KNOWLEDGE AND COMMITMENT IN INNOVATION PROCESSES

by

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A thesis presented to the University of Western Sydney in partial fulfilment of the requirements for the degree of Doctor of Philosophy

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STATEMENT OF AUTHENTICATION

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or part, for a degree at this or any other institution.

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Abstract

This study was aimed at achieving an understanding of the role of knowledge and commitment in the process of innovation. To do that the study confronted several intractable problems of innovation research that have created barriers to knowledge accumulation.

First, there is no consensus on what the term innovation means. Rhetorical, political and ideological forces have caused business practitioners and innovation researchers to treat innovation as a level variable, whereas innovation, as doing things differently, is just one means of solving organizational problems. Whether it is the appropriate means depends on the problem and its context. To construct a variable of a level nature, innovation researchers have conflated the innovation variable with level variables such as knowledge and outcomes. This has the effect of concealing both the innovation variable and the knowledge-action gap, and so removes the means of explaining how knowledge for innovation is transformed into action.

Second, the models of traditional innovation research neither reflect the fundamental processes of innovation, nor explain how or why the organizational change process spontaneously arises, and is motivated, yet at the same time resisted, by organizational forces.

Theoretical models were developed based on organizational knowledge and commitments and aimed at overcoming the shortcomings of the traditional research models. In this theoretical scheme, innovation is conceived as a style variable on a continuum of business practice and the variable innovativeness defined as a point on the continuum. The subjective and irrational aspects of innovation are incorporated through extending the psychological concept of commitment into the organizational sphere, and developing a view of organization as a self-reference system based on social transactions and commitments. In this self-reference view the organization is constituted of two circuits of commitments, one a closed system of commitments that is historical and acts to protect the identity of the organization, another an open system of commitments that motivates knowledge creation and renewal of the organization.
These theoretical models of organizational change were investigated through multiple case studies of innovation projects that compared organizations of different type and size, and change processes of both technological and administrative character. The study achieved analytic generalization of the theoretical models, and demonstrated that the models were useful and applicable to business organizations generally. The results were less convincing in their support of the self-reference view of organization, but the view is not rejected, and a direction is set for useful research in the future.

The study has shown that explanations sourced from the psychological and social processes of the organization have more merit than those based on objectified knowledge. Combining the descriptions of both subjective and objective processes tells more of the story of organizational change.

The explanations of the theoretical models verified in this study challenge some traditional approaches of innovation research. In particular, the findings of this study provide no support for the conventional idea that innovation is correlated with knowledge or outcomes. A conclusion is that innovation research should learn to live with the dialectic that innovation is unrelated to knowledge or outcomes. This would help to focus research attention on the means by which knowledge is transformed into action, the central problem of the management of innovation.
Chapter One: Introduction

1.1 Background to interpretation

This research study is about knowledge and commitments. Both are things that are formed in the past but influence our view of the future, so it is appropriate that I declare my own knowledge commitments, and their influence on how I think about this work. We are made by our past.

My heritage is strongly Australian working class. All of my great grandparents were born in Australia of parents arriving in Australia in the 1850s. As far as I can determine, I was the first of my extended family to finish high school, and work at other than manual labour. I stayed full term at high school by working at weekends and school holidays cutting timber with my father, and after that became an apprentice electrician, while studying a part-time degree. I am proud of the fact that I can work with my hands, and have experienced just about every level of job that industry has to offer. I respect people who have pride in their labour, whatever it might be. For better or worse I remain sceptical of the role and motives of management, despite much of my 50 year working life being spent as a manager.

Being sceptical about management is not particularly helpful for a management career in a major company, and I seem to have always adopted the stance of being a student of the process rather than an insider. However, I was fortunate that the company where I spent the major part of my working life, 3M, tolerated difference and constructive discontent, and provided me great practical experience in the art of the thing called innovation. I readily admit that these experiences colour my interpretations of the literature on innovation, and the opinions that I express.

While I was always heavily involved in 3M’s business processes, my active interest in the topic of innovation only came after I had voluntarily retired from the company. My enthusiasm for understanding more about the workings of innovation may reflect a need to explain my many mistakes in its practice, and their sometime disastrous effect on my career progress.

The breadth of my career with 3M Australia was relatively rare in a company of many different technologies and sales divisions. I had management roles at levels from general
foreman to general management, and across the functional areas, technical, manufacturing, sales and marketing, field service operations, and industrial relations. At one time or other I held the senior management role in each of these functions. Also at certain times these management positions covered all of 3M’s many product and market divisions, allowing me to foster a unique network of contacts within the parent company and other subsidiaries. This broad experience in the company, together with further part-time studies while working for 3M (MBA and two degrees in psychology), provided me different insights into how 3M worked. It was this background that allowed me to establish a further 10-year career in consulting and teaching about innovation processes and innovation management.

While 3M might have a high reputation for innovation, for people working within it, trying to do things differently leads to a surprising amount of struggle and loss of popularity. For what actually happens within 3M is often very different to the myths promulgated by its corporate communications, and lapped up by academics and organizations that visit 3M for benchmarking purposes. Understanding this has made me sceptical about much of the popular management literature on innovation that is based on research into best practice companies like 3M.

Past experiences influence my thinking on innovation, and my approach to this research exercise.

I have seen work colleagues so besotted with a product idea that no one else thought made a scrap of sense that they sacrificed their career in the company rather than give it up. I have seen friends spend over 20 years building a respected and profitable business, and then lose all of their assets, including their homes, when it came time to do things differently. Doing things differently many times leads to personal disasters.

I learnt that using quantitative methods to evaluate new ideas was of questionable value. 3M people learn to work to simple rules that are appropriate to working with a 50,000 odd product portfolio. When someone is committed to a project it has a chance of success, whatever an accountant’s analysis might say. In contrast, the most promising of projects has no chance of success if there is no one interested in it. 3M practices, such as setting laboratory priorities by allowing people to vote their preferences, tend to be ways of sorting out people’s commitments.

I learnt some important lessons that are best explained through a fable often told by a 3M colleague, an entrepreneurial ex-policeman:
‘As you are creeping around the side of a house in darkness in order to apprehend a burglar, you look behind to see who is supporting you, and you find no one there. When you have collared the criminal and marched him back to the police station where the press photographer is waiting, when you look behind you find that everyone in the station is there.’

People don’t want to be involved where their reputation is at risk. However, success breeds commitment, and when the project seems likely to be successful, there is no end of volunteers who would like to be associated with the project, and share the credit.

My previous research into escalation of commitment in decision making (Waters, 1986), and experiences such as those above, directed my attention towards the role of acts of commitment in innovation. As I read into the literature, I sought ways of explaining my 3M experiences, and in reading about the concept of the ‘innovation champion’ I came across a phrase that immediately struck a chord. The text said that the idea of innovation champion shed light on one of the central problems of innovation, which ‘is to do with the linking of knowledge and commitment’ (Scarborough & Corbett, 1992; p.131). Was it through effective management of commitment processes that a company like 3M distinguishes itself in innovation?

Reflecting on this question led me to formulate some ideas on the relationship between knowledge and innovation that were presented at the 1999 Third World Congress on “The Management of Intellectual Assets” at Hamilton, Ontario (Waters, 1999), and awarded the best conceptual paper. The reviewers of the article for publication (Waters, 2000) were agreed on the importance of the research problem, the importance of its contribution to theory, the importance of the findings, the reasonableness of its conclusions, and the ponderous style of the writing. This thesis expands on the ideas of this article.

Finally, I feel that my age and experience cause me to carry more personal baggage than might a normal PhD student. On the positive side the baggage might lend experience and relevance to my interpretations; on the negative side the baggage might encourage ‘garbage-can thinking’ (Cohen, March, & Olsen, 1972), in that I may have ready-made answers looking for questions. However, we are made by our past. I cannot change that, but I hope I can understand and take advantage of it by calling on my experience in interpreting situations, while, at the same time, reflecting on these interpretations to ensure that they constitute fresh views, and do not simply replay past answers to past problems.
1.2 Background to the study

This thesis is about achieving innovation, thought to be an important factor for business success and national wellbeing, and said to be even more important at a time such as this when the pace of business and competition is increasing, and new technologies and the emergence of a new world economic order bring new markets and new business opportunities.

Innovation is the commonly used term for introducing something new or different (Macquarie Dictionary), but also a term that business has abused and weighed down with additional meanings. But innovation is not just a phenomenon of business. It is of a more fundamental nature. Innovation through changing technology has been the hallmark of human society since the emergence of humans as a separate species, and man’s continuing ascent (Bronowski, 1973). Innovations of the administrative type have occurred ever since man started organising into social groups. The histories of previous eras of great change, such as the irrigation societies of Egypt and Mesopotamia and the Industrial Revolution, show that technological and organizational innovation have gone hand-in-hand (Drucker, 1970).

Social theorists assert that innovation is necessary to the survival of any social system, whatever its dimensions - civilization, nation, business enterprise or social group (van der Molen, 1994). While the environment is relatively benign, social systems cohere in order to do things better and slowly adapt. However, when changes to the environment accelerate beyond the social system’s ability to adapt through small improvements, more fundamental changes need to be made if the system is to survive – that is, things have to be done differently, even though this might risk loss of cohesion and failure of the system.

This social systems view of innovation provides some clear messages for organizations. One, “innovate or die”, has permeated the management and organizational literature over the past few decades. A second, that sometimes it is “innovate and die”, is largely ignored in the management literature, for system failures are not treated as the result of an innovation, but rather as a management mistake. This contributes to a management ‘pro-innovation bias’, the presumption that all innovation will benefit an organization (Kimberly, 1981), when that is clearly not the case.
The academic focus on innovation was initiated by the work of the economist Joseph Schumpeter, who during the 1930s identified innovation, or in his words, any ‘doing things differently’ in the realm of economic life (Schumpeter, 1939; p.84), as the driving force of capitalism. Schumpeter rejected the prevailing economic consensus that capitalism was essentially a stable system that sought equilibrium when changes in the economic environment occurred, asserting instead that capitalism was an evolutionary process of economic change in which innovation was the source of its instability. In his view the problem for capitalism was not how it ‘administers existing structures’, but rather ‘how it creates and destroys them’, and, consequently, the problem for capitalists was how to survive by learning to live and participate within a ‘perennial gale of creative destruction’ (Schumpeter, 1928, 1943).

Following Schumpeter, the latter half of the 20th Century saw a period of sustained academic effort and writing on the need for innovation, and how nations and businesses should go about it. The effort accelerated in the 1970s and 1980s through a perceived decline in competitiveness in Western industry as first Japan and then other Asian countries mastered the dynamics of innovation and took advantage of their lower labour costs, especially in key automobile and consumer electronics industries and markets.

National and business leaders in Western countries were exhorted to give an even higher priority to innovation. Innovation was shown to be a principal driver of competition (Porter, 1980, 1985), and entrepreneurship and innovation central to the competitive advantage of nations (Porter, 1990; p.778). Academics claimed that in the turbulent times ahead, innovation was ‘the only hope’ (Kanter, 1984; p.51), and for companies there was only one way to achieve truly sustainable competitive advantage and that was to out-innovate their competition (Moore, 1993). In the latter decades of the 20th century, the concerns about innovation placed it at the very centre of public debate (Dahrendorf, 1988; p.ix), with national leaders seeking to stimulate economic growth by stimulating national innovation systems and adopting new political ideologies for revamping the role of government.

History may show the 1990s to be a very significant era of innovation and the early years of the 21st Century as a period of sober reappraisal. By the latter half of the decade, a burst of business creativity inspired by the technology of the Internet providing a means of global interconnection, and the opportunity of conducting business in different ways. The product offerings of information technology and communications companies co-evolved to provide the hardware and software to support these new business activities, and the vast expansion in electronic communication traffic that was expected to follow. The market valuations of both
Internet start-up and their technology providers ultimately reached unprecedented and irrational levels, and from May 2000 the market bubble burst. The subsequent massive failures of Internet and communications companies illustrate the instability and creative destruction that can be associated with innovation, as Schumpeter described.

However, historians may find even more in this story. Social philosophers point out that all knowledge is overlayed by interests and they say that when knowledge is focused on the pursuit of technical interests to the detriment of the social and emancipatory interests of society, the spectre of social conflict is raised. Indeed this is the agenda for ‘modern social conflict’ that Dahrendorf (1988) described in his essay on the politics of liberty. When the social and emancipatory effects of innovation are neglected, a division is raised between the people and societies that emphasise innovation, and those people and societies that are unwilling to see the loss of their local values. The violent mass protests at the World Trade Organization meetings in Seattle and Washington in 1999 and 2000 respectively, and at the World Economic Forum in Melbourne in 2000, that railed against the effects of globalization make sense when viewed as a protest against the spread of Western hegemony about innovation.

In summary, innovation is an important and far-reaching issue, and achieving innovation, whether at the level of individual, social group, business organization or nation, has ramifications well beyond the technicalities of its accomplishment. Consequently, innovation is an activity that requires a better understanding and a more informed and balanced approach, if people and organizations are to prosper, while at the same time, a sustainable future for human society is to be assured.

1.3 Justification for the study

The business theme of “innovate or die” has propelled an industry of popular management writing on how companies might achieve the holy grail of innovation. The shelves of the world’s bookshops and libraries groan under the weight of the thousands of management books related to innovation in some way. For example, a May 2004 search for titles containing the word innovation at Amazon.com found over 65,000 books. This management literature addresses questions such as why some organizations are more innovative than others, or what are the characteristics of innovative organizations. However, the answers provided are largely expressed in terms of “best practice” or “how to” guides, based on anecdotal stories rather than sourced from integrative research programs (Tidd, 1997).
As to the academic research, it is surprising that after many decades of research effort and thousands of academic studies, lack of consensus about the meaning of the term innovation, and inconsistent results remain a major topic (Downs & Mohr, 1976; Fiol, 1996; Van de Ven, 1986; Wolfe, 1994). If practitioners are considered the ultimate users of the research work, then this lack of consistency and relevance raises questions about whether innovation researchers have addressed the problems of vital interest to their clients.

Critics of innovation research contrast the broad questions raised by general management practitioners, such as how to maintain a culture of innovation and entrepreneurship within their organizations, with the narrowly conceived, technically oriented, functional management based, scholarship of the field (Van de Ven, 1986). Some critics say that practitioners have not been provided with a useful theoretical framework within which to understand innovation (Abrahamson, 1991; Tidd, 2001), and others say that innovation research needs to move beyond descriptions of the what towards explaining and understanding how and why things occur (Van de Ven & Rogers, 1988). Other critics say that innovation research has to be reconceived to become useful to practitioners (Fiol, 1996).

Any useful model of innovation, or of change more generally, has to be grounded in the purposive action of individuals (Van de Ven, Angle, & Poole, 2000a). It has to explain how the members of organizations get things done, and what motivates them to do so. Innovation research has failed to do that, building knowledge about the innovation process, but saying little about what makes desired actions come about. This might be referred to as a knowledge-action explanatory gap.

One popular approach to papering over this explanatory gap has been to consider organizational innovation to be the result of the actions of certain individuals. However, if this were an adequate approach to explaining innovation then one need only look to individual psychology for understanding. This would be an oversimplified approach to understanding innovation in organizations where much of the behaviour is determined by impersonal forces (Thompson, 1967).

Sociological models provide no theory of motivation that can explain the knowledge-action gap. They contain an implicit theory of motivation in order to make them work, but the theory remains unarticulated, and so does not explain why action does or does not occur (Turner, 1987).
An understanding of the shortcomings in sociological explanations comes by referring to the philosopher Karl Popper’s theory of knowledge (Popper, 1979). Popper distinguishes between the worlds of objective knowledge, subjective knowledge, and physical objects. Problems, critical arguments and theoretical models exist in the world of objective knowledge, and for an action to take place in the physical world, an abstract object from the world of objective knowledge has to be grasped by someone, and this is a mental process from the world of subjective knowledge. In other words, looking for explanations of changes in the physical world requires study of both worlds of subjective and objective knowledge.

Innovation research has traditionally specialised in objective knowledge explanations, with a recent minor shift in emphasis towards subjective explanations through analytical concepts such as values and corporate culture. Research efforts that concentrate solely on the subjective world provide only a partial view of things. A useful model of innovation would incorporate both objective and subjective worlds, provide a more holistic approach for practitioners, and offer an approach to improving the consistency of innovation research findings. The development of such a model would make a useful contribution to theory in innovation and provide a different approach to solving the consistency of results problem in innovation research.

### 1.4 Research aims

The aim of this research study is to gain an understanding of the role of knowledge and commitment in the process of innovation, and through that develop a conceptual model of the innovative change process in organizations that is useful to management practitioners. The work aims to add to current innovation theory and research practice by incorporating the roles of both objective and subjective knowledge processes in the model.

The requirements of a useful model of organizational change have been described by Van de Ven and his associates (Poole & Van de Ven, 1995; Poole, Van de Ven, Dooley, & Holmes, 1999; Van de Ven & Poole, 2000c), and these, with only minor adaptation, are listed below. A useful model should do the following:

i. Provide a conceptual schema that is useful to management practitioners.
ii. Describe and explain the overall longer-term development process, as well as the operative processes that create the development patterns in the short term.

iii. Be transferable across organizational contexts. To accomplish this the model should be based on a precise definition of innovative change and a means of measuring it.

iv. Be applicable to all forms of innovative change - product, process, technical and administrative.

v. Recognize that decision-making about innovative change takes place in a context of a highly uncertain or unknowable future, and so may involve processes that are both rational and non-rational.

vi. Explain how and why knowledge is generated for the purposes of change, and how and why this knowledge is applied towards innovative change.

vii. Explain how organizational relationships (structure) are linked with individual purposive actions in order to produce change.

viii. Explain both the stability and instability of the innovative change process.

ix. Explain how the innovative change process is motivated.

1.5 Scope of the study

The theoretical concepts developed in this study are intended to be applicable to all types of innovative change, including but not limited to, product innovation, service innovation, process innovation, administrative innovation, and marketing innovation. The research design reported in this study is also applicable to these types of change. However the empirical investigations are conducted on projects of a technical and administrative type.

This research study is designed to inform one particular perspective within the academic field of the management of innovation. The content of the academic field can be conveniently divided into three levels of analysis (Kanter, 1988a) that are associated with three levels of potential practitioner audiences (Walker, 1994).
At a micro level of analysis, the management of innovation is about analysing products and services and executing the routine tasks of implementation. The audience are those charged with getting the practical tasks of innovation task done – usually engineers and other professionals, as well as their direct management supervisors. While the work of this thesis will not directly address the practice needs of this audience, it may be informative to it.

At a macro level of analysis, the management of innovation is about taking a global overview of innovation, establishing new vision, setting strategic frameworks, and designing and maintaining an appropriate organizational setting. The audience is those establishing the global context of innovation - the CEOs of large companies and government policy makers. The work of this thesis will not directly address the practice needs of this audience, although it will be informative to it.

At an intermediate or organizational level of analysis, the management of innovation is about internal decision-making and managing internal change processes of a non-routine nature. It is also about attending to the critical upfront processes of innovation, where uncertainty and ambiguity are at their highest. At this level of analysis, managing ideas, conceptualising the task, and understanding the “how?” and “why?” are important issues. The audience is the senior managers in large organizations and general managers of smaller companies. The work of this thesis is intended to provide useful conceptual tools for this audience group.

1.6 Overview of the study

In order to achieve the research aims this thesis progresses the research in the following manner:

The following Chapter 2 and Literature Review, examines three separate strands of literature, referred to here simply as the innovation, knowledge and commitment literatures.

The review of the innovation literature focuses on how researchers have defined and described the concept of innovation, and the extent to which its essential process has been accommodated in their models. The theory building in innovation is reviewed and the problems hampering the effort are highlighted. The literature concerning forces that motivate and de-motivate the innovation process is also reviewed.
The Chapter 2 review of the knowledge literature traces how knowledge has become a strategic tool for business. It then examines the various types of knowledge thought necessary for innovative change. The review concludes with a critique of the emerging academic field of knowledge management.

The review of commitment literature covers the research into commitment of several academic fields, investigates the extent to which the concept of commitment fits with explanations of innovative change, and examines the literature of commitment in organizations.

Chapter 3, Theory Development, extends on the literature review of Chapter 2 in two ways. First, a strategic model of business practice is developed that combines ideas about knowledge and commitment, and provides a means of measuring business practice on an ‘innovativeness’ continuum. Second, knowledge-commitment models are developed for knowledge creation, and the overall organizational change process. As part of the development of these models the literatures associated with communication in organizations and the conception of organization as a self-referencing system are reviewed. Chapter 3 concludes by stating the research propositions that derive from the models.

Chapter 4, Research Design, reviews the means of answering the research propositions, provides justification for the choice of method, and describes the development of the study protocol and research instruments.

Chapter 5 presents the results of the analysis of the research data collected from qualitative and quantitative sources. The supporting raw data and the detailed analysis are placed in the Appendices.

Chapter 6 is the discussion chapter that evaluates the evidence supporting the theoretical models developed in Chapter 3, evaluates the theoretical implications of the models and suggests ways in which the models can inform practice. The limitations of the results, and the extent to which the findings of the study can be generalized are also covered.

The final Chapter 7 outlines the conclusions that are drawn from this study.
2 Chapter Two: Literature Review

2.1 Chapter introduction

Organizations develop new-to-the-world products, conceive and implement new business methods and redesign their administrative processes in order to do things differently, and so gain advantage over competitors. That is, they innovate.

Innovation is always a change process, but change processes are not always innovative. This distinction has been eroded over time as business usage of the term innovation began to reflect the perceived desirability of all types of change, and to recognise that an organization’s innovations could create a competitive advantage. Consequently, the term innovation has become almost synonymous with the process of change. This chapter will show that this has not been helpful to academic researchers, as a lack of precision in their terms affects the consistency of their research results.

For any change process to occur there needs to be some understanding about what is required to achieve the change, and there needs to be a motivating force to get the job of change done. As well, when things are done differently the outcome cannot be predicted from rational processes of inference, for normally the outcome cannot be understood until after the event (Schumpeter, 1947). Accordingly, any explanation of the motivating forces involved must go beyond the explanations of economical rationality.

This chapter introduces the concept of commitment to explain behaviours that go beyond rationality, for under the influence of commitment people are known to do things that are not in their own interest (Sen, 1982).

The literature review proceeds in five parts.

Section 2.2 and its subsections deal with the nature of innovation, the unique problems that face researchers in this area, and the forces that both motivate and de-motivate the innovation processes.
Section 2.3 and its subsections deal with knowledge and its strategic use by organizations, the knowledge necessary for innovation, and a limited critique of the emerging academic field of knowledge management.

Section 2.4 and its subsections review the multi-disciplinary research literature on the concept of commitment.

Section 2.5 and its subsections review the concept of commitment from the organizational perspective and examine the links between commitment and knowledge creation.

Section 2.6 reviews this chapter and the shortcomings of the literature that inspire the further literature review and theory development of Chapter 3.

### 2.2 The nature and problems of innovation

#### 2.2.1 What is innovation?

Modern academic interest in the subject of innovation commenced with the economist Joseph Schumpeter’s critique of capitalism, where he asserted that the process he named ‘innovation’ was the driving force of capitalism, and the cause of its evolutionary nature and inherent instability (Schumpeter, 1928). Schumpeter’s definition of innovation was a business-oriented one:

> ‘Technological change in the production of commodities already in use, the opening of new markets or of new sources of supply, Taylorization of work, improved handling of material, the setting up of new business organizations such as department stores – in short, any “doing things differently” in the realm of economic life – all these are instances of what we shall refer to by the term Innovation’ (Schumpeter, 1939; p.84).

In distinguishing innovation from other kinds of change, Schumpeter cautioned economic theorists about the different kinds of change reactions in the economy (Schumpeter, 1947). Where the change response expands upon existing practice then Schumpeter referred to it as an *adaptive response*. When an economy, or an industry, or a firm within an industry does something different, and outside of existing practice, this was referred to as a *creative*
In his view the creative response had essential characteristics and consequences of lack of predictability, extent of the ultimate change, and the frequency of its occurrence, that made it an entirely different social phenomenon to the adaptive response. Schumpeter linked the study of the creative response and innovation to the study of entrepreneurship, a link that remains current (Drucker, 1985).

Schumpeter also cautioned that the changes brought on by innovation, as he described it, were irreversible and could not be decomposed into smaller change steps. The frequent, predictable and understandable, but limited changes that accompany adaptive responses could never add up to a creative response and innovation. In Schumpeter’s words, ‘Add as many mail-coaches as you please, you will never get a railroad by so doing’ (Schumpeter, 1935; p.5).

Schumpeter’s view of what innovation was and was not about would seem to have provided a reasonable basis for accumulating research findings. However Schumpeter’s precision has been steadily eroded over time, with the term innovation becoming a dumping ground for rhetorical, political and ideological claptrap, and many definitions of innovation proliferating in the organizational literature.

Many authorities have followed Schumpeter’s lead by associating newness with innovation. For example, organizational innovation has been described as ‘an idea, practice or object that is perceived as new’ (Rogers, 1983; p.11); ‘the adoption of means or ends that are new’ (Downs & Mohr, 1976; p. 701) ‘the adoption of change that is new’ (Knight, 1967; p.478); ‘adopted changes considered new’ (Daft & Becker, 1978; p.5). Researchers have also attempted to define and measure innovation in degrees of newness (Johannessen, Olsen, & Lumpkin, 2001).

The use of the term new in these definitions is seemingly straightforward, and corresponds with dictionary definitions of innovation as ‘something new or different’ (Macquarie Dictionary). However, the meanings that surround the everyday use of the term “new” create interpretive problems in organizations, for in the modern world the conventional view of progress is about steady improvement, so, in conventional thinking, what constitutes “new” has very little to do with doing things differently. For what is most times presented as “new” is a simple elaboration of an existing concept (Grudin, 1990).

Modern marketers, especially, present things as “new” that represent only fashion changes that have no permanent impact on the world, and do not lead to any significant change in
anything. The conventional use of the word new, and the concept of newness, becomes a force for stability rather than change (Grudin, 1990). Conventional thinking about newness might well be regarded as the antithesis of innovation. Consequently, definitions of innovation that use the term new can mislead in two ways. First, by conditioning people to understand new as involving only adaptive change processes, and thus conflating adaptive and creative change responses. Second, by concealing the fact that innovation is actually about change. The authorities using the term new in their definitions seem to never explain how one can have something new without change, or have change without something new appearing.

Second, many researchers have used the terms “creativity” and “innovation” interchangeably (Arad, Hanson, & Schneider, 1997). The justification given is that innovation requires the generation of creative ideas, and this approach guides researchers in organizational creativity (Amabile, 1988, 1998; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Robinson & Stern, 1997). The creativity school sees innovation as about ‘the generation, acceptance, and implementation of new ideas, processes, products and services’ (Kanter, 1983; p.20). The problem faced by conflating creativity with innovation is the question of ‘what creativity?’, for creativity is as confused a concept as innovation. A following Section 2.2.1.2 will place innovation and creativity into context.

Third, as the economies of western world countries have become more knowledge-based, researchers have pointed out the important role of knowledge creation in innovation, even to the point of equating the two (Nonaka & Takeuchi, 1995). Knowledge management writers claim that it is necessary ‘to view innovation as an activity geared towards the generation and application of new knowledge’ (Kaltoff, Nonaka, & Nueno, 1997), and that defining innovation in this way provides a more powerful approach. However, this approach seems to be more about promoting the field of knowledge management than explaining innovation (Waters, 2000), and is the subject of a critique in a following Section 2.3.9.

Fourth, business definitions of innovation recognize that, in business practice, Schumpeter’s distinctions cannot be readily made. A washing machine that is redesigned to substitute microprocessor controls for electro-mechanical controls may represent a great change in design and production practice for the manufacturer, but for distribution channels and the customer it remains a “new” washing machine that is much like those that went before. A change that is outside existing practice for the manufacturer remains a simple extension of existing practice for the customer. So which viewpoint is relevant to classifying the
change? The business viewpoint seems to be that the question is irrelevant, and business definitions of innovation tend to be broad descriptions such as:

‘In business, innovation is something that is new or improved done by an enterprise to create significantly added value either directly for the enterprise or indirectly for its customers.’ (Carnegie & Butlin, 1993; p.3)

Here the new (creative and adaptive responses) and the improved (adaptive response) are equated, and the idea of change subsumed by the concept of added value. Such definitions become a catch-all for all organizational change or non-change effects that might result in an economic benefit. Such a broad definition may work perfectly well for making organizational change programs inclusive, but it is not helpful to managers who need an understanding of change management, and it is not helpful to researchers who have an interest in maintaining the precision of their research terms.

Fifth, one academic field, adaption-innovation theory (Kirton, 1976, 1984, 1994a, 2003), is exceptional in the psychological and organizational research literature by following the precise terms of Schumpeter’s formulation of innovation. This field has a 30-year history of accumulating consistent research results through some hundreds of studies.

This study does not add to the innovation research literature’s terminological confusion by suggesting a different definition of innovation. Rather it promotes the idea of reverting to Schumpeter’s original description of innovation as ‘doing things differently in business’, a description that encompasses the intentions of most of the definitions adopted in the research literature.

### 2.2.1.1 Innovation processes

If the process of innovation or anything else is to be usefully modelled, then the fundamental nature of the process is of vital interest. A major criticism of innovation research is that the models on which it is largely based do not reflect the essential nature of innovation (Clark & Staunton, 1989; Nelson & Winter, 1977; Rosenberg, 1994).

Schumpeter’s thesis was based on an assertion that innovation was both unpredictable and irrational in nature. In regard to the first of these, Schumpeter states that an essential characteristic of innovation is that it can always be understood after the event, but
practically never before. Consequently, it cannot be predicted by making inferences based on pre-existing facts, because there are effectively none of these (Schumpeter, 1947). Thus if innovation cannot be anticipated in any formal way or defined empirically, rational calculation has no direct application to the process.

In speaking of rationality, Schumpeter said that the assumption that business behaviour is rational, ‘works tolerably well only within the precincts of tried experience and familiar motive. It breaks down as soon as we leave those precincts ….’ (Schumpeter, 1939; p.98). Since innovation lies outside the range of ‘tried experience’ then, in Schumpeter’s terms, the rationality of behaviour breaks down. However, Schumpeter’s analysis and view of rationality is a purely economic one, and fails to account for other forms of rationality, such as Weber’s ‘value rationality’ that may motivate people in this situation (Weber, 1968).

If one takes the information processing view on decision making then the lack of information resulting from the uncertainty associated with innovation clearly means that decisions will involve a ‘bounded rationality’ (Simon, 1996). If rationality is taken as the selection of appropriate means to reach designated ends (Simon, 1997), then the choice of innovation to reach certain business ends may be a perfectly rational one, even though the decision processes by which the choice is made may be bounded in their rationality by the restricted level of information available.

For Schumpeter’s intellectual heirs, evolutionary economists, it is the inability to come to grips with the basic essences of innovation, disequilibrium, irrationality and unpredictability, that prevents management theorists from developing a useful model of innovation (Nelson & Winter, 1977), and throws doubt on the meaning of the equilibrium models used in innovation research, where the ‘essential nature of innovation is systematically neglected’ (Rosenberg, 1994; p.54). Nelson and Winter (1977) claim that any research framework that hopes to integrate the disparate knowledge on innovation ‘must incorporate explicitly the stochastic evolutionary nature of innovation’ (p.48).

While Schumpeter’s fundamental views on innovation remain unchallenged, for researchers they remain in the “too hard basket”. In the meantime, practitioners state their view that innovation is an unpredictable and disorderly affair (Coyne, 1996), and the popular management literature delights in anecdotes about the roles of chance, serendipity, irrationality and even chaos (in the vernacular sense of confusion and disorder) in innovation (Jellinek & Schoonhoven, 1990; Peters, 1989; Quinn, 1985; Robinson & Stern, 1997). Change theorists caution against thinking that change outcomes can be guaranteed,
and how managing change as though there were certainty of outcome can do serious damage
to the people involved (Griffith, 2002). Practitioners are also well aware of the non-linearity
of innovation, and enthusiastically search for simple changes that will have a great impact
on their business (Drucker, 1985), the 3M Post-it Note, a relatively minor technical
invention that changed the communication habits of the world, being a clear example of
‘little things meaning a lot’ (Petroski, 1994b).

However, recent research reports on product innovation models indicate moves to re-
orientate the field towards reflecting more of the reality of organizations. For Cunha and
Gomes (2003) the evolution of innovation models has gone hand in hand with paradigmatic
changes in the view of organizations, and this has meant a working towards a more flexible,
contingent, learning-based, opportunity seeking, network-based, and chaotic view of
process. For Buijs (2003) reflecting reality means including more of the chaotic character of
the innovation process in organizations. At the same time they caution that while chaos
models may have greater theoretical merit, they may be less useful in practice and education
than those that follow the linear logic. A model is only useful to a practitioner to the extent
that it can be readily understood.

Despite these harbingers of change, the view of innovation process most commonly used in
the research literature neglects the process characteristics mentioned above. The prevailing
view remains that of the simple linear sequence of activity stages that is identified with the
work of Everett Rogers (Rogers, 1983). This view of process is capable of reflecting many
of the organizational relationships involved in the process, and has the advantage of being
relatively easy to understand. But it also has many shortcomings that are discussed in a later
Section 2.2.2.2.

In summary, practical innovation models have tended to neglect the fundamental processes
involved, while capturing more of the organizational reality may work against the
usefulness of the models. What is needed is a simple concept that reflects the irrational
nature of the innovation process.
2.2.1.2 Innovation, invention and creativity

It is necessary to distinguish innovation from other similar concepts. Both researchers and practitioners are prone to using the terms innovation and creativity interchangeably (Arad et al., 1997), and in everyday usage, the term “invention” is often confused with the term innovation.

Schumpeter (1939, 1943) distinguished between innovation and what he referred to as invention. He asserted that these involved entirely different social processes, and that those involved, innovator and inventor, were likely entirely different people. Schumpeter referred to invention as having no economic value indicating that his conception differed to the current concept of an invention, for while the dictionary definition of invention, as the act of creating something from the imagination (Macquarie Dictionary) may have remained the same from Schumpeter’s time, the use of the term invention in business has not. Ruttan (1959) explains that influential work on the history of inventions, especially by Usher (1954), promoted the heroic qualities of the individual inventor and led to a narrower use of the term invention, as something with obvious economic value, as in a patent (Ruttan, 1959; Usher, 1954). This has permanently tied the business use of the word invention to situations where a patent is involved. However, for the purposes of this study, invention will be treated as the act of creating something from the imagination, and defined that way in the Glossary.

So it is more appropriate to equate Schumpeter’s use of the word invention with the use of the imagination or the activity of generating ideas, what has been termed ‘creativity’ in the organizational literature. A question that follows is whether the process of creativity should be treated separately to the innovation process, the process of economic relevance?

The organizational creativity literature defines creativity in terms of the production of useful ideas, and defines organizational innovation as the separate process of successfully implementing ideas (Amabile, 1988). While creativity, as a process, focuses on individual contributions, it is generally agreed that innovation is always a collective process of organization (Kanter, 1988b). This consensus has been confirmed by studies showing that idea suggestions were predicted by personal and job variables, whereas implementation were predicted by organizational variables (Clegg, Unsworth, Epitropaki, & Parker, 2002). These findings confirm useful distinctions between creativity and innovation without informing about the connections between the processes.
An example of how innovation researchers think about this connection is the metaphor of innovation process that Fiol intended to inspire new research directions (Fiol, 1996). Her conception is of innovation as a sponge. The process of filling the sponge is determined by institutional factors that provide the social conditions for creativity. On the output side, market pressures drive a separate process of squeezing innovation from the sponge. Unfortunately, the implication of the metaphor, that one cannot get more out of the innovation sponge than one puts in as ideas, seems to neglect the essential non-linearity of innovation. However the metaphor describes creativity and innovation as independent processes, and suggests that the two may be displaced in time (the sponge providing a temporary store of ideas in process). At the same time there remains a misleading implication that ideas generated will eventually turn into innovation.

There is strong anecdotal evidence that the link between the social processes of creativity and innovation are tenuous at best. Stories abound of people with original ideas, such as the inventors of the domestic sewing machine (Utterback, 1994), personal computer, and spreadsheet software, who did not share in the vast markets that their ideas established, pointing out that an idea in the hands of an inventor is a different thing to an idea in the hands of an entrepreneur. Furthermore, most ideas that are generated do not prove useful.

The main studies of the process by which novelty comes about are based on the Darwinian model of evolution through natural selection (Dasgupta, 1996). The evolutionary model is reflected in the often-quoted homily of innovation practitioners that it takes 100 ideas to find a good one. As well, writers encourage innovators to steal ideas from everyone else rather than generate them themselves (Peters, 1990, 1991), and admonish nations for not doing the same (Spencer, 1990), attesting to the independent nature of ideas and their transferability. All of this is implicit recognition that creativity is one thing, innovation another, and only sometimes will the twain meet.

However, the literature on corporate creativity makes little of the distinction between the creativity and innovation processes, and provides many examples of people getting ideas and immediately putting the ideas into action (Robinson & Stern, 1997). Indeed the Japanese approach to the management of continuous improvement, kaizen, depends on this exact process (Basadur, 1992; Robinson & Stern, 1997). Why is the link between the processes of creativity and innovation sometimes strong and sometimes tenuous? The answer lies in understanding Schumpeter’s formulation of change responses, and that different responses elicit different levels of acceptance by people subjected to the change.
With an adaptive response the idea comes from within existing practice, so is relatively easy to understand, and readily accepted. In contrast, with a creative response the idea comes from outside of existing practice. Such ideas will be more difficult to understand and accepted, for they are outside the range of experience and understanding of those to whom the idea is addressed (Kirton, 1984).

Consequently when dealing with an adaptive practice that is aimed at doing things better, such as in the work of quality improvement, then the creativity and innovation processes may be closely connected and the value of the idea immediately captured (Basadur, 1992). However, when dealing with innovative practice aimed at doing things differently, then the link may be less obvious. Most innovative ideas need lengthy gestation periods, sometimes lasting many years (Van de Ven, Polley, Garud, & Venkataraman, 1999), and so it is not surprising that innovative ideas might diffuse outside of the originating organizations in search of entrepreneurial commitment, as in the cases of the sewing machine, the personal computer and the spreadsheet previously mentioned.

It is surprising that the corporate creativity literature sees the value in making these distinctions between adaption and innovation (Robinson & Stern, 1997), whereas the innovation literature does not. For example, a popular text on the management of innovation (Tidd, Bessant, & Pavitt, 2001) cautions against the ‘one-dimensional management’ approach of treating innovation as ‘breakthroughs’, what the innovation of Schumpeter is mainly about, for it might lead to ‘ignoring the significant potential of incremental innovation’ (pp.43/44). The fact that prominent authorities caution against making distinctions about innovation, suggests surrender to the business practice viewpoint on innovation, to the detriment of the precision necessary for consistent research effort. After all, the ability to make distinctions is what knowledge is about, and making new distinctions is what knowledge building is about (von Krogh, Roos, & Slocum, 1996b), so failing to make distinctions inevitably leads to the conflation of important variables, and confused thinking.

The uncritical thinking that conceals the difference between adaptive responses and innovative responses also tends to conceal differences between the creativity and innovation processes, a mindset that is misleading for innovative practice. This mindset leads organizations to conclude that innovation is simply about generating lots of ideas, and improving innovation about sending all employees to individual creativity training. Such action might be appropriate for promoting a continuous improvement program, but may be of little value if the organization seeks to reinvent itself by innovating (Leonard & Straus, 2000).
This mindset also encourages organizations to act as though the sources of innovation lie entirely in its internal creativity process, and leads to discounting the ideas from customers and suppliers. This is thinking that von Hippel’s research has firmly dispelled (von Hippel, 1986, 1988; von Hippel, Thomke, & Sonnack, 1999).

This critique is not intended as a condemnation of attempts to enhance the creativity mechanisms of organizations. Evidence from the organizational creativity literature, and studies such as that of Bharadwaj and Menon (2000), makes it clear that organizations that encourage individuals to be more creative, and have formal mechanisms to enhance organizational creativity, also have superior performance at innovation. However, this literature and such studies also leave questions unanswered.

First, if an organization generates ideas then some may be useful and some may be taken up, and it may be reasonable to conjecture that the more ideas generated the more will be taken up. However, one might ask as to what type of ideas are being discussed? It has been previously reasoned that adaptive ideas are more readily understood and accepted. Taking up adaptive ideas is thus a straightforward and sensible thing to do, in comparison to innovative ideas. But taking up adaptive ideas can only improve on measured innovation performance if the innovation measure includes adaptive change responses. This may be one reason why business favours an all-encompassing definition, so that innovation measures improve even if the business measures do not.

Second, there is more to the innovation process than the simple acceptance of an idea. Finding a positive relationship between creativity mechanisms and innovation outcomes, as did Bharadwaj and Menon (2000), also relies on organizations being accepting of ideas, and organizational processes that can lead to a successful implementation. Clearly if an organization does not have these latter things then no amount of creativity will lead to outcomes. In other words, for organizations to be effective at innovation they will need an effective creativity process as well as an effective innovation process.

In summary, there is merit in understanding the separate nature of the creativity and innovation processes. The creativity process involves people, and the processes of their minds. The innovation process involves people, and their organizational actions. The process of innovation commences, not when an idea is generated, but when a person takes action as the result of the idea. The following section discusses such creative acts.
2.2.1.3 Creative acts

An organizational view of innovation that starts with an act inspired by a useful idea, and finishes with the implementation of the idea, fails to account for what comes before and what comes after. What comes before is the contribution of the organization to the formation of the useful idea. The creativity literature and the commonsense view state the truism that ideas stem from the individual imagination. However, taking a person-centred view of creativity, and failing to consider the influence of the organizational context on the individual, removes any capability of explaining organizational creativity (Ford & Gioia, 1995). There are many more evaluative mechanisms at work in organizations than in individual contexts, and it is very clear that creative acts in organizations emerge from a highly interactive social milieu (Amabile, 1988; Amabile et al., 1996; Kanter, 1988b). Because of social constraints, it takes a great deal of perseverance and social skill to have an idea attended to in an organization. Ideas and actions may surface through individuals, but the social processes of the organization shape these ideas and potential actions, and are influential in determining those ideas that surface and those that do not.

It is also clear that any creative act involves a purposive decision by an individual. Quinn (1997; p.3) talks about ‘motivated creativity’ as the skill of greatest value to innovation in organizations. Other writers point to problem finding as the motivated activity that is the real test of creativity in organizations (Basadur, 1992, 1994; Mackworth, 1965).

In taking action as the result of finding a problem or generating an idea, it is well established that people have cognitive preferences that influence the way that they interpret situations, and the way they respond (Kirton, 1976; Leonard & Straus, 1997; Sternberg, 1997). Thus individual differences will influence the problems that are found and the ideas people choose to surface in an organization, as well as the nature of the creative act, particularly as to whether the act represents an adaptive or innovative change response (Kirton, 1976).

Recent research has demonstrated this effect in practice. In a study of entrepreneurs, Shane (2000) showed that when the same information on an invention was given to eight sets of entrepreneurs, each set discovered different opportunities, and organized their entrepreneurial effort in different ways. A study of 106 middle managers by Rodan and Galunic (2004) demonstrated that access to heterogeneous knowledge was important to innovativeness of chosen tasks and innovation performance, demonstrating that individual differences influence the opportunities that people discover from the information they are given.
In a study of 47 champions in product innovation, Howell and Shea (2001) showed that individual differences influenced environmental scanning, the way that ideas were framed as opportunities, and the behaviour of the champion during the project. The evidence here is that individuals interpret the same situation in different ways, frame ideas in different ways, formulate different responses, and behave in different ways.

In summary, the role of individual differences is of critical importance to the innovation process because of its influence at the very beginning of the process, in determining what ideas are attended to, how the ideas are framed, and what change response is perceived as appropriate. Recent research has identified that these initial individual choices are influential in the ultimate success of product innovations (Goldenberg, Lehmann, & Mazursky, 2004).

### 2.2.2 Theory building in innovation

A starting point to any discussion of innovation theory is to acknowledge the complexity of the process of innovation, and the great bulk of its associated research. Wolfe (1994) advises that it is incumbent on innovation researchers to minimize ambiguity by making clear the stream of innovation research and literature that is relevant to their study (Wolfe, 1994).

Innovation research takes place in at least three levels of analysis, innovation project, organization, and extra-organizational (Kanter, 1988a), essentially the same three levels of thinking that were described in previous Section 1.5 to outline the scope of this study. As stated there this study aims primarily at the organizational level of analysis, but may inform the other two levels.

Several reviews of the research literature on organizational innovation have identified streams of research that address different foci, research questions, unit of analysis and dependent variables (Slappendel, 1996; Wolfe, 1994).

Wolfe (1994) identifies three different research approaches that have developed sequentially.

1. Diffusion of innovation research, concerning the diffusion of innovations amongst potential adopting organizations.
2. Organizational innovativeness research, that addresses the question of what makes for an innovative organization.

3. Process theory research that addresses the processes those organizations go through in order to implement innovation.

The first on this list, the earliest of innovation research, is best represented by the work of Everett Rogers and his review of thousands of diffusion studies (Rogers, 1983). This work is essentially about how individuals and organizations make decisions to adopt new ideas and is outside the scope of this research study.

On the second approach, Van de Ven and Rogers (1988) reported that work on defining the essential characteristics of innovation within organizations (Zaltman, Duncan, & Holbeck, 1973) encouraged a shift in the main dependent variable of innovation research from adoption, or the decision to use, towards implementation, or the putting to use, and to studying the organizational context of innovation. The shift towards implementation was accompanied by an emphasis on the influence of structural variables on organizational innovation typified by the work of Damanpour (1988, 1991). However, the research program related to this overall approach has attracted a great deal of criticism on the basis that it has not identified any set characteristics that might differentiate between innovative and non-innovative organizations (Tornatzky & Klein, 1982), that there are extreme variances in its findings (Downs & Mohr, 1976), that it is narrowly conceived and technically oriented (Van de Ven, 1986), and concentrates on the ‘what?’ rather than the more important ‘how?’ and ‘why?’ (Van de Ven & Rogers, 1988).

Interest in the third approach, process theory, developed from the perceived shortcomings of the second approach and the stability of its findings (Wolfe, 1994). As well, there was an emerging trend in the 1980s towards an interpretive approach to studying organizational phenomena, an approach that was felt to be particularly relevant to understanding innovation processes (Van de Ven & Rogers, 1988). Within this third approach Wolfe (1994) identified two generations of research, first, stage model research that treats innovation as a series of activities that take place sequentially over time and, second, in-depth longitudinal research aimed at understanding how innovations actually develop over time.

This research study is mainly concerned with process, Wolfe (1994)’s third approach, and seeks to go beyond stage model research. However, analysing the shortcomings of the stage
A second literature reviewer, Slappendal (1996; p.109), organizes the literature on the basis of three perspectives on action identified by previous authors (Pierce & Delbecq, 1977), and in an order that reflects their sequential development, namely:

1. An individualist view that assumes innovation in organizations results from the actions of individuals.
2. A structuralist view that sees innovation as determined by the structural characteristics of the organization.
3. An interactive process view that assumes innovation to result from the interaction of individual action and structural influences.

In the individualist perspective individuals are viewed as self-directing agents who act to achieve their own goals unconstrained by the organization. Within the literature on organizational innovation this perspective is expressed in work that seeks to establish individual antecedents to innovation (Scott & Bruce, 1994), including creativity (Amabile, 1988) and cognitive style (Kirton, 1994b), as well as literature that assumes that individuals in roles such as intrapreneurs (Pinchot, 1985; Pinchot & Pellman, 1999), champions (Howell & Higgins, 1990; Maidique, 1980), and organization leaders are the major source of change in organizations. However an individual approach to innovation in organizations has some shortcomings. Clearly, any individual perspective on organizations is an oversimplified view of things (Thompson, 1967), and the assumption that decisions on innovation involve only single individuals is rarely a valid one (Van de Ven et al., 2000a). However, the idea that individuals play an important role in promoting innovative activity is widely accepted and has been long held (Schon, 1963), and, as well, the personal knowledge of individuals is a crucial element in defining problems, and designing and operating organizational processes of all types. Accordingly, an organizational model of innovation cannot neglect the role of individuals in the process.

In the structuralist perspective the function of an organization is to work towards surviving within an environment that is continually changing. Theory building in this perspective began over 40 years ago in cross-disciplinary research that established the relationship between innovation and organizational structure (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; March & Simon, 1958; Woodward, 1965), and spawned the contingency approach to organizations, and positivist organization theory (Donaldson, 1996). Some of
the most prevailing knowledge on innovation derives from the early research in this perspective. For example, innovation raises the uncertainty of organizational tasks and task uncertainty affects the relationships between people, or structure (Perrow, 1967). The organizational structure of roles in innovation is more effective as ‘organic’ rather than ‘mechanistic’ (Burns & Stalker, 1961). However, wide differences in structure may be appropriate within the one organization (Lawrence & Lorsch, 1967). The production department may reflect the routine nature of its work by a mechanistic structure, while the R&D department may reflect the uncertainty of innovation by organic structure. In innovation projects, as they proceed uncertainty declines so an organic structure is more appropriate to the front end, while a mechanistic structure will be more appropriate to implementation (Zaltman et al., 1973). Findings such as these have been absorbed into management best practice in innovation.

The interactive process perspective moves away from purely individual and structural explanations of innovation towards viewing innovation process in its organizational context, and analysing individual and structural factors through their interaction with the process (Slappendel, 1996). This perspective also responds to calls from leading researchers for the research field to move beyond stage models to viewing the innovation process as a ‘dynamic, continuous conception of change over time’ (Van de Ven et al., 1988; p.638).

Another distinguishing feature of this perspective is its attention to understanding the relationship between action and structure. In the individualist and structuralist views innovation is caused either by individual action or the organization’s structure. In the interactive process view some events in the innovation process may be the result of purposive individual action, while other events may result from the influence of structure. A problem for such a view of things is that neither social nor organizational theory offers straightforward explanation about how structure and action are related (Giddens, 1984). Some theorists have offered possible approaches to resolving the structure-action relationship, including different theoretical analysis through structuration theory (Giddens, 1984), and the use of longitudinal case studies by which the interaction of action and structure can be observed over time (Poole et al., 1995; Poole et al., 1999), an approach endorsed by Pettigrew (1985). Other theorists reflect the structure-action relationship in their analysis of change in terms of the continuous interaction of the context, content and process (Pettigrew, 1985), and in the analysis of innovation through structural repertoires (Clark & Starkey, 1988; Clark & Staunton, 1989).
Time, effort and cost have told against the popular use of longitudinal case studies in innovation research. The only prominent examples of large-scale research efforts involving longitudinal case studies are the Minnesota Innovation Research Program that involved a team of 34 researchers studying fourteen business creation projects starting 1983 with first analysis published in 1989 (Van de Ven et al., 2000a), and final publications in 1999 (Poole et al., 1999; Van de Ven et al., 1999), and the Radical Innovation Project of the Rensselaer Polytechnic (Leifer et al., 2000) that examined twelve projects over a 5 year period, involving over 175 employees from the host companies in interview and workshop activities. Both research studies involve a style of institutional research - multidisciplinary teams employed over a long period of time - that may represent the future of knowledge production (Gibbons et al., 1994), but lies beyond the scope of individual researchers.

This research study is concerned with the interactive process perspective, and in explaining innovative action from both individual and organizational viewpoints. However, there are several general problems, of a seemingly intractable nature, that work against theory building in innovation research. These are discussed in following subsections.

### 2.2.2.1 Conceptualising the dependent variable

Innovation is a complex problem, and in the search for theory researchers can be accused of following strategies that exacerbate rather than reduce this complexity. The overall research strategy for complexity reduction seems to have been to decompose the complex problem of innovation into manageable segments based on types of innovation, stages of innovation, mode of organization, tiers of research and competing theoretical perspectives. This problem decomposition appears to have resulted in narrow conceptions and a technical orientation (Van de Ven, 1986), and in research outcomes that reviewers accuse of being inconclusive and unstable (Downs & Mohr, 1976, 1979; Fiol, 1996), inconsistent (Fiol, 1996; Wolfe, 1994; Tidd, 2001), inappropriate in important ways (Nelson & Winter, 1977; Van de Ven, 1986), and failing to give coherent advice to managers (Tidd, 2001).

A content analysis of innovation research published between 1997 and 2002 also suggests that the research has become routine, with a heavy focus on replicating past studies, cross-sectional designs and a single level of analysis (Anderson, De Dreu, & Nijstad, 2004). Anderson et al view innovation research as in a state of ‘distress’, and suggest one way out of that state is to study innovation as an independent variable.
At the same time prominent researchers dispute whether instability is a problem to be solved or more an indication that no single theory of innovation exists, and that stability can be achieved when the type of innovation and the type of organization are held constant (Damanpour, 1988, 1991). Wolfe (1994)’s review reports a convergence among researchers that the more learnt the more the realization that ‘the whole’ was beyond their grasp. Essentially, there may be many theories of innovation in need of discovery.

However, taking another view of the situation, continual decomposition of a problem, and formulating many part theories might confuse the problem of innovation even further. In her review of innovation research, Fiol (1996) suggests that further decomposition of the problem is ‘not likely to solve our problem of accumulating masses of inconsistent research results’ (p.1013), for without a synthesizing framework of theory specifying more moderating variables would simply exacerbate the problem of a divergent research output. In her call for a re-conceptualisation of innovation research Fiol seems to have reflected on ways of resolving a conceptual mess (Schein, 1993). If a mess becomes too great then it makes economic sense to throw the mess away and start again. If everything you do increases confusion then it is time to do things differently - that is, be innovative.

Downs and Mohr (1979) identified a major source of confusion as the definition of the dependent variable, innovation itself. In their opinion social scientists ‘have allowed “innovation” to take on too many different meanings and have allowed its meaning to be ambiguous in too many significant respects’ (p.385). They argue that consistent and stable results cannot be expected where the meaning of innovation varies from study to study. This is a problem that remains intractable. Every innovation researcher is obliged to define the relevant dependent variable, in terms of the researcher’s theoretical perspective, the nature of the study (whether technical or administrative innovation, for example), the type of innovation (whether incremental, radical, or some other classification), how the researcher conceives the term (whether as object or process), and, if conceived as process, what part of the process. Clearly every time the confused concept is reinterpreted in this way it may assist in clarifying a single study but add to the overall confusion.

One confusion surrounding the dependent variable arises from the practice of conflating unrelated level and style variables (Kirton, 1994a; Kirton, 2003). In organizations, innovation is just one way of solving problems. Deciding to do things differently is a decision about the style of problem solving to be adopted. In contrast, a variable such as ‘successful outcome’ is of a level nature, for the only question is ‘how much?’ (refer Glossary for formal definition of level and style variables). In business usage, innovation is
treated as a change program that creates business value (Carnegie et al., 1993), and thus refers to both style of problem solving and success, so that when researchers adopt this meaning level and style variables are confounded, and the opportunity of analysing success with different styles of problem solving is lost. Furthermore, the conflation of innovation and success variables is equivalent to papering over the knowledge-action explanatory gap, and removing attention from the relevant subjective processes.

Researchers in product innovation have had a particular concern with the plethora of definitions of innovation type. Following an extensive literature review, Garcia and Calantone (2002) claimed that terms such as incremental, radical, really-new and discontinuous are used ubiquitously without any consistency in definition of the terms. These authors suggest that innovations need to be identified from all of technological, marketing, micro level and macro level perspectives, and suggest a method of measuring and classifying innovations in terms of the concept of *innovativeness*.

Innovativeness is a term that has been applied to the characteristic behaviour of people (Rogers, 1983), as well as to the proclivity of organizations to innovate, and a predictor of their effectiveness (Rogers & Rogers, 1976). In the Rogers and Rogers (1976) formulation of innovation, innovativeness is a property of an adopting unit, and an intervening variable rather than the dependent variable. In contrast, product innovation researchers have promoted innovativeness as the dependent variable, with several studies demonstrating that innovativeness can be conceived as a continuum, and demonstrating positive relationships between dimensions of innovativeness and the development patterns of the product project (Avlonitis, Papatathopoulou, & Gounaris, 2001), as well as with project decisions and product performance (Danneels & Kleinschmidt, 2001). One writer has suggested that the concept of product innovativeness has been overlooked as a way of removing the main cause of deficiency in research into organizational innovation – the varying conceptualisations of the innovation construct (Salavou, 2004).

The difficulties of innovation research with defining the dependent variable and consequent inconsistency of results can be contrasted with a related research area from organizational psychology, adaption-innovation theory (Kirton, 1976, 1994a, 2003), that follows a strict approach of distinguishing the same level and style variables. This field treats innovation and successful outcomes as independent variables. In contrast to innovation research, adaption-innovation research has steadily accumulated knowledge over a 30-year period through highly consistent results from hundreds of research studies.
To summarize, an important step in achieving consistency in research results would be to make the definition of the dependent variable, innovation, more precise by separating it from those variables, such as successful outcomes, that are currently treated as though they are correlated with innovation, when that is not necessarily the case. This study develops a way of doing this that is in accord with the direction suggested by Salavou (2004).

2.2.2.2 Stage models of process

The research literature’s most common view of innovation process remains that of the linear sequence of activity stages (Rogers, 1983). The stage model of process begins with the conception of an idea and progresses through sequential stages of evaluation and decision making until the idea is embodied into a product, service or program that is implemented, and then diffused to and adopted by ultimate end users. Since the stage model reflects on what is a continual process the number of possible stages is limited only by the ability to identify sub-processes, and how fine the researcher needs to take the analysis. In Wolfe (1994)’s summary of stage models he showed that a composite of the many studies he reviewed involved ten stages, with the independent studies using about half that number to describe the innovation process. In other words, different researchers conceptualise the stages in different ways. At the simplest level a two-stage conceptualisation of process as initiation of a project followed by implementation of the project meets certain research requirements (Damanpour, 1988; Rogers, 1983; Zaltman et al., 1973) while multi-stage life-cycle schemes represented by the ‘stage-gate’ (Cooper, 1994) and ‘third generation process’ (Roussel, Saad, & Erickson, 1991) conceptualisations, have been developed to meet business requirements.

The research view of innovation process has evolved through stage models (Rothwell, 1992; Wolfe, 1994). Rothwell, for example, describes five generations of innovation process models starting with simple two-stage linear models in the 1960s, a third generation represented by interactive stage models, such as described by Cooper (1994), and a fourth generation of increasing levels of integration and interaction with internal functions inside and external customers and alliance partners, through networking supported by IT (Quinn, 1997; Quinn, Baruch, & Zien, 1996). Only the ultimate but ill defined fifth generation model, systemic innovation achieved through total systems integration and extensive networking, goes beyond stage models to a dynamic continuous conception of change (Van de Ven, 1986).
Examining these generations of stage models shows them as limited to describing the ‘what’ of innovation. Stage models, no matter what level of organizational sophistication is reflected in their formal interactive links, effectively treat innovation as a linear sequential process whereas the fundamental process of innovative change is non-linear, uncertain and irrational in nature (Nelson & Winter, 1977; Schumpeter, 1939), and subject to all manner of stops, starts, iterations and errors. However, questions still remain as to whether models that reflect more of the disorder and chaos of the innovation process are more useful than logical stage models for education and practice (Buijs, 2003; Cunha & Gomes, 2003).

As a final comment, stage models completely neglect any informal or subjective features of the organizational environment in which the model is set, things that are known to be important in innovation. Stage models do not explain how initiatives arise in organizations or how the implementation of the innovation affects the organization. Accordingly, they cannot explain what motivates the innovation process or what determines the timing and magnitude of events. With stage models, questions about motivation can only be answered in terms of external forces, and spontaneous change cannot be explained at all.

### 2.2.2.3 Comparing success and failure

A standard means of drawing research conclusions is to make comparisons across observations. In innovation research, the most prominent approach to setting up the basis of comparison is to contrast successes and failures. The most explicit use of this comparison is in studies of new product performance (Montoya-Weiss & Calantone, 1994), but the comparison is implicit and plays an important role in all innovation research. The purpose of this sub-section is to show that the nature of organizations and their management of the innovation process biases project results towards success, and invalidates the success versus failure basis of comparison.

Despite their theoretical shortcomings, stage models remain highly useful as a management tool, and will be used here as a basis of analysis. Experienced practitioners working under uncertainty adopt project management practices aimed at minimizing risk. The standard approach to the risk management of projects is to establish progress milestones, and at each milestone re-evaluate the project and make the decision on allocating the necessary resources for achieving the next milestone. Stage models, such as Cooper’s stage-gate scheme, effectively model this decision process, and become a relevant and effective tool for innovation project planning and management. The progress of a project can be
systematically evaluated at key milestones, and the risk of loss minimized by the withdrawal of resources when evaluation of the project is unfavourable. Since the rate of increase of project costs increases with the life of the project, attention to the earliest stages of evaluation is critical to risk management, as reflected in techniques such as ‘front loaded development’ (Thomke, 2001, 2003).

Organizations vary in the extent that they use formal systems for managing risk in innovation, but it is reasonable to assume that any organization that organizes in projects has a formal or informal system in place for evaluating the progress of the projects. An assumption that these work in an economically rational way is not a safe one, for there is an entire body of literature that examines the many instances where people and organizations get trapped into their past decisions and escalate their allocation of resources to failing courses of action (Janis, 1983; Staw, 1976; Staw & Ross, 1987). However, it would be reasonable to expect that some projects that are established do not proceed through the organization’s evaluation system and are not implemented. The ideas on which the project was based may not have been sufficiently robust, insurmountable technical problems may have arisen, the activity of the project may have generated an opportunity that was better than the original one, or the organization may not have had the resources to complete the project. The question is, what is the status of such projects? In a research environment where the dependent variable confounds innovation and success, and innovation becomes so only by its implementation (Van de Ven & Rogers, 1988), then such projects have no status.

The point to be made is that the management of the innovation process is deliberately biased towards successful outcomes. The purpose of management systems is to engineer failures out of processes. As well, there are other organizational effects that reinforce this bias.

Misjudgements will occur and some projects will progress through all of the stages of evaluation and still fail. Failure reflects on the reputation of individuals or groups, and this may result in either an individual being made a scapegoat, or a quiet dismantling of the project, and in either case a seemingly immediate loss of corporate memory (Kirton, 1984). Consequently, people will be less willing to talk about their failures than they will about their successes.

At the same time, the history of innovation is replete with examples and studies of successful innovations resulting from previous failures (Drucker, 1985; Maidique & Zirger, 1985). Writers on technology say that failure is the motivating force for all innovation (Petroski, 1994b). When a 3M scientist produced an adhesive that did not permanently bond
as he had designed it, it was clearly a failure. When Art Fry used this adhesive to create the 3M Post-it Note it was suddenly a success. Any successful product or system will eventually become a failure, when the world changes. The difference between success and failure may be simply a matter of timing. Failure is an event while success is a temporary state (Petroski, 1994a).

Success or failure is dependent on observers, and the judgment criteria that the observers have set. Innovation projects are dynamic affairs, and an objective set at the start of a project may change as the project progresses. The innovation development process may uncover a more promising approach, and objectives may become more ambitious. The development process may prove difficult, and objectives may become more modest. With their reputation on the line, managers become clever at turning potential failures into minor successes (Kanter, 1988a).

Hence it is misleading to think about success and failure as alternative events or states. Of course, where an innovation project is implemented and meets all of the objectives set for the project, then it is clearly a success. However, what of an innovation project that does not meet its initial objectives, but either intentionally or unintentionally creates the platform for even greater value creation in the longer term? Success can be a variable, so it is best treated that way and separated from the dependent variable, innovation.

### 2.2.2.4 Motivation and innovation

Innovation research builds knowledge about the organizational innovation process, but says little about whether or how the members of an organization turn the knowledge into action. Writers point out the need for more research emphasis into the effects of intentionality and social action on the innovation process (Hellstrom & Hellstrom, 2002).

The failure to account for the knowledge-action gap and describe innovation process in its entirety results from innovation researchers’ past specialization on objective knowledge explanations. Karl Popper’s theory of knowledge (Popper, 1979) helps in understanding why that is so. Popper distinguishes three epistemological worlds, the worlds of physical objects, subjective knowledge, and objective knowledge. The last of these, objective knowledge, is the world of problems, critical arguments, theories, and the codified knowledge of books, journals and libraries. The theoretical models of innovation research exist in this world, but they effect the physical world only by the intervention of subjective
knowledge processes. Looking for explanations of changes in the physical world requires study of both subjective and objective knowledge processes.

Also, any useful model of innovation has to be grounded in the purposive action of individuals (Van de Ven et al., 2000a). It has to explain how the members of organizations get things done, and what motivates them to do so. Recent research has sought explanations of this through investigating the sources of motivation for knowledge workers (Amar, 2004), and the different types of motivation that are necessary to transferring the different forms of knowledge in the innovation process (Osterloh & Frey, 2000).

However, it is not sufficient to think about organizational innovation as simply the result of the actions of certain individuals (Thompson, 1967). A theory of motivation of organizations, as distinct from a theory of motivation of the members in organizations, must be able to be generalized across organizational contexts, and this lies beyond the capability of theories of individual psychology. Rather it requires a social and organizational view of motivation.

However, a social or organizational theory of motivation has not been described. According to Turner (1987) all sociological models lack an explicit theory of motivation, while all contain some form of implicit theory of motivation in order to work. Turner outlines a number of propositions for articulating the implicit models and encouraging the building of theory, but these propositions focus on the interaction of members within an organization rather than the organization itself. An organization must be considered as an entity if the impersonal forces of organizations are to be accounted for, and to answer the question of whether and how organizational level knowledge is transformed into action.

The lack of a coherent social theory of motivation is also a problem in the study of entrepreneurship. While the motivations of people making entrepreneurial decisions are clearly important to the process of entrepreneurship, some reviewers believe this to have been neglected in favour of explanations involving macro-level forces (Shane, Locke, & Collins, 2003). However, entrepreneurship, whether internal or external to organizations, takes place within social networks. As with innovation, accommodating the motivations of the individuals to the process will only go part way towards explaining the entire social process.

Closing the explanatory gap between knowledge and action is not a straightforward matter, and reflects problems that occur at many levels of social analysis. For example, at the
individual level decades of research in social psychology have failed to establish a causal link between individual’s cognitions and their behaviour (Ashworth, 1979), and there is compelling evidence that an individual’s knowledge, even at the manifest level of management competence, is unrelated to style of behaviour (Kirton, 1994b; Schroder, 1994). There is a gap between an individual’s knowledge, and the application of that knowledge to action. Individual psychology provides various theories of motivation and individual differences that help explain how this gap is closed (Cofer, 1972), the organizational level of analysis does not.

At the sociological level, the explanatory gap is evident in academic fields related to innovation. For example, the organizational learning literature refers to the gap under the heading of the cognition-behaviour debate (Easterby-Smith, Crossan, & Nicolini, 2000). This debate seems to have subsided as organizational learning practitioners have heeded advice to learn to live with the understanding that cognitions and behaviours are entirely different and independent phenomena that should be treated as unrelated (Fiol & Lyles, 1985). This is a quite sensible approach to maintaining the precision of the two concepts.

In contrast, the emerging field of knowledge management neglects the explanatory gap completely by treating the essentially unrelated concepts of knowledge and action (innovation) as though they were correlated. By conflating knowledge and innovation, knowledge management simply assumes action without explaining how or why knowledge will be applied to innovation rather than to the alternative, useful endeavours of organizations (Waters, 2000). Furthermore, by treating knowledge as an objective, tangible thing separated from its use, knowledge management may widen the knowledge-action explanatory gap (Pfeffer & Sutton, 2000).

To summarise, explanations of innovation cannot be complete without attending to both the objective and subjective knowledge processes of innovation. Objective knowledge processes cannot explain action in innovation, or any other activity of organizations, without reference to the subjective processes of the organization. An understanding of the subjective processes of organization is necessary to explaining how the knowledge-action gap is closed.

The following Sections 2.2.3 and 2.2.4 review the subjective forces that both restrain and motivate the innovation process.
2.2.3 Restraints on innovation

2.2.3.1 Attending to innovation

The nature of organization and its orientation towards efficiency and stability leads to a style of organizational thinking that diverts the organization’s attention away from doing things differently, and provides a strong counterforce to any internal or external forces for change.

In this thinking, innovation is proposed as creating a dilemma, as in ‘all organizations face the dilemma of balancing and blending their relative orientation to efficiency and to innovation” (Clark & Staunton, 1989). The idea that efficiency and innovation tend to be mutually exclusive tends to have become a maxim of practical management. Efficiency requires organizations to stabilise operations and to focus on critical tasks in order to continually improve things. Innovation can be the antithesis of this. Innovation is about doing things differently, and that means challenging the existing order, and breaking down the prevailing social structures.

Managers are also socialised towards the everyday wisdom that efficiency is a prerequisite to surviving in business. Practical management thinking that is based on Henri Fayol’s ‘to manage is to forecast and plan, to organize, to command, to coordinate and to control’ (Pugh, Hickson, & Hinings, 1971) is aimed at creating the stability and efficiency necessary for profit-making. Management incentives and recognition are normally based on short-term profits, whereas doing things differently involves expenditures and risk in the short term. So it is not surprising that managers attend to what they see as the essential imperative of efficiency, and tend to neglect the signs that innovation has become necessary. This leads to the significant general management problem of simply having people pay attention to innovation (Van de Ven, 1986). Consequently, Clarke and Staunton (1989)’s call for a ‘balancing and blending’ of efficiency and innovation takes no account of a management orthodoxy that accepts the primacy of efficiency.

In his detailed study of the US hard disc drive industry Christensen (2000) pointed out the inability of organizations in that industry to attend to the concerns of efficiency while also attending and responding to weak signals from the environment about the need for more fundamental change. Christensen describes the situation of attending to both efficiency and innovation, and meeting the need for both, as the innovator’s dilemma (Christensen, 2000).
There are two theoretical viewpoints that suggest that the problem of attending to innovation might be conceived as a problem of managing diversity. The first is about the cognitive preferences of people as described by adaptation-innovation theory, that states that people vary in their style of problem solving on a continuum (Kirton, 1976). At one extreme of the continuum people prefer to solve problems and create within the constraints of existing practice. At the other extreme people prefer to solve problems and create outside of the range of existing practice. In pursuing their aim of stability and efficiency organizations specialise in adaptive practices, and organizations become home to those people that prefer to work within existing practice (Kirton, 1980, 1994b). Organizations are less hospitable to people who prefer to work outside of existing practice. Innovative behaviour produces conflict and poor relations with co-workers (Janssen, 2003). Those with innovative ideas find their initiatives stymied by the majority of the organization (Kirton, 1984), and this leads them to either separate from the organization, or develop strategies to cope with the inhospitable work environment (Meyerson, 2001). With the organization and the majority of its members preferring to solve problems adaptively the entire climate of the organization becomes adaptive in nature (Kirton & de Ciantis, 1994), and the work climate continually reinforces attention to and preference for adaptive problem solving.

A second viewpoint, social catastrophe theory, suggests that attending to both orientations, efficiency and innovation, is so fundamental to the survival of human social systems that it is likely imprinted in the human genetic code (van der Molen, 1994). In brief, this view is that in all social systems a persistent focus on efficiency is accompanied by an adaptive structuring that leads to ossification, and, subsequently, to either radical restructuring or collapse when the system proves unable to accommodate changes in its environment. However, social systems that persist in the innovation orientation, while disregarding the efficiency orientation, may similarly be limited in their life span. Continual innovation needs the support of those adaptive mechanisms and relationships necessary for maintaining social group life and system stability, for without such processes the social group will also disintegrate. A focus on one or other orientation, to the neglect of the other, may threaten the survival of the social system.

In essence, if an organization is to survive there is a need for both efficiency and innovation, and this suggests the need for having a diversity of problem solving styles in organizations, so that the organization can attend in a balanced way to problems in its environment. The need for social groups to have a diversity of thinking in order to be healthy, creative and effective is reinforced in business literature on corporate creativity (Leonard & Straus, 1997; Robinson & Stern, 1997), work groups (Kirton, 1994b; Leonard, 1995), high performing
teams (Katzenbach & Smith, 1993a, 1993b; Leavitt & Lipman-Blumen, 1995), management groups (Schroder, 1994), and successful organizations (Collins & Porras, 1994; Kaltoff et al., 1997; Peters & Waterman, 1982).

2.2.3.2 Kuhn model of change

The dominant cognitive model of innovation reinforces the efficiency-stability orientation of organizations, and hinders the organization in turning its attention to innovation.

Cognitive models are the mental structures that individuals use to make sense of the world and, subsequently, to make their decisions about what future actions to take. These are sensemaking processes that have an important influence on decision making within organizations generally (Weick, 1995). More specifically they shape the processes of innovation within organizations (Weick, 1990) through influencing the decisions of the managers who have access to the organizational resources necessary to pursue innovation (Swan, 1995).

Within a culture individuals will draw upon knowledge to make choices and decisions about innovation in similar ways. The mental models of an individual will incorporate shared values and other social beliefs (Hofstede, 1994), things that are ‘commonsense’ in the culture (Geertz, 1983), and consensual social structures such as dominant theories or paradigms (Kuhn, 1996). One such consensual structure is the assumption, shared by academics and practitioners alike, of how change actually comes about.

The dominant model of change that underlies the research and literature of innovation is the paradigmatic framework by which Thomas Kuhn described patterns of scientific progress (Kuhn, 1996). While the term paradigm has become widely and loosely used in the sense of being a relevant example (as in paradigm case of something), Kuhn’s use of the term is sociological as ‘the entire constellation of beliefs, values, techniques, and so on shared by a given community’ (p.175).

In Kuhn’s analysis scientific theories are social structures. Science progresses when the disorganised and diverse activity that precedes a science is eventually structured, and the scientific community adopts a single ‘paradigm’. This consensus on theoretical assumptions, and the techniques of their application, allows work to be more directed. The focused scientific work within the paradigm, or ‘normal science’, aims at developing and articulating
the paradigm. However, the concentration on normal science inevitably experiences a crisis when empirical results conflict with the theoretical assumptions of the paradigm. The crisis is resolved when an entirely new paradigm emerges, and when sufficient scientists accept the new paradigm the old paradigm is abandoned. The discontinuous move from one paradigm to another constitutes a ‘scientific revolution’.

When regarded as a general model of change, Kuhn’s analysis provides a powerful metaphor for the process of innovation. Taking the example of technical innovation in an industry, the innovation process, like the Kuhn model of scientific progress, starts with disorganised and unstructured activity that leads eventually to an initial structuring in terms of competitive new product concepts and offerings. One of these product concepts wins the allegiance of the marketplace, and this in innovation parlance is the emergence of the “dominant design” (Abernathy & Utterback, 1978; Utterback, 1994; Utterback & Abernathy, 1975). Beyond this point development and marketing work is focused on seeing that the dominant design is improved and more widely adopted. However, products have a life cycle, for consumer tastes change and competitors produce alternative offerings with superior performance. No matter how much work might be done on the dominant design to extend its life cycle, eventually technical limitations cannot be overcome, and there is a crisis of falling sales, as a superior product paradigm emerges in the industry. The Kuhn model inspires explanations of the industry innovation cycle, where steady technical improvement occurs along the ‘s-curve’ until a ‘discontinuity’ arises (Foster & Kaplan, 2001; Foster, 1986), as well as the punctuated equilibrium model of change (Tushman & Cummings, 1985).

The idea that there are two types of change mechanisms at work, one emulating the steady progress of normal science, another emulating the discontinuity of the shift from one paradigm to another, is also implicit in the distinctions of the innovation research literature. These distinctions recognise that not all of the changes that go by the term innovation are equal in their impact on an organization. Changes that reinforce existing practices and follow the course of Khun’s normal science are termed ‘incremental’, those that depart from existing practice, Khun’s revolution or discontinuity, are commonly termed ‘radical’ (Clark & Staunton, 1989; Damanpour, 1988). Theorists use various terms to refer to these same distinctions. For example, some distinguish between ‘routine’ or minor changes in organization, and ‘non-routine’, where changes to the internal or external environment are introduced (Nord & Tucker, 1987; Perrow, 1967, 1968). In product innovation, the term ‘variation’ is used to denote refinements and modification of products, while the term ‘reorientation’ is used to denote fundamental changes in products (Normann, 1971).
The Kuhn model is also implicit in thinking about social and organizational change more generally. For example, the work on social catastrophe theory already reported (van der Molen, 1994) defines two aspects of change in line with the Kuhn model. As well, the dominant practical approach to change, ‘incrementalism’ (Lindblom, 1959), is said to keep the organization within its existing policy and practices, so as to reduce the uncertainty of outcome and level of unpredictable consequences (Wilson, 1992).

However, the three examples of the Kuhn mindset discussed above can also be misleading in informing innovation practice. First, thinking about innovation in dichotomous categories leads to the neglect of the greater part of innovation practice that lies on a continuum described by the incremental versus radical and other similar distinctions (Clark & Staunton, 1989). Second, a social catastrophe theory that describes the problem of social change in dichotomous terms can make no suggestion about how to manage the dichotomous change processes simultaneously, the only way of overcoming the problem the theory introduces. Third, an incrementalist approach to change reinforces the primacy of the stability-efficiency view of organizations, and again takes attention away from innovation.

In summary, the Kuhn model is about achieving a stability that is sometimes punctuated by risky and dangerous episodes of innovation. This is a mindset that focuses the organization’s attention on the stabilising processes of adaption, and turns the organization’s attention away from the process of innovation. The Khun cognitive model may remain relevant in a stable environment where the organization can be focused on extending and elaborating current principles for relatively long periods of time. However, it may be a completely inappropriate cognitive model for handling turbulent market conditions, where the need for continuous change is thrust upon an organization.

2.2.4 Promotion of innovation

2.2.4.1 Ideology, politics and pro-innovation bias

The purpose of this section is to explain how social and political forces of a global nature promote change in organizations. These forces are ideological in nature, and can lead to biased decision making towards innovation. While these forces promote innovation as
important to the longer-term development of an organization, they offer no explanation of the internal operative processes that create patterns of change in the shorter term.

At the level of national policy, and at the strategic level of organizations, the question of whether or not to innovate seems to have been answered in the affirmative. There is a general consensus amongst policymakers and business leaders that global forces demand innovation, and that its achievement benefits everyone in our society. It is often promoted as a case of ‘get innovative or get dead’ (Peters, 1990, 1991). Whether that message is actually true or not is highly questionable, but it may be the case that any message, no matter how naïve, will be believed if repeated often enough (Getz & Robinson, 2003). However, it is clear that there is a societal push towards innovation, and the question is how did it come about, and does it represent a fundamental process driving innovation in organizations?

When ideas grow to become social movements then they justly earn the term ideology, as a pervasive influence on the thinking of societies, organizations and individuals. Rolf Dahrendorf has said that at the end of the 20th century ‘the tone of public debate is set by those who worry about innovation’ (Dahrendorf, 1988; p.ix). He argued that with the question of how to stimulate economic growth uppermost in their minds, leaders have put their trust in new technologies, the information society, entrepreneurs and the pull of incentives - all the stuff of innovation. National and business leaders have been encouraged in these actions by influential academic writers who point out that technological innovation is a principal driver of competition (Porter, 1980, 1985), that entrepreneurship and innovation are central to national competitive advantage (Porter, 1990), and that innovation is ‘the only hope for times ahead’ (Kanter, 1984; p.51).

The latter part of the 20th century also provided the context for two politically inspired forces for change. First, the perceived decline of competitiveness in Western industry in the 1970s and 1980s, as first the industries of Japan and then other Asian countries mastered the dynamics of innovation and took advantage of their lower labour costs, especially in key automobile and consumer electronics industries and markets. While this alleged decline may have been hardest felt in the USA where the growing national indebtedness and a growing tendency for foreigners to buy American assets sounded countless alarm bells (Reich, 1991), the situation and the response was similar in all Western countries – the desire to achieve national competitive advantage through innovation. Second, the emergence of new Western political ideologies with themes variously referred to as the ‘enterprise culture’ (Keat & Abercrombie, 1990), ‘post-Fordism’, ‘Thatcherism (1979-90)’ and ‘Reaganism (1980-88)’ (Wilson, 1992), that not only promoted change through the deregulation of financial and
other industries and the structural reorganisation and privatisation of publicly owned assets, but also changed the context in which theories of innovation and change were viewed and evaluated (Wilson, 1992).

These political influences have reinforced what Kimberly (1981) calls ‘pro-innovation bias’, the presumption that innovations will benefit an organization. The bias is said to have stemmed from the aftermath of the Second World War, when high rates of innovation promoted high rates of economic growth (Kimberly, 1981). Whether that is so or not, there is a consensus amongst reviewers of the innovation literature that a strong pro-innovation bias exists (Abrahamson, 1991; Downs & Mohr, 1976; Van de Ven, 1986; Zaltman et al., 1973). However, whether the great deal of attention to innovation in government and academic management circles, and an over-representation of innovation in management thought and decision-making, or even a perceived status as a fad (Abrahamson, 1991), adds up to what might be termed an ideology is a further question.

A system of ideas become ideological when it misrepresents things, or fails to present the full story about things, and, as a result, serves certain sectional interests instead of the general interests of society (Shrivistava, 1986). The question is how does the presentation of the concept of innovation misrepresent things? There are at least two ways that the pro-innovation bias (Kimberly, 1981) and the idea that innovation is the only hope for the future (Kanter, 1984) are misleading simplifications when applied at the organizational level.

First, innovation, as a process, can be regarded as instrumental in organizational problem solving by providing one response, doing things differently, to a great range of organizational problems. Of the problems that organizations face, innovation best solves some of them, as in the strategic need for new-to-the-world products, or the need to implement a different and more competitive business model. However, there are a great many more organizational problems that are best solved by adaptive problem solving, and hard work and persistence at routine tasks, where doing things differently would be disruptive. Clearly, whether innovation or adaption is the appropriate change response to a problem depends purely on the nature of the problem. Furthermore, social catastrophe theory (van der Molen, 1994) suggests that social systems can no more survive continuous innovation, and its associated destruction of social cohesion, than it can lack of innovation. The reality is that innovation is not the answer to all organizational problems, just some of them. It is a style rather than a level variable.
Second, one might argue that organizational members are mislead when innovation and change is promoted as being inevitable, ‘good for everyone’ or ‘being in everyone’s interest’. Anyone with experience in large private or public sector organizations over the past decade understands that the rhetoric of innovation and change can be grossly misleading and manipulative. Similarly, all who participate in our consumer society are subject to the manipulative messages of marketers and advertisers that are designed to present ordinary, routine, commodity products as innovative marvels of the modern age.

The final question is, who is misled, and whose interests are furthered, by these misrepresentations about the concept of innovation? The innovation ideology is used to advantage by business and other organizations that, for strategic reasons, try to build an image and a differentiation based on their innovativeness. The term “innovative” is ubiquitous in the annual reports and product advertising of companies whether or not they have any claim to its use. One might also argue that the pro-innovation bias was present in the evaluation of technology stocks, and the irrational surge in the valuations of new technology companies on the world’s share markets ahead of March 1991, that appear to have responded to biased perceptions about the future worth of technological innovations than to normal investment criteria. Here the investment community was misled by the promise of continual innovation, at great ultimate cost to the world economy and the retirement savings of hundreds of millions of people.

Reich (1991) also explains how technological change benefits the technocratic elites and knowledge workers, as well as the global suppliers of technology. One might argue that unless one is part of one or other of the above interest groups, there is little real benefit to be derived from the continued march of innovation. Furthermore, continuing technological innovation tests the limits of our planet, takes away meaningful work for many citizens, puts more power in the hands of commercial interests (Noble, 1995; Rifkin, 1995), and threatens our political liberties (Dahrendorf, 1988). As well, most of the world’s population has yet to benefit from many of the advances of 20th century technology. Stabilizing the growth of developed countries so as to share resources across the world, without endangering the viability of life on the planet, may well be the major problem of the 21st century.

In summary, the rhetoric, politics and ideology of innovation, and the pro-innovation bias that they reinforce, promotes the view that innovation is of benefit to everyone while concealing the reality that innovation, by its fundamental nature, will always affect people’s lives, and not always beneficially. When ideas are accepted as a truth in a society they become social commitments for people and organizations in the society. And ideas, like
innovation, that come to mislead through failing to disclose all of the information necessary for making rational decisions, establish commitments that affect the rationality of decisions as to how the organization spends its scarce resources.

Through the politics and ideology of innovation business people and innovation researchers have become interested in innovation as a level variable (that is, more innovation is better), whereas the reality is that innovation is a style variable (that is, whether or not innovation is better depends on the context). Researchers appear to have responded by conflating the style variable innovation with level variables such as knowledge and successful outcome in order to construct a level variable concept, but at the expense of concealing the innovation variable and losing precision with its definition.

2.2.4.2 Power

This section argues that power, exercised by persuasion, is a force that motivates change in organization. However, neither power nor persuasion can explain how creative actions arise in organizations, and so offers no explanation of the motivation of spontaneous change processes.

Power and its use are fundamental to the act of organizing. Some authorities on organizations go so far as to say that it is power that makes them work (Perrow, 1986). And authorities on programmed change in organizations always treat change as an exercise of power (Wilson, 1992). So it is not surprising that in their analysis of power and product innovation Hardy and Dougherty (1997) conclude that similar things can be said of organizational innovation - it is power that makes it go. Hardy and Dougherty assert that power can either facilitate or inhibit sustained efforts at innovation. They argue that when organizational power is aligned with innovation, innovators are able to draw on the organization’s resources and competencies to develop new products. However when power is aligned against innovation, innovators are denied such access to resources.

The broad view of the concept of power refers to all kinds of influence between persons and groups, including that involved in social exchange processes where rewards are used by persons to induce others to accede to their wishes (Blau, 1986). But according to Blau there are limits to the exercise of power in organizations. The limiting conditions are, at one extreme, physical coercion, and at the other a “no power” condition that occurs where levels of interdependence are high and mutual influences are of equal strength (Emerson, 1962).
Another view of power is of the capability of a person or group to overcome resistance in achieving a desired result (Pfeffer, 1981). Overcoming resistance can be thought about as the task of understanding and changing the pattern of commitments in which people and organizations are involved (Kegan & Lahey, 2001). Thus power might also be considered as the capability of changing the commitments of others.

A distinction is usually made between influence based on negative sanctions or threats of them, power as it is commonly understood, and influence based on rewards or incentives, as involved in social exchange transactions (Blau, 1986). Influence of the latter nature, where coercion is not directly involved, is best described by the processes of persuasion (Brown, 1963; Conger, 1998). However, while persuasive techniques might not appear to directly involve coercion, they most times rely on the creation of coercive conditions (Barnard, 1938). So, in the context of this argument, it would seem best to regard power, influence and persuasion as similar things.

The context of innovative change requires two power-related dilemmas to be examined. First, those with the knowledge necessary to developing an innovative idea rarely have the power to get things done within an organization. Second, innovative changes upset the status quo and raise resistance to the change at individual and organizational levels. Consequently, an innovation cannot be implemented without the use of power to overcome this resistance.

In the first dilemma, one can see that the innovation process causes a mutual dependency to arise. Those who have innovative ideas are dependent on those with resources to achieve innovation. At the same time, those who control resources, and who wish to use them towards business growth, are dependent on those that can create innovative concepts with which to conduct the business creation process. For example, inventors look for venture capitalists to fund their ideas, while venture capitalists look for opportunities through innovation projects. One might argue that this form of mutual dependency reduces the power exercisable in innovation.

Within organizations the two sets of mutually dependent resources are the people who have the technical knowledge, skills, and ideas necessary for innovation, and those people who control the physical and monetary resources. In large organizations the former are most likely to be young, educated, "cosmopolitan" (Gouldner, 1957a, 1957b) in attitude and working in professional staff roles such as in R &D, engineering, accounting, and
marketing. The latter are more likely to be older, less recently or less well educated, ‘local’ (Gouldner, 1957a, 1957b) in attitude, and working in senior line roles.

If this pattern is followed, those in professional staff roles will be less constrained by the consensual structures of the organization, and thus be more likely to offer innovative solutions to organizational problems. In contrast, those in senior line roles are more likely constrained by internal consensual structures, and thus more likely to offer adaptive solutions to the same organizational problems.

With the two influential groups in organizational change having differing worldviews, and preferred styles of problem solving, conflict will be unavoidable and has to be resolved. A commonsense argument would be that those with the control of monetary resources and influence over the career prospects of others will use their power to win the day. However that neglects two things. First, that there is a level of mutual dependency that may reduce the absolute power of the resource managers. Second, that the people without resources have the opportunity of exercising power through their persuasive capability. Individuals who overcome opposing sources of power in order to get innovation projects on the organizational agenda earn the name “champions of innovation” (Frohman, 1999; Howell & Higgins, 1990; Maidique, 1980). However, if those who control the resources undertake the role of sponsor for a project (Humphrey, 1987; Pinchot, 1985; Pinchot & Pellman, 1999), and use their power to help facilitate the project, then the power of the champion is aligned with the power of a sponsor, and the project has a greater chance of success as Hardy and Dougherty (1997) have claimed.

The second dilemma, resistance to change, is often treated in management literature as an irrational response of individuals to rational programs. The problem with this view is that it adopts the management viewpoint complete with pro-innovation bias, and neglects the fact that humans are problem solvers, and that their behaviour usually makes sense from their own viewpoint (Kegan & Lahey, 2001). As well, in organizations, resistance to change is not purely an individual effect but is also a social phenomenon by which an organization moves to protect its identity (Goldstein, 1988).

Where a change program is outside the range of current practice then people may find the concepts difficult to understand, and threatening, and this effect may even be amplified for those whose cognitive preference is to work within existing practice (Kirton, 1984). However, whatever people’s preferences for types of change, people will embrace programs that are beneficial to them, and resist programs that do not favour them or have unclear
outcomes (Kirton & Mulligan, 1973). And when people’s competing commitments are uncovered and analysed their resistant behaviour is usually seen to be ‘stunningly sensible’ (Kegan & Lahey, 2001).

In other words there may be logical reasons for people to resist a change, so an idea will not progress unless a significant number of people are persuaded to support the change, despite the outcomes being unclear, and the change maybe not in their own best interest. People will have to be persuaded both of the inherent worth of the idea, as well as the need to support it for the greater good. This will require a persuasive capability that goes beyond the communication of information appropriate to making a logical decision, towards creating emotional connections that transcend the individual situation (Conger, 1998). This is one reason why innovation is often an emotionally charged activity, and one of the characteristics of successful champions seems to be an emotional attachment to their projects, and an ability to emotionally engage with others who may have had different perceptions and interests (Weisenfeld, 2003).

While power might drive processes of change there is little evidence that power initiates them. The stronger evidence is that useful ideas arise spontaneously in organizations, and are adopted as the result of shocks to the organizational system (Schroeder, Van de Ven, Scudder, & Polley, 2000). For affected individuals, organizational power is an extrinsic force, and there is little evidence to suggest that extrinsic factors play other than an inhibiting role in individual and organizational creativity (Amabile, 1998; Basadur, 1992; Robinson & Stern, 1997), while there is strong evidence that individual and organizational creativity is encouraged by the intrinsic motivation generated through individuals having freedom to act (Amabile, 1988, 1998; Amabile et al., 1996). As well, in the view of one authority there is no evidence that any formal organizational planning system, a system designed for extrinsic control of individuals, has ever generated a noteworthy innovation (Quinn, 1985).

In summary, power describes a driving force of innovation projects, but cannot explain how the projects are spontaneously initiated or how the internal processes involved operate. Consequently, the concept of power cannot explain the organizational process of change.
2.2.4.3 Popper model of change

The Popper inspired cognitive model of change conceptualises innovation as continuous and systemic rather than as about balancing efficiency and innovation as does the Khun model (refer previous Section 2.2.3.2).

The Kuhn model is difficult to reconcile with the views of business writers who assert that in this era the only sustainable advantage comes from changing faster than the competition (Moore, 1993), and managers have to become ‘masters of change’ (Kanter, 1983; Thorne, 1991), in order that they can organise innovation that is continuous and systemic. It also does not fit with the views of organizational theorists who believe that managers need to embrace change more openly, and that organizational science needs to treat change as the natural rather than the exceptional condition of organizations (Tsoukas, & Chia, 2002).

The idea of continuous change is most prominent in discussion of organizations operating in innovative environments (Shareef, 1997). These organizations are said to operate in and accommodate ‘turbulent fields’, where the field itself is subject to dynamic processes (Emery & Trist, 1965). In such environments, there are rapid rates of technological progress, product demand can change dramatically as competitors introduce radical new products, and the nature of competition can change unexpectedly (Dessler, 1986). The global consumer electronics and information technology industries might be typical examples of such environments.

The turbulence of such environments make them difficult, if not impossible, to analyse (Daft & Weick, 1994), and organizations survive by trying new things and seeing what happens, while ignoring traditional rules and precedents. Such a description of change behaviour is in conflict with the ‘normal science’ element of Kuhn’s model that takes place within a framework of precedents, rules and social expectations. Rather, as Shareef (1997) points out, the description of continuous change behaviour better corresponds with Karl Popper’s description of the growth of scientific knowledge (Popper, 1959), a theory that competes with Kuhn’s descriptions within the sociology of science (Mennell, 1980).

At the basis of Popper’s theory of knowledge are three main ideas. First, that scientific knowledge is distinguished from non-scientific knowledge by being potentially falsifiable. All knowledge is provisional and remains so no matter how many observations may appear to confirm it. However, one indisputable observation to the contrary is sufficient to falsify
The Popper model of change is reflected in evolutionary based approaches to strategy formulation (Whittington, 1993). Theorists who adopt this approach (Hannan & Freeman, 1988; Williamson, 1991) see the market as operating by the natural law of the jungle, and the market’s dynamism, hostility and unpredictability as making rational future-oriented planning irrelevant. In this view long-term survival cannot be planned and only those firms that somehow or other hit upon profit-maximising strategies will survive (Whittington, 1993). In the absence of knowledge about the future, finding appropriate strategy means relying on some method of experimentation or “trial and error”. As Reich (1991) says, ‘the habits and methods of experimentation are critical in the new economy, where technologies, tastes and markets are in constant flux’ (p.232).

The literature recognizes the value of experimentation processes in innovation. For example, in a major study of 158 new product successes Maidique and Zirger (1985) found that many of the successes followed previous failures and that the failure often turned out to be instrumental in achieving the later success. The idea of learning from failure has become a common theme in the innovation literature (Drucker, 1985; Leonard, 1995; Maidique & Zirger, 1985; Peters, 1989). Another recent emphasis in the innovation literature has been the role of tacit knowledge (Nonaka & Takeuchi, 1995; Polanyi, 1962; von Krogh, Ichijo, & Nonaka, 2000), that implicitly involves trial and error in learning, as do other reported processes known by terms such as ‘learning by doing’ (Arrow, 1962; Jellinek & Schoonhoven, 1990), ‘learning by using’ (Rosenberg, 1982), and absorption (Cohen & Levinthal, 1989, 1990).

Experimentation is implicit in business practices concerned with managing risk. For example, a 3M homily about launching new products says ‘make a little, sell a little and then make a little more’ (Gundling, 2000). This is both a call for caution, and implicit recognition that a way of minimising technical and market risk is to keep things small and act speedily (Smith & Reinertsen, 1995). However, the idea that experimentation can form
the practical basis of innovation process is a recent development (Thomke, 2001, 2003). In the past there was a consensus that formal experimentation approaches were too expensive, but the development of IT tools for speeding up and tightly managing experiments (Quinn et al., 1996) has provided the opportunity of conducting complex experiments quickly and cheaply. The combination of these techniques with more flexible development approaches (Iansiti, 1995; Iansiti & MacCormack, 1997) is said to have transformed the product development processes of leading companies operating in innovative environments (Thomke, 2003).

In summary, the Popper inspired cognitive model that emphasises continuous change rather than the efficiency-stability orientation of the Kuhn model makes two valuable contributions towards a useful model of innovation. First, the model is applicable to all market environments, whereas the Khun model is appropriate only in stable environments. Second, the model is more appropriate to describing the fundamental evolutionary nature of innovation as asserted by Schumpeter.

2.3 Knowledge and its strategic use

2.3.1 What is knowledge?

There is no simple or clear-cut definition of the term knowledge; what is meant by knowledge needs to be defined in relation to the context. Much of human discourse treats knowledge as a homogeneous concept. For example, when it is argued that it is the ability to discover and accumulate knowledge that distinguishes humans from all other species (Bronowski, 1973), and when the changing role of knowledge in post-industrial society (Bell, 1973; Drucker, 1993) and working life (Jones, 1982) is debated, knowledge is regarded as a unity, and the nature of the knowledge being talked about not questioned. However, as any dictionary will demonstrate, knowledge is not the homogeneous concept that these discourses imply.

For example, the Compact Macquarie Dictionary lists nine different current usages for the term knowledge. Examination of these shows that all usages are related in one way or other to one of three descriptions, first, ‘acquaintance with facts, truths or principles’, second, ‘the body of truths and facts accumulated by mankind in the course of time’, and third, ‘the state of being cognisant or aware, as of a fact or circumstance’.

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The first two of these definitions denote knowledge as about facts and principles related to real world things that exist independently of human consciousness. This is objective knowledge that can be codified through language, and accumulated over time in such things as books, libraries and computer databases. In contrast, the third definition denotes knowledge as an awareness of facts and principles that is dependent on human consciousness. This knowledge only exists where there is a knower - knowledge as a subjective reality. Thus any discourse on knowledge needs to accommodate and distinguish between both objective knowledge and subjective knowledge (Popper, 1979).

The business management literature expresses the dichotomy between knowledge that needs a knower, and knowledge that does not, in several ways. A common distinction is that between practical knowledge (that resides with knowers) and theoretical knowledge that is found in text books (Wikstrom & Normann, 1994). The academic discourse on the dynamics of knowledge creation distinguishes tacit knowledge (Polanyi, 1962, 1966) or unarticulated knowledge that resides with knowers from explicit knowledge or articulated knowledge that can be readily accessed by others (Baumard, 1996; Nonaka & Kenney, 1991; Nonaka & Takeuchi, 1995; Spendier, 1996). As well, researchers in codification-diffusion theory (Boisot, 1983; 1994a, 1998; Boisot & Child, 1988; Child, 1987) distinguish uncodified knowledge that resides in the minds of knowers from codified knowledge, in the form of oral, written or numeric statements that can be readily communicated to others. The broader terminology of codification-diffusion theory is adopted in this research study.

In contrast, those influential writers concerned with the societal view of knowledge development have tended to neglect subjective knowledge altogether. Daniel Bell’s influential analysis of post-industrial society, is based on the view that ‘knowledge is that which is objectively known’ (Bell, 1973; p.176), even though Bell admits this to be a ‘utilitarian definition’ that neglects many important sociological questions. Stehr (1994), in his analysis of knowledge societies, points out that those promoting this view of modern society mainly employ the conceptions of objectified knowledge. As well, the emphasis of Peter Drucker’s writing is on the emergence of the concept of objectified knowledge, and the change in world view that it fostered (Drucker, 1970, 1993). However, other authors point out that the change in world view favouring objective knowledge was a largely Western phenomenon, and that the subsequent neglect of subjective knowledge in Western business thinking might hinder Western companies seeking to innovate, in comparison to their Japanese counterparts (Nonaka, 1991; Nonaka & Kenney, 1991; Nonaka & Takeuchi, 1995; von Krogh et al, 2000). Furthermore, the lack of a systematic documenting and
recording of knowledge in eastern cultures as compared to western cultures has not prevented eastern cultures from achieving outstanding levels of performance in business generally (Chia, 2003).

This latter view of things re-affirms that while the distinction between subjective and objective knowledge may be useful in analysing knowledge processes, it might conceal the meanings that attach to the concept of knowledge in organizations, as well as that organizational processes always involve both forms of knowledge. Other writers on organizations neglect these distinctions and define knowledge broadly by describing the types of knowledge relevant to organizational tasks. For example, Quinn and his associates list the necessary knowledge of an enterprise in ascending order of importance as (1) cognitive knowledge or “know what”, (2) advanced skills or “know how”, (3) system understanding or “know why”, (4) motivated creativity or “care why”, and (5) synthesis and trained intuition or “perceived how and why” (Quinn, Anderson, & Finkelstein, 1996; Quinn, 1992, 1997). Other writers define the relevant types of knowledge in more practical terms as (1) information or simple fragmented knowledge of the objective kind supplying answers to “know what” questions, (2) skill or know how, knowledge that is embedded in knowers (3) explanation, that provides answers to “why” questions and is found in professional articles, text and reference books, and (4) understanding, the knowledge that arises when principles and connections are recognised by a knower (Wikstrom & Normann, 1994).

While these latter two definitions may differ a little in terminology, more important is that they confirm current management thinking that the knowledge of organizations is both subjective and objective, and that the concepts of “skill” and “information” are included in management usage of the term knowledge. That has not always been the case with the concept of skill, for it is only through a change of world-view following the invention of technology during the Industrial Revolution, and the demonstration that experience and skill could be codified that skill came to be regarded as an uncodified form of knowledge (Drucker, 1970, 1993).

Including information in the definition of knowledge, and regarding it as a fragmented form of knowledge, remains a moot issue especially with writers who seek to distinguish knowledge management from information management. One argument is that the concept of information has been over-extended, leading to all forms of knowledge being regarded as information, and to the erroneous thinking that one can break down the deeper forms of knowledge (understanding, for example) into pieces small enough to be handled by
information systems (von Krogh et al., 2000; Wikstrom & Normann, 1994). Another argument is that confusing information and knowledge and the relationship between the two conceals any understanding of the processes involved in knowledge creation (Marchand, 1998; Nonaka & Takeuchi, 1995; von Krogh et al., 2000).

Explanations of the information-knowledge relationship start with the concept of data (Boisot, 1994a, 1998; Marchand, 1998). Data can be regarded as a difference between physical states that can be picked up by a person’s senses. Data can be shared among people, but whether or not the data contains useful information depends on the prior knowledge of the person receiving and examining the data. Thus data can be characterised as about “things”, and knowledge characterised as a property that predisposes people to perceive and act in certain ways (Boisot, 1998), with information creating the relationship between the things and people. Accordingly, knowledge creation in organizations can be considered as about the continuous transformation of information into knowledge through people interpreting information, and knowledge into information through people codifying their knowledge (Boisot, 1994a; Marchand, 1998; von Krogh et al., 2000). Thus the two concepts, knowledge and information, while distinguishable conceptually, are, in practice, intimately connected and indispensable to each other.

However, these explanations restrict themselves to a subjective view of knowledge. Data derives from things, information is about verbal and written messages that make sense to people, and knowledge resides in people. Information can be directly examined; knowledge can only be inferred from the actions of people. The problem is that in this same subjective view a book is merely a collection of sheets of paper with black marks. It becomes a book only if there is a reader who understands the marks on the page. Popper (1979) denies this, reasoning that the pages of a book contain objective knowledge whether anyone ever looks at or understands what is on the pages. The objective knowledge contained in the pages of a book exists independently of people.

In summary, from the subjective viewpoint the pages of a book contain potential information, from the objective viewpoint the pages contain knowledge. That is, the conceptual distinction between information and knowledge only holds up from a subjective viewpoint, and even then the concepts are so intimately connected that for practical purposes the distinction has little meaning. Accordingly, the interests of this research study is best met by considering information as an objective knowledge component that contributes to the ‘know what’ knowledge of an organization (Wikstrom & Normann, 1994).
For some authorities the foregoing reductionist view of knowledge as an extension of data and information is too simplistic. They see knowledge as something inherent in practice and in the concepts that employees invent to denote these practices (Brown & Duguid, 2001; Styhre, 2003). They also claim that a reductionist view of knowledge cannot explain the contrasting and contradictory properties of knowledge as sometimes embedded and difficult to transfer and other times freely transferable. Brown & Duguid (2001) see this as indicative of the need for quite different descriptions of knowledge, and for different perspectives on knowledge and organization. However, it is clear that one can also look for explanations of differences in the transferability of knowledge in effects such as the motivation of the recipient of the knowledge (Kalling, 2003).

In conclusion, while the reductionist view of knowledge may be simplistic it is the most common perspective of the knowledge management literature, and will be the view adopted in this study. Thus knowledge will be defined as all of the types of knowledge relevant to business and organization that cover the range of subjective and objective phenomenon, namely, information, skill, explanation and understanding, as per Wickstrom and Normann (1994).

2.3.2 Strategic use of knowledge

The purpose of this section is to examine the literature that outlines the change in the way that knowledge is used in organizations, and that with gradual recognition of the commercial value of objectified knowledge the business world’s attention has turned to the use of knowledge as a strategic tool.

Over the past three decades many writers have explained that Western society has developed to a stage where the volume and nature of the society’s work forms have become based on knowledge, and where knowledge provides an engine for economic growth. The term ‘knowledge society’ has been coined to describe this societal development (Bell, 1973; Drucker, 1968; Lane, 1966; Stehr, 1994).

However, the idea of a ‘knowledge society’ is inspired by the emergence of objectified forms of knowledge, and tends to downplay the mainly subjective forms of knowledge that were used in previous eras. The organization of military, religious and business activity has taken place for thousands of years, and to do that people must have developed knowledge
about how to create and manage organized activity. At the beginning of the 20th Century Max Weber wrote of the role of knowledge in the authority structures and control of organizations (Weber, 1947). In analysing the dominant organizational form Weber stated that, ‘Bureaucratic administration means fundamentally the exercise of control on the basis of knowledge’ (p.339).

In the same era Frederick Taylor was explicitly concerned with the processing of knowledge within organizations. The first of his four principles of scientific management was ‘… the deliberate gathering in on the part of those on the management’s side of all the great mass of traditional knowledge, which in the past has been in the heads of the workmen…’ (Taylor, 1947). The principle at work here was of separating the organization’s “thinking” from “doing” in order to create a management that was both repository and processor of the organization’s knowledge. This also followed the principle of deskilling workers and the objectification of their knowledge, the same formula by which craft skills were converted into technology during the Industrial Revolution (Drucker, 1970, 1993), and currently inspires the emerging field of knowledge management that seeks to make the skills of knowledge workers more routine (Korac-Kakabadse, Kouzmin, & Kakabadse, 2002).

However, the idea of a knowledge society where knowledge is the major economic resource, also directs attention away from the internal exercise of control in organizations that concerned Weber and Taylor, towards the external strategic use of knowledge by organizations. For where the dominant forms of organizational activity are knowledge based, then it is from within the development and use of knowledge that the sources of competitive advantage might be best found.

Formal recognition of the strategic nature of knowledge is a relatively recent phenomenon that is mirrored in the emergence of the academic field of knowledge management over the past decade (Boisot, 1998; Davenport & Prusak, 2000; Davis & Botkin, 1994; Nonaka & Takeuchi, 1995; ; Stewart, 1997; von Krogh & Roos, 1996a; von Krogh, Roos, & Kleine, 1998; Wikstrom & Normann, 1994). However, this development had its beginnings in several decades of influential academic writing that pointed out the changing role of knowledge in society and business.

Prominent economists first pointed out the changing nature of the use of knowledge in developed economies, and how knowledge was becoming an engine for growth of economic activity (Boulding, 1966; Hayek, 1945). Prominent sociologists wrote about the societal implications of these changes (Bell, 1973; Lane, 1966), and over a period of almost 40 years
the influential management thinker, Peter Drucker, focused on the changing role and meanings of knowledge, and the connections between knowledge and work, knowledge and modern organizations, and knowledge and modern society.

Drucker was the first to declare that organizations were knowledge systems by asserting that, ‘knowledge is the business’, and that ‘physical goods and services are only the vehicle for the exchange of customer purchasing power against business knowledge’ (Drucker, 1964). He also interpreted Frederick Taylor’s first principle of scientific management in a favourable light, crediting Taylor with being the first to understand that ‘knowledge, rather than manual skill, was the fundamental productive resource’ (Drucker, 1970), and in inspiring the ‘knowledge economy’ by providing the impetus for the new specialist workers, such as production engineers and management consultants, who were needed to support a new rationalist, knowledge based, style of management. Drucker claims to have introduced the term ‘knowledge worker’ to the world at around 1960 (Drucker, 1993), and he alerted management to the impact of the increasing level of such workers in organizations (Drucker, 1988), and to the implications of the ‘knowledge society’ for organizations (Drucker, 1992; 1993, 2002). His prediction that making knowledge productive would bring about changes in jobs, careers and organizations every bit as drastic as those that occurred in factories in the aftermath of the application of Scientific Management to manual work (Drucker, 1970), has helped fuel the work of the many writers who have debated and communicated this societal issue to a wide audience through popular management books (Handy, 1990; Naisbitt, 1984; Reich, 1991; Toffler, 1971, 1981, 1990). Drucker’s important theme that in a knowledge society it is knowledge and not labour that creates economic value (Drucker, 1992, 1993, 2002) has become a “top of the mind” issue for business strategists and government policymakers.

However, it was only from the early 1990s that management academics began to write about the economic significance of knowledge and examine its implications for organizations. Despite a mood of scepticism about the concepts involved (Blackler, Reed, & Whitaker, 1993), the consensus about knowledge as an economic and strategic resource stimulated the growth of the academic field of knowledge management. This field accommodates at least three diverse groups of interests and approaches. The first approach is about the management of knowledge within organizations, with emphasis on its role in innovation (Davenport & Prusak, 2000; Leonard, 1995; Nonaka & Takeuchi, 1995; Stewart, 1997). A second approach is the knowledge-based view of the firm (Grant, 1996; von Krogh & Roos, 1996a; von Krogh et al., 1998) that is associated with the resource and competence based approaches to strategy (Hamel & Heene, 1994a; Hamel & Prahalad, 1994b; Prahalad &
The third approach is that of providers of Information Technology based tools that view knowledge management as about capturing, codifying and storing objectified knowledge. While each would claim to provide a basis for the strategic use of knowledge in organizations, it is the first and second approaches above that are of interest to this research study.

If creating strategy and achieving a strategic advantage is understood to be about creating difference (Porter, 1996), then the first approach about managing knowledge in organizations revolves around how organizations use knowledge to create that difference. At the level of organizational practice knowledge becomes manifest through technology, broadly defined as ‘the work done in organizations’ (Perrow, 1967; p.194), or through the view that technology is essentially knowledge that is embodied in hardware, software or organizational processes (Clark & Staunton, 1989; Scarbrough & Corbett, 1992; Van de Ven & Rogers, 1988). When one thinks about how the use of advanced technologies have enabled great changes in the way that people and organizations work over the past few decades, it becomes clear that it is the role of knowledge in technology and innovation that is at the heart of the strategic use of knowledge.

As regards the second approach to the use of knowledge, the concept of formulating strategy is about working out how to do things differently to that of competitors (Hamel, 1996; Hamel & Prahalad, 1994b; Porter, 1996). Formulating strategy is essentially an innovative activity, and influential authors decry the indiscriminate use of the term strategy for other than doing things differently (Hamel & Prahalad, 1994b; Ohmae, 1982; Porter, 1996). The competence-based approach to achieving difference starts from the viewpoint that an organization is constituted of knowledge and that creating difference is about formulating strategic architecture for the organization’s development of unique combinations of knowledge that will provide both intellectual leadership and a superior means of addressing opportunities.

All of this suggests that generating knowledge lies at the heart of all change processes (Balogun & Jenkins, 2003). For any organizational change to occur the organization’s members have to learn different ways of interacting with each other and external stakeholders, as well as learning different ways of coordinating their activities. This new knowledge will likely reside in the minds of the organization’s members and be manifest in different organizational routines, but may also be written down as formal standards and operating procedures.
In summary, the strategic use of knowledge revolves around three things. First, recognition that objectified and codified knowledge has economic value and can be traded, second, recognition that knowledge is an organizational resource that can create strategic advantage, and, third, the use of knowledge as technology in creating a difference for, and improving the performance of, the organization. These three things also reflect the view that knowledge creation is an essential part of all change processes.

### 2.3.3 Knowledge in innovation

When an organization does something differently then two types of knowledge necessarily come into play. First, there is knowledge about the organization and its technology, practices, processes and markets that are the basis for the further organizational development. Second, there needs to be knowledge about the different technology, processes and markets that will constitute the change.

In Goldberg (1989)’s analysis he looked at both types of knowledge that contribute to innovation in organizations, as well as how knowledge is communicated within the organization. Goldberg takes the organizational knowledge types involved in innovation and classifies them in the following four ‘availability forms’ (Goldberg, 1989; p.64):

1. Public knowledge, as in the ‘basic’ knowledge collected in the literature and in libraries and ‘market-related’ knowledge, the public nature of which is necessary for markets to operate and products to be sold.
2. Individual or institutional knowledge, to do with performing research, developing products or processes, product and process know-how, implementing new products and processes, managing the producing enterprise, and product related knowledge. This category of knowledge may be partly public or partly secret, for it is recognised that there are clear differences between the performance of individuals and institutions that result from knowledge that has not been, or cannot be, made public.
3. Entrepreneurial know-how about how to link all of the other knowledge types towards grasping new ideas, combining new and existing technology and organizational forms into new products or processes, and building a market for them. This category of knowledge is individual and largely secret until such time as entrepreneurial actions become public.
4. Classified knowledge denotes that knowledge that organizations attempt to withhold from competitors by restricting its communication. This can apply to any of the individual or institutional forms of knowledge covered by form 2 above.

Goldberg’s knowledge types can also be categorised in terms of whether articulated or non-articulated (that is, secret) or whether it is available to just one or a few within the organization, or shared widely. Mapping the level of articulation versus degree of sharing of knowledge results in the 2 X 2 table of Figure 2.1 that describes four categories of knowledge containing the knowledge types of Goldberg’s analysis. For reasons that will become clear the knowledge types are named in accordance with the terminology adopted by Boisot (1994a).

Knowledge arrangements such as that of Figure 2.1 appear in the organizational literature to explain the process of knowledge creation in organizations, and describe the learning processes involved (Boisot, 1994a; Nonaka & Takeuchi, 1995). In order to establish a framework and terminology for the analysis of the categories of knowledge, Figure 2.2 arranges these categories with hypothesised learning processes as described by Boisot (1994a) and Nonaka & Takeuchi (1995), with both sets of terminologies shown. The analysis here concentrates on the knowledge elements, and the presence of associated learning processes is assumed. Given this non-critical view of learning, Figure 2.2 can be considered as an organizational learning cycle, identical to those of the literatures of action learning (Revans, 1980), and organization learning (Garratt, 1994).

The four categories of knowledge described in the figures, personal, proprietary, public and collective knowledge, will be analysed in following sub-sections. Each of the four knowledge categories are treated as ideal types, as Weber describes (Weber, 1968).
Articulated knowledge that is ‘classified’. Goldberg’s availability forms 2 and 4.

2. PROPRIETARY KNOWLEDGE

Articulated knowledge that is widely shared within the institution and/or public. Goldberg’s availability form 1.

3. PUBLIC KNOWLEDGE

Unarticulated or ‘secret’ knowledge of individuals. Goldberg’s availability form 2 and 3.

1. PERSONAL KNOWLEDGE

Unarticulated or ‘secret’ knowledge that is widely shared within the institution. Goldberg’s availability form 2.

4. COLLECTIVE KNOWLEDGE

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Figure 2.1: Knowledge for innovation

![Knowledge for innovation diagram](image)

Combination (N)

Diffusion (B)

Externalization (N)

Problem Solving (B)

Absorption (B)

Internalization (N)

Scanning (B)

Socialization (N)

(B) – Terminology of Boisot (1994a)


Figure 2.2: Knowledge for Innovation and Learning Processes
2.3.4 Personal knowledge

The concept of personal knowledge introduced here is of unique knowledge possessed by an individual that cannot be easily made available to others. This will be distinguished from knowledge that is shared within an organization or made public, where the same knowledge resides in the minds of many individuals. This latter category of knowledge will be termed the collective knowledge of the organization (see Section 2.3.5).

In Polanyi (1962)’s formulation the reason why personal knowledge is not easily shared with others is because nobody, including the individual who possesses the knowledge, fully understands it and thus cannot articulate it. Even if the principles involved are articulated this does not necessarily lead to the acquisition of sufficient knowledge for the practice of a skill or for skilful performance to result. Using Polanyi’s paradigm case, cyclists do not generally know the principles by which a cyclist keeps his or her balance, and so very few cyclists are able to articulate the principles of bicycle riding. Furthermore, if these principles were articulated, in terms of the centrifugal and gravitational forces involved in maintaining balance, it would be of little help to a person who wishes to learn how to ride a bicycle. The skill of bicycle riding cannot be communicated by use of language; it can only be developed experientially.

However, Polanyi’s idea that personal knowledge may be largely unconscious to its possessor does not allow for the possibility that an individual may have knowledge that he or she fully understands but has no wish to articulate, and no interest in sharing with others. This might be particularly so in organizations, where people who have developed experiential skills important to an organization might desist from sharing information on these skills with others, in the interest of enhancing their personal remuneration and career prospects.

Another possibility is that certain things remain unarticulated, not because some people do not understand them or are unwilling to articulate them, but because there is a high cost in time and effort in articulating the knowledge. It is knowledge of this character that the knowledge creation literature refers to as tacit knowledge, even though Polanyi’s formulation of the term covered only the narrower version discussed above (Li & Gao, 2003). This is also the type of knowledge that quality management processes seek to surface and articulate, by having participants in an operations process get together and talk about improvement issues, so that those who can articulate their understandings of the process can
raise the understanding of other participants, and create a shared commitment to improvement (Winter, 1994).

Personal knowledge in innovation is represented by individual know-how or skill related to any of the instrumental types of knowledge necessary to innovation (Goldberg’s availability form 2), or to entrepreneurial know-how (availability form 3) about how to marshal and coordinate any of the other types of knowledge necessary to innovation. While unique skills in any of the aspects of innovation might lead to competitive advantage for an organization, it is the concept of entrepreneurism as a personal skill, and the entrepreneurial role of key individuals in the innovation process that receives most attention in the literature. Thus the entrepreneurial process is equated with the innovation process (Drucker, 1985; Schumpeter, 1947), and individuals using personal initiative or entrepreneurial skills become key players in innovation (Frohman, 1999). The literature on internal entrepreneurs, innovation champions and change masters assert the importance of such personal knowledge in innovation (Howell & Higgins, 1990; Kanter, 1983; Pinchot, 1985).

Personal knowledge of the entrepreneurial variety might also be considered part of what Popper described as subjective knowledge (Popper, 1979), for this includes ‘dispositions to behave or react’ (p.60). Dispositions to act in certain characteristic ways might be argued as outside the range of the thing called knowledge. However, what is inferred from Popper’s formulation is that people have idiosyncratic perceptions of things that may lead to them to respond in certain characteristic ways. For example, entrepreneurs may perceive things in ways different to non-entrepreneurs, and this may reflect in a certain way of going about things. These same ideas are contained in the psychological concept of cognitive style, an underlying element of individual personality (Kirton, 1976, 1994a; Sternberg, 1997). For example, the research literature of adaptation-innovation theory, describes how individuals relate to structure and cope with uncertainty, and hence measures an individual’s relative tendency to think and act innovatively.

To summarise, the category personal knowledge is treated as consisting of three dimensions of unarticulated knowledge:

i. Knowledge that is unarticulated because neither the person nor anyone else can articulate it. This is tacit knowledge as presented by Polanyi (1962).

ii. Knowledge that is unarticulated because only some people understand it, and there may be a high cost involved in articulating it. This relates to accumulated experiential learning.

iii. Idiosyncratic knowledge that results in behavioural dispositions.
The term tacit knowledge has become widely used in the knowledge management and innovation literature as an umbrella term that denotes all forms of unarticulated knowledge (Styhre, 2004). This tendency is counterproductive in confusing Polanyi’s original concept, concealing the various forms of unarticulated knowledge, and removing them from the analysis.

2.3.5 Proprietary knowledge

*Proprietary knowledge* is articulated knowledge that is secured to the organization by keeping its know-how secret or the granting of a patent. This is knowledge that creates a direct opportunity for strategic advantage. For an organization this knowledge may be embodied in drawings, designs, prototypes, and standard operating procedures related to its products, systems and processes. It is also be embodied in its formal project, marketing and business plans that contain the organization’s unique view of the market obtained from its own market research effort.

Proprietary knowledge is the result of the knowledge creation process of *design* (Simon, 1996). The innovation-design perspective on innovation (Clark & Starkey, 1988; Clark & Staunton, 1989) recognises design as central to products, services, production processes, the supply chain, distribution channels, image, and every other organizational activity where new knowledge is necessary. Taking this viewpoint, every product, process, or organizational design embodies both a new configuration of knowledge, as well as an understanding of the knowledge (Perkins, 1986). Design itself is an exercise in problem solving that proceeds by narrowing the solution space according to a combination of different creative leaps. It starts with unstructured and uncertain knowledge about market needs and integrates various other types of knowledge in order to converge on a structured solution that will create value for the organization or its customers. The sources of knowledge will be both the personal knowledge of the individuals who participated in the design, as well as the pre-existing organizational knowledge in the categories of proprietary, market and collective knowledge. The new knowledge created by the design will be in the articulated and codified form of drawings, prototypes, or written operating procedures.

Because of the problem solving nature of the activity, design is also a learning experience for participants to the design. So that at the same time as new proprietary knowledge is
being created, there is a concomitant creation of new personal knowledge. The new design, if developed as a product for sale or as an improvement in internal process, becomes the basis for the creation of further new knowledge. The sale of a new product requires new knowledge to be created about the marketplace, in terms of such things as the requirements of market segments, market prices, and potential buying behaviours. As well, in order to sell the product, the organization must share some of its proprietary knowledge with potential buyers through promoting and demonstrating the product. It is only through the sharing of the explicit knowledge of product, selling process, and conditions of sale that market mechanisms can work. This type of new knowledge will be referred to as *market knowledge*.

It also follows that where an organization shares its proprietary knowledge in the marketplace, through knowledge embodied in product and promotional literature, then competitors are in a position to imitate the design and the processes of its production, and the organization is consequently in danger of losing strategic advantage. Hence the value of patents and other design protection in preventing this becomes clear.

### 2.3.6 Public knowledge

The essential characteristic of the knowledge of this category is that it is fully articulated and codified, and made freely available to and shared with as many people as require access to it. The term public knowledge would be best used to describe the kind of knowledge that is accumulated in the world’s newspapers, magazines, professional journals, scientific literature, libraries and public archives. In recent years the technology of the Internet has allowed significant increases to such public knowledge.

All public knowledge is available to members of an organization and, if appropriately accessed, is an important source of information about changes and trends in the organization’s environment. However, members of an organization are particularly interested in what might be described as a subset of public knowledge – *market knowledge*. This is the knowledge about the market in which the organization participates.

Market mechanisms work most efficiently where knowledge of the market commodity and the market processes involved are codified, so that all participants to the market can be knowledgeable about all aspects of the market, and thus free to act independently. Thus
markets involving commodities, where the product is completely specified and understood by both buyers and sellers, and where price information is freely traded, tend to be more competitive and more efficient marketplaces than, for example, the management consulting market where the services to be provided are relatively ambiguous, and prices are not freely available. In terms of efficiency, buying on a commodity market may take place in the period of a keystroke, whereas buying a consulting service may involve many weeks of face-to-face negotiation.

An organization can only be successful in its market to the extent that it provides prospective buyers with sufficient knowledge about the organization, its products, its prices, and the means of buying, to enable an informed choice to be made. The forms of this knowledge are brochures, data and information sheets, product bulleting and company promotional literature. In the interest of efficiency in diffusing the knowledge, it will be codified either as written material, or in electronic form on the Internet and electronic-marketplaces. When diffused this knowledge becomes available to all who seek it, the equivalent of public knowledge.

Decision makers in organizations bring their personal knowledge to the interpretation of market and public knowledge in order to devise new structures and strategies for the progress of the organization’s business.

2.3.7 Collective knowledge

The experiences gained from the market performance of new products, new markets, and new processes, lead to the creation of new and different types of knowledge. Those persons within the organization who have the relevant overview of the market (for example, marketing and general management), or are in market interface positions, learn from this experience, and share their newly gained knowledge with others through the organization’s communication and planning processes. This is knowledge that informs the organizations strategic decisions.

As well, in reacting to the needs of the marketplace, many individuals of the organization learn to combine and coordinate in formal and informal ways to create the organizational routines that characterise the organization (Nelson & Winter, 1982). These routines are more effective the more the knowledge is shared with organization members. This is unarticulated knowledge that is created by the process of absorption (Cohen & Levinthal,
1990). The shared knowledge of the market, the organization’s routines, and the organization’s sets of shared values, assumptions and attributions that are generally referred to as cultural knowledge (Sackman, 1991; Schein, 1985) make up the collective knowledge of the organization.

But what is the role of collective knowledge and the role of socialization processes in generating personal knowledge and individual creative actions? Boisot (1994) offers a simplified explanation that ultimately all problems are solved in individual minds, and that a widely shared problem in an organization can only be solved by an individual with the idiosyncratic personal knowledge that leads to a singular perception and framing of the problem. In this view, it is through minds with singular visions that shared problems are converted into personal knowledge.

However, this explanation neglects the influence of the organizational context. In organizations, the shared values and assumptions that are part of its collective knowledge, lead to common reference frames, and to the organization’s members interpreting problems in much the same way (Daft & Weick, 1984), and consequently to the organization responding in habitual ways (March & Simon, 1958). The more that an organization attempts to build a strong culture, through building its collective knowledge, the more consistent will be the interpretation of problems, and the more consistent will be the consequent actions (March, 1991). As a result, creative actions have to compete with well-established responses to organizational situations (Ford & Gioia, 1995).

This also suggests that ‘singular’ perceptions of problems and ‘singular’ frames of reference will not occur, for these will always reflect organizational interpretations. This is the socialization process at work. What this further suggests is that creative responses in organizations will be largely based on organizational interpretations and current practice, in other words adaptive ideas. This is a problem for organizations seeking creative responses outside of current practice, or innovative ideas. This is where individual differences come into play, as outlined in previous Section 2.2.1.3. Organization need to learn how to manage diversity, and employ some people who are less susceptible to the organization’s socialization process, those with an innovative thinking style (Kirton, 1989), or are unconventional (Steiner, 1995), or authentic (Mulhall, 1996). That is, individuals who may be more difficult to manage but who will expand the bandwidth of the organization’s problem solving capability.
2.3.8 Organizational knowledge base

Previous sub-sections have described the knowledge necessary for innovation and the processes by which the knowledge is created. Further analysis of knowledge in innovation requires a conceptual framework that can help explain the role of the structure of knowledge in the innovation process. Literature on knowledge management and organizational learning tend to frame knowledge on the basis of a knowledge structure dichotomy – for example, tacit versus explicit, unarticulated versus articulated (Baumard, 1996; Nonaka & Takeuchi, 1995; Spender, 1996). Since knowledge can be structured in many ways, a dichotomous view of structure constrains the analysis.

The analysis in this and later sections adopts the conceptual framework of codification-diffusion theory (Boisot, 1983, 1994a, 1998; Boisot & Child, 1988; Child, 1987). This framework describes knowledge in terms of its level of codification and the extent of its diffusion within the organization, through what Boisot refers to as the culture vector space. Boisot’s reasoning is that the codification vector reflects psychological processes while the diffusion vector reflects sociological processes, and that together these present the opportunity for cultural analysis. Examining this attractive but complex conceptual argument is beyond the needs of the current analysis.

Figure 2.3 places the knowledge required for innovation on the C-D vector space and forms the basis for the analysis of this sub-section.

The codification vector reflects on the structuring of knowledge. Codification is a process by which individual minds are applied to turning ideas into a more explicit form of knowledge through problem solving processes. Individual knowledge that is purely tacit can be represented on this axis at the zero-junction with the diffusion axis, for this is knowledge that is unexplainable by the individual and cannot be communicated in any practical way. At increasing levels of codification knowledge may be communicated by gestures, symbols, speech, writing, numbers, and ultimately by digital representation, and the higher the level of codification the greater the potential audience. For example, the use of gestures, symbols and speech limits the communication of knowledge to persons within the range of sight and sound. The use of the written word extends the ability to communicate to those who can read, but the reach is limited by the technologies available for moving paper. Knowledge that can be represented digitally can use advanced communication technologies to share the knowledge with anyone who has access to a computer terminal. Digital representation is the
full extent of codification with current technology and for scaling purposes will be given unity value.

Codifying knowledge to a certain level is only an indication of its potential for communication and diffusion, for the actual level will be determined by whether potential receivers attend to the sender’s message. This may be culturally determined. For example, if an organization has developed a common reference frame (Daft & Weick, 1984) that discourages innovation then messages about innovation will be less likely attended to and internalised by the organization’s members. Hence the relationship between the codification of knowledge and its diffusion through an organization is mediated by both the communication technology and the cultural knowledge of the organization.

The conceptual framework of Figure 2.3 positions four categories of knowledge for innovation on the vector space as pure ideal types. Personal knowledge (0,0) is exclusive to the individual and tacit. Proprietary knowledge (0,1) generates maximum value by being highly codified, yet not diffused, and thus scarce. Market knowledge (1,1) is both highly codified so that communication is highly effective and widely shared, conditions for the smooth operations of markets. Collective knowledge (1,0) consisting of routines and cultural components works at a subconscious level, and is widely shared with the members of the organization.

The actual knowledge of the organization will fall within the C-D vector space when characterized in terms of its codification and level of sharing. The distance of actual knowledge from its equivalent ideal type might be regarded as a measure of that knowledge’s effectiveness in use. The mapping of an organization’s knowledge on the vector space might also be regarded as the organization’s knowledge base, and an implementation of the theoretical approach to organizational learning introduced by Duncan and Weiss (1979).

Duncan and Weiss view organizational learning as an organizational process concerning the development of organizational knowledge about ‘action-outcome relationships’ (Duncan & Weiss, 1979; p.75). Shrivistava (1983) extended the idea to an organizational knowledge base that resides with individuals and in explicit policies and procedures, as well as ‘assimilated in the structure of the organization, and in the organization’s socio-cultural norms’ (Shrivistava, 1983; p.25). The representation of knowledge in the vector space, and its characterization in terms of its codification and sharing has been shown to provide a
representation of structure that provides explanations of innovative organizational environments (Waters, 1997).

The character of knowledