2007). Due to environmental uncertainty, managers “must make informed conjectures about the path ahead” in terms of sensing and seizing opportunities (Teece, 2009). In addition, knowledge articulation found to be useful in environments with high levels of dynamism, can help uncover and expose implicit causal linkages (Romme et al., 2010). Involving experts in group problem solving and decision making enables the transfer of tacit knowledge. Thus, as an organisation encounters more dynamic environmental conditions, efforts should be made to develop and retain highly specialised knowledge workers. For example, project team resources that come into an organisation for a major project and then leave once the project completes may not be appropriate. In addition, high job mobility and rotation practices may not enable a significant degree of deliberate practice required in a particular domain to develop expertise in the domain (Dane & Pratt, 2007).

Second, a focus or an emphasis on control rather than on prediction in problem solving reasoning and theories is important in an environment that is largely unpredictable. Effectual reasoning focuses on outcomes that can be controlled and causal reasoning focuses on controlling the risk of an outcome through prediction (Sarasvathy, 2001). Notably, the focus in effectual reasoning is on a particular principle which may be embodied in many outcomes, and applies to the ‘how’ of strategy rather than the ‘what’. For example, with reference to the case study, a principle of ‘settlement certainty’ may not mean 100 per cent ‘settlement certainty’ and a focus on ‘automating transactions and managing exceptions’ in terms of what is required, may obscure a ‘difficult to articulate’ underlying meaning of how it should be achieved. The further implication is that problem solving and decision making should be cognisant of managers’ affective responses and implicit knowledge (Hodgkinson & Healey, 2011). Rigidly adhering to a particular

focus on what must be achieved in problem solving may be counter productive, given changing environmental conditions. Content oriented beliefs should provide a broad context for problem solving. For example, new technological standards may serve as a focal point for technological development and yet be general enough to guide action (Bogner & Barr, 2000). In other words, problem solving should be more principle oriented rather than being centred on absolutes in terms of both 'what' is required and 'how' it should be achieved.

Third, sensemaking practices which embody principles that help direct attention and enable attention to be captured are important because they can facilitate cognition. For example, with reference to the case study, practices that help broaden the scope of analysis, such as scenario planning, and deepen the level of analysis, such as critical analysis, direct attention to certain factors and can facilitate cognition in technological problem solving. In addition, practices enabling frequent and intense exposure, such as regular reporting on business risk that is critical to the bank's risk profile, and frequent and intense focus, such as separating project teams based on typical project time horizons, enable attention to be captured and can facilitate cognition. Understanding the particular principles required and matching them to the situation can be likened to matching a technology or a way of organising to a market situation by aligning structural relations. Recognising opportunities in this way can be cognitively challenging and particularly complex in dynamic industries (Grégoire et al., 2010) and likely to require domain expertise. Further, recognising opportunities and enacting them in this manner can be likened to orchestrating assets (Teece, 2007).

Implications for scholars

In addition, three implications for scholarly enquiry are suggested. First, the analytical framework developed as a result of the case analysis may be used to discern learning patterns in other situations demanding the development of dynamic capabilities. The framework may be tested and refined in further case analyses. In addition, it can be used to shed more light on the nature of dynamic capabilities and on dynamic capability learning, as well as enable comparison across multiple case studies under different conditions of environmental dynamism.

Second, the entrepreneurial learning process may contribute to the development of an entrepreneurial method. Such a method may be comparable with the scientific method (Venkataraman et al., 2010). Research on the method is likely to entail specifying the utility and mechanisms it involves (Sarasvathy & Venkataraman, 2011), as well as systematically explaining the strategies and principles that enable purposeful ends to be achieved (Venkataraman et al., 2010). An entrepreneurial method may be applied not only in organisational research, but also as a distinct method to be used for purposes of scholarly enquiry.

Third, further research is suggested on the implications of entrepreneurial learning in a dynamic environment. Drawing from existing research, the implications of entrepreneurial learning in a dynamic environment can be more fully expounded and empirically tested. The research is likely to contribute towards an understanding of the concept of 'entrepreneurial fitness' (Teece, 2007), in terms of its nature, benefit, and importance in a dynamic environment.

9 REFERENCES

- Abbott, A. (1990). A primer on sequence methods. *Organization Science*, 1(4), 375-392.
- Adner, R., & Helfat, C. E. (2003). Corporate effects and dynamic managerial capabilities. *Strategic Management Journal*, 24(10), 1011-1025. doi:10.1002/smj.331
- Argote, L. (1999). *Organizational learning: Creating, retaining and transferring knowledge*. Norwell, MA: Kluwer.
- Argote, L. (2011). Organizational learning research: Past, present and future. *Management Learning*, 42(4), 439-446. doi:10.1177/1350507611408217
- Argyris, C. (1976). Single-loop and double-loop models in research on decision making. *Administrative Science Quarterly*, 21, 363-375.
- Argyris, C., & Schon, D. A. (1996). *Organizational learning II: Theory, method, and practice*. Reading, MA: Addison-Wesley.
- Augier, M., & Teece, D. J. (2009). Dynamic capabilities and the role of managers in business strategy and economic performance. *Organization Science*, 20(2), 410-421. doi:10.1287/orsc.1090.0424
- Baron, R. A., & Ensley, M. D. (2006). Opportunity recognition as the detection of meaningful patterns: Evidence from comparison of novice and experienced entrepreneurs. *Management Science*, 52(9), 1331-1344. doi:10.1287/mnsc.1060.0538
- Barr, P.S., Stimpert, J. L., & Huff, A. S. (1992). Cognitive change, strategic action, and organisational renewal. *Strategic Management Journal*, 13, 15-36. Retrieved from <http://www.jstor.org/stable/2486350>
- Benner, M. J., & Tripsas, M. (2012). The influence of prior industry affiliation of framing nascent industry: the evolution of digital cameras. *Strategic Management Journal*, 33, 277-302. doi:10.1002/smj.950
- Bettis, R. A., & Prahalad, C.K. (1995). The dominant logic: retrospective and extension. *Strategic Management Journal*, 16(1), 5-14. Retrieved from <http://www.jstor.org/stable/2486943>
- Bingham, C. B., & Eisenhardt, K. M. (2011). Rational heuristics: The 'simple rules' that strategists learn from process experience. *Strategic Management Journal*, 32, 1437-1464. doi:10.1002/smj.965
- Bogner, W. C., & Barr, P. S. (2000). Making sense in hypercompetitive environments: A cognitive explanation for the persistence of high velocity

- competition. *Organization Science*, 11(2), 212-226. Retrieved from <http://www.jstor.org/stable/2640285>
- Brown, J.S., Durchslag, S., & Hagel, J., III. (2002). Loosening up: How process networks unlock the power of specialization. *The Mckinsey Quarterly*, Special Edition: Risk and Resilience, 58-69.
- Brown, S. L., & Eisenhardt, K. M. (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organisations. *Administrative Science Quarterly*, 42(1), 1-34. Retrieved from <http://www.jstor.org/stable/2393807>
- Chase, W. G., & Simon, H. A. (1973). Perception in chess. *Cognitive Psychology*, 4, 55–81.
- Cohen, M. D., & Bacdayan, P. (1994). Organizational routines are stored as procedural memory: Evidence from a laboratory study. *Organization Science*, 5(4), 554-568. Retrieved from <http://www.jstor.org/stable/2635182>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35, 128-152.
- Collis, D. J. (1991). A resource-based analysis of global competition: The case of the bearings industry. *Strategic Management Journal*, 12, 49-68. Retrieved from <http://www.jstor.org/stable/2486641>
- Collis, D.J. (1994). Research note: How valuable are organisational capabilities? *Strategic Management Journal*, 15, 143-152. Retrieved from <http://www.jstor.org/stable/2486815>
- Crossan, M. M., & Berdrow, I. (2003). Organizational learning and strategic renewal. *Strategic Management Journal*, 24(11), 1087-1105. doi: 10.1002/smj.342
- Crossan, M. M., Lane, H. W., & White, R. E. (1999). An organizational learning framework: From intuition to institution. *Academy of Management Review*, 24(3), 522-537. Retrieved from <http://www.jstor.org/stable/259140> .
- Crossan, M. M., Maurer, C. C., & White, R.E. (2011). Reflections on the 2009 AMR decade award: Do we have a theory of organizational learning? *Academy of Management Review*, 36(3), 446-460.
- Cyert, R. M., & March, J. G. (1963). *A Behavioral Theory of the Firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Daft, R. L., & Weick, K. E. (1984). Towards a model of organizations as interpretation systems. *Academy of Management Review*, 9(2), 284-295. Retrieved from <http://www.jstor.org/stable/258441>
- Dane, E. & Pratt, M. G. (2007). Exploring intuition and its role in managerial decision making. *Academy of Management Review*, 32(1), 33–54.

- Davidson, E. J. (2002). Technology frames and framing: A sociocognitive investigation of requirements determination. *MIS Quarterly*, 26(4), 329-358. Retrieved from <http://www.jstor.org/stable/4132312>
- Day, D. V., & Lord, R. G. (1992). Expertise and problem categorisation: The role of expert processing in organisational sensemaking. *Journal of Management Studies*, 29, 35-47.
- Denrell, J., Fang, C., & Winter, S. G. (2003). The economics of strategic opportunity. *Strategic Management Journal*, 24, 977-990. doi:10.1002/smj.341
- Denrell, J. & March, J. G. (2001). Adaptation as information restriction: The hot stove effect. *Organization Science*, 12(5), 523-538. Retrieved from <http://www.jstor.org/stable/3085997>
- Di Stefano, G., Peteraf, M., & Verona, G. (2010). Dynamic capabilities deconstructed: A bibliographic investigation into the origins, development, and future directions of the research domain. *Industrial and Corporate Change*, 19(4), 1187-1204. doi:10.1093/icc/dtq027
- Doz, Y. L. (1996). The evolution of cooperation in strategic alliances: Initial conditions or learning processes? *Strategic Management Journal*, 17, 55-83.
- Dutta, D. K., & Crossan, M. M. (2005). The nature of entrepreneurial opportunities: Understanding the process using the 4I organisational learning framework. *Entrepreneurship Theory and Practice*, July, 425-449.
- Easterby-Smith, M., Crossan, M. M., & Nicolini, D. (2000). Organizational learning: Debates past, present and future. *Journal of Management Science*, 37(6), 783-796.
- Easterby-Smith, M., Lyles, M. A., & Peteraf, M. A. (2009). Dynamic capabilities: Current debates and future directions. *British Journal of Management*, 20, S1-S8. doi:10.1111/j.1467-8551.2008.00609.x
- Edmondson, A. C. (2003). Framing for learning: Lessons in successful technology implementation. *California Management Review*, 45(2), 34-54.
- Edmondson, A. C. & McManus, S. E. (2007). Methodological fit in management field research. *Academy of Management Review*, 32(4), 1155-1179.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532-550.
- Eisenhardt, K. M. (1989). Making fast strategic decisions in high-velocity environments. *Academy of Management Review*, 32(3), 543-536. Retrieved from <http://www.jstor.org/stable/256434>
- Eisenhardt, K. M. (1991). Better stories and better constructs: The case for rigor and comparative logic. *Academy of Management Review*, 16(3), 620-627. Retrieved from <http://www.jstor.org/stable/258921>

- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), 25-32.
- Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10/11), 1105-1121. Retrieved from <http://www.jstor.org/stable/3094429>
- Eisenhardt, K. M., & Tabrizi, B. N. (1995). Accelerating adaptive processes: Product innovation in the global computer industry. *Administrative Science Quarterly*, 40, 84-110.
- Engell, J. (1981). *The creative imagination: Enlightenment to romanticism*. Cambridge, MA: Harvard University Press Blackwell.
- Farjoun, M. (2008). Strategy making, novelty and analogical reasoning - commentary on Gavetti, Levinthal, and Rivkin (2005). *Strategic Management Journal*, 29, 1001-1016. doi:10.1002/smj.690
- Feldman, M. S., & Pentland, B. T. (2003). Reconceptualising organisational routines as a source of flexibility and change. *Administrative Science Quarterly*, 48, 94-118.
- Fiol, C. M. (1994). Consensus, diversity, and learning in organisations. *Organization Science*, 5(3), 403-420. Retrieved from <http://www.jstor.org/stable/2635138>
- Fiol, C. M., & Lyles, M. A. (1985). Organizational Learning. *Academy of Management Review*, 10(4), 803-813.
- Gavetti, G. (2005). Cognition and hierarchy: rethinking the microfoundations of capabilities' development. *Organization Science*, 16(6), 599-617. doi:10.1287/orsc.1050.0140
- Gavetti, G., Greve, H. R., Levinthal, D. A., & Ocasio, W. (2012). The behavioral theory of the firm: Assessment and prospects. *Academy of Management Annals*, 6(1), 1-40. Retrieved from <http://dx.doi.org/10.1080/19416520.2012.656841>
- Gavetti, G., & Levinthal, D. A. (2000). Looking forward and looking backward: cognitive experiential search. *Administrative Science Quarterly*, 45(1), 113-137. Retrieved from <http://www.jstor.org/stable/2666981>
- Gavetti, G., Levinthal, D. A., & Rivkin, J. W. (2005). Strategy making in novel and complex worlds: The power of analogy. *Strategic Management Journal*, 26, 691-712. doi:10.1002/smj.475
- Gavetti G., Levinthal D. A., & Rivkin J. W., (2008). Response to Farjoun's strategy making, novelty, and analogical reasoning - commentary on Gavetti, Levinthal, and Rivkin (2005). *Strategic Management Journal*
- Global Custodian 2002 review of agent banks in major markets: South Africa. (2002, Fall). *Global Custodian*, pp. 192.

- Global Custodian 2003 review of agent banks in major markets: South Africa. (2003, Fall). *Global Custodian*, pp. 179.
- Global Custodian 2005 review of agent banks in major markets: South Africa. (2005, Fall). *Global Custodian*.
- Global Custodian 2006 major market agent bank review: South Africa. (2006, Fall). *Global Custodian*, pp. 155-156.
- Global Custodian 2007 Major Market Agent Bank Review: South Africa. (2007, Fall). *Global Custodian*, pp. 161-163.
- Grant, R. M. (1996a). Prospering in dynamically-competitive environments: organizational capability as knowledge integration. *Organization Science*, 7(4), 375-387.
- Grant, R. M. (1996b). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17, 109-122.
- Grant, R. M., & Baden-Fuller, C. (2004). A knowledge accessing theory of strategic alliances. *Journal of Management Studies*, 41(1), 61-84.
- Grégoire, D. A., Barr, P. S., & Shepherd, P. A. (2010). Cognitive processes of opportunity recognition: The role of structural alignment. *Organization Science*, 21(2), 413–431. doi:10.1287/orsc.1090.0462
- Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M. A. (with Maritan., C. A.), Singh, H., Teece, D. J., & Winter, S. G. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Malden, MA: Blackwell Publishing.
- Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: Capability lifecycles. *Strategic Management Journal*, 24(10), 997-1010. doi:10.1002/smj332
- Helfat, C. E. & Peteraf, M. A. (2009). Understanding dynamic capabilities: Progress along a developmental path. *Strategic Organization*, 7(1), 91-102. doi:10.1177/1476127008100133
- Helfat, C. E., & Raubitschek, R. S. (2000). Product sequencing: Co-evolution of knowledge, capabilities and products. *Strategic Management Journal*, 21(10/11), 961-979.
- Helfat, C. E. & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (n)ever-changing world. *Strategic Management Journal*, 32, 1243–1250. doi:10.1002/smj.955
- Henderson, R. M., & Clark, K. B. (1990). Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly*, 35(1), 9-30.
- Hobson, D. & Cayse, A. (2004, Fall) Global Custodian 2004 review of agent banks in major markets. *Global Custodian*, 189-224.

- Hodgkinson, G. P. & Healey, M. P. (2011). Psychological foundations of dynamic capabilities: reflexion and reflection in strategic management. *Strategic Management Journal*, 32, 1500-1516. doi:10.1002/smj.964
- Hodgkinson, G. P., Langan-Fox, J., & Sadler-Smith, E. 2008. Intuition: a fundamental bridging construct in the behavioural sciences. *British Journal of Psychology*, 99, 1-27. doi:10.1348/000712607X216666
- Inkpen, A. C., & Crossan, M. M. (1995). Believing is seeing: Joint ventures and organisation learning. *Journal of Management Studies*, 32(5), 595-618.
- Jaikumur, R., & Bohn, R. E. (1992). A dynamic approach to operations management: An alternative to static optimization. *International Journal of Production Economics*, 27, 265-282.
- Kale, P., & Singh, H. (2007). Building firm capabilities through learning: The role of the alliance learning process in alliance capability and firm-level alliance success. *Strategic Management Journal*, 28(10), 981-1000. doi:10.1002/smj.616
- Kaplan, S. & Beinbocker, E. D. (2003). Real value of strategic planning. *Sloan Management Review*, Winter, 71-76.
- Kaplan, S. (2008a). Cognition, capabilities, and incentives: Assessing firm response to the fiber-optic revolution. *Academy of Management Journal*, 51(4), 672-695.
- Kaplan, S. (2008b). Framing contests: strategy making under uncertainty. *Organization Science*, 19(5), 729-752. doi:10.1287/orsc.1070.0340
- Kiesler, S. & Sproull, L. (1982). Managerial response to changing environments: Perspective on problem sensing from social cognition. *Administrative Science Quarterly*, 27(4), 548-570. Retrieved from <http://www.jstor.org/stable/2392530>
- Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3), 383-397.
- Kirzner I. (1973). *Competition and entrepreneurship*. Chicago, IL: University of Chicago Press.
- Kirzner, I. (1997). Entrepreneurial discovery and the competitive market process: An Austrian approach. *Journal of Economic Literature*, 35: 60-85.
- Klein, G. (1998). *Sources of power*. Cambridge, MA: MIT Press.
- Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: a critical review and rejuvenation of the construct. *Academy of Management Review*, 31(4), 833-863.
- Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review*, 24(4), 691-710.

- Langley, A., & Truax, J. (1994). A process study of new technology adoption in smaller manufacturing firms. *Journal of Management Studies*, 31(5), 619-652.
- Leiponen, A. & Helfat, C. E. (2010). Innovation objectives, knowledge sources, and the benefits of breadth. *Strategic Management Journal*, 31, 224–236. doi:10.1002/smj.807
- Leonard-Barton, D. (1990). A dual methodology for case studies: Synergistic use of a longitudinal single site with replicated multiple sites. *Organization Science*, 1(3), 248-266.
- Levinthal, D. A. (2000). Organizational capabilities in complex worlds. In G. Dosi, R. R. Nelson, & S. G. Winter (Eds.), *The nature and dynamics of organizational capabilities* (pp. 363-379). New York: Oxford University Press.
- Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, 14, 95-112. Retrieved from <http://www.jstor.org/stable/2486499>
- Levinthal, D. A., & Rerup, C. (2006). Crossing an apparent chasm: bridging mindful and less-mindful perspectives on organisational learning. *Organization Science*, 17(4), 502-513. doi:10.1287/orsc.1060.0197
- Levitt, B., & March, J. G. (1988). Organizational learning. *Annual Review of Sociology*, 14, 319-340. Retrieved from <http://www.jstor.org/stable/2083321>
- Lin, A. C. (1998). Bridging positivist and interpretivist approaches to qualitative methods. *Policy Studies Journal*, 26(1), 162-180.
- Lyles, M. A. & Schwenk, C. R. (1992). Top management, strategy and organisational knowledge structures. *Journal of Management Studies*, 29(2), 155-174.
- MacCormack, A., & Iansiti, M. (2009). Intellectual property, architecture, and the management of technological transitions: Evidence from Microsoft Corporation. *The Journal of Product Innovation Management*, 26(3), 248-263.
- March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), 71-87. Retrieved from <http://www.jstor.org/stable/2634940>
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis*. Newbury Park, CA: Sage.
- Miner, A. S., Bassoff, P., & Moorman, C. (2001). Organizational improvisation and learning: A field study. *Administrative Science Quarterly*, 46(2), 304-337. Retrieved from <http://www.jstor.org/stable/2667089>
- Mintzberg, H., Raisinghani, D., & Théorêt, A. (1976). The structure of "unstructured" decision processes. *Administrative Science Quarterly*, 21, 246-275.

- Moorman, C. & Miner, A. S. (1998). The convergence of planning and execution: Improvisation in new product development. *Journal of Marketing*, 63(2), 1-20. Retrieved from <http://www.jstor.org/stable/1251740>
- Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Cambridge, MA: Belknap Harvard University Press.
- O'Reilly, C. A., III, Harreld, J. B., & Tushman, M. L. (2009). Organizational ambidexterity: IBM and emerging business opportunities. *California Management Review*, 51(4), 75-99.
- O'Reilly, C. A., III, & Tushman, M. L. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior*, 28, 185-206.
- Parada, P., Alemany, L., & Planellas, M. (2009). The internationalisation of retail banking: Banco santander's journey towards globalisation. *Long Range Planning*, 42(5/6), 654-677.
- Pentland, B. T. (1999). Building process theory with narrative: From description to explanation. *Academy of Management Review*, 24(4), 711-724.
- Pisano, G. P. (1994). Knowledge, integration, and the locus of learning: An empirical analysis of process development. *Strategic Management Journal*, 15, 85-100. Retrieved from <http://www.jstor.org/stable/2486812>
- Pisano, G. P. (1996). Learning-before-doing in the development of new process technology. *Research Policy*, 25, 1097-1119.
- Pisano, G. P. (2000). In search of dynamic capabilities: The origins of R&D competence in biopharmaceuticals. In G. Dosi, R. R. Nelson, & S. G. Winter (Eds.), *The nature and dynamics of organizational capabilities* (pp. 129-154). New York: Oxford University Press.
- Prahalad, C. K. & Bettis, R. A. (1986). The dominant logic: A new linkage between diversity and performance. *Strategic Management Journal*, 7 (6), 485-501. Retrieved from <http://www.jstor.org/stable/2486135>
- Rerup, C. (2005). Learning from past experience: Footnotes on mindfulness and habitual entrepreneurship. *Scandinavian Journal of Management*, 21, 451-472.
- Romme, A. G. L., Zollo, M., & Berends, P. (2010). Dynamic capabilities, deliberate learning and environmental dynamism: a simulation model. *Industrial and Corporate Change*, 19(4), 1271-1299. doi:10.1093/icc/dtq031
- Rubin, H. J., & Rubin, I. S. (2005). *Qualitative interviewing: The art of hearing data* (2nd ed.). Thousand Oaks, CA: Sage.
- Sanchez-Manzanares, M., Rico, R., & Gil, F. (2008). Designing organisations: does expertise matter? *Journal of Business and Psychology*, 23, 87-101. doi:10.1007/s10869-008-9076-y

- Sarasvathy, S. D. (2001). Causation and effectuation: Toward a theoretical shift economic inevitability to entrepreneurial contingency. *Academy of Management Review*, 26(2), 243-263. Retrieved from <http://www.jstor.org/stable/259121>
- Sarasvathy, S. D., Dew, N., Read, S., & Wiltbank, R. (2008). Designing organisations that design environments: Lessons from entrepreneurial expertise. *Organization Studies*, 29, 311-350. doi:10.1177/0170840607088017
- Sarasvathy, D. K., Simon, H. A., & Lave, L. (1998). Perceiving and managing risks: Differences between entrepreneurs and bankers. *Journal of Economic Behavior & Organization*, 33, 207-225.
- Sarasvathy, S. D., & Venkataram, S. (2011). Entrepreneurship as method: Open questions for an entrepreneurial future. *Entrepreneurship Theory and Practice*, January, 113-135. doi:10.1111/j.1540-6520.2010.00425.x
- Schoemaker, P. J. H. (1993). Multiple scenario development: Its conceptual and behavioural foundation. *Strategic Management Journal*, 14(3), 193-213. Retrieved from <http://www.jstor.org/stable/2486922>
- Schumpeter J. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, 11(4), 448-469. Retrieved from <http://www.jstor.org/stable/2640414>
- Shane, S. (2012). Reflections on the 2010 AMR decade award: Delivering on the promise of entrepreneurship as a field of research. *Academy of Management Review*, 37(1), 10-20. Retrieved from <http://dx.doi.org/10.5465/amr.2011.0078>
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217-226. Retrieved from <http://www.jstor.org/stable/259271>
- Szulanski, G. (2000). Appropriability and the challenge of scope. In G. Dosi, R. R. Nelson, & S. G. Winter (Eds.), *The nature and dynamics of organizational capabilities* (pp. 69-98). New York: Oxford University Press.
- Teece, D. J. (1998). Capturing value from knowledge assets: The new economy, markets for know-how, and intangible assets. *California Management Review*, 40(3), 55-79.
- Teece, D. J. (with Augier, M). (2009). *Dynamic capabilities & strategic management: Organizing for innovation and growth*. New York: Oxford University Press.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28, 1319-1350. doi:10.1002/smj.640

- Teece, D. J., Pisano, G. P., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533. Retrieved from <http://www.jstor.org/stable/3088148>
- Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management Journal*, 21, 1147-1161.
- Van de Ven, A. H. (2007). *Engaged scholarship: A guide for organizational and social research*. New York: Oxford University Press.
- Van de Ven, A. H., & Poole, M. S. (1995). Explaining development and change in organizations. *Academy of Management Review*, 20(3), 510-540.
- Van de Ven, A. H., & Poole, M. S. (2005). Alternative approaches for studying organizational change. *Organization Studies*, 26, 1377-1404.
- Venkataraman, S., Sarasvathy, S. D., Dew, N., & Forster, W. R. (2010). Reflections on the 2010 AMR decade award: Whither the promise? Moving forward with entrepreneurship as a science of the artificial. *Academy of Management Review*, 37(1), 21-33. Retrieved from <http://dx.doi.org/10.5465/amr.2011.0079>
- Vera, D., & Crossan, M. M. (2005). Improvisation and innovative performance in teams. *Organization Science*, 16(3), 203-224. Retrieved from <http://www.jstor.org/stable/25145963>
- Walsh, J.P., (1995). Managerial and organizational cognition: Notes from a trip down memory lane. *Organization Science*, 6(3), 280-321. Retrieved from <http://www.jstor.org/stable/2635252>
- Walsh, J. P., & Ungson, G. R. (1991). Organizational memory. *Academy of Management Review*, 16(1), 57-91. Retrieved from <http://www.jstor.org/stable/258607>
- Weick, K. E. (1998). Improvisation as a mindset for organisational analysis. *Organization Science*, 9(5), 543-555. Retrieved from <http://www.jstor.org/stable/2640292>
- Weick, K. E. (2002). Puzzles in organisational learning: an exercise in disciplined imagination. *British Journal of Management*, 13, S7-S15
- Weick, K. E. (2006). Role of imagination. *European Journal of Information Systems*, 15, 446-452. doi:10.1057/palgrave.ejis.3000634
- Weick, K. E., & Roberts, K. H. (1993). Collective mind in organisations: Heedful interrelating on flight decks. *Administrative Science Quarterly*, 38(3), 357-381. Retrieved from <http://www.jstor.org/stable/2393372>
- Weick, K. E., & Sutcliffe, K. M. (2006). Mindfulness and the quality of organisational attention. *Organization Science*, 17(4), 514-524. Retrieved from <http://www.jstor.org/stable/25146054>

- Wiltbank, R., Dew, N., Read, S., & Sarasvathy, S. D. (2006). What to do next? The case for non-predictive strategy. *Strategic Management Journal*, 27, 981-998. doi:10.1002/smj.555
- Winter, S. G. (2000). The satisficing principle in capability learning. *Strategic Management Journal*, 21(10/11), 981-996.
- Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 24, 991-995. doi:10.1002/smj.318
- Winter, S. G., & Szulanski, G. (2001). Replication as strategy. *Organization Science*, 12(6), 730-743.
- Yin, R. K. (2003). *Case study research: design and methods*. Thousand Oaks, CA: Sage.
- Zollo, M., & Singh, H. (2004). Deliberate learning in corporate acquisitions: Post-acquisition strategies and integration capability in U.S. bank mergers. *Strategic Management Journal*, 25, 1233-1256. doi:10.1002/smj.426
- Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 13(3), 339-351.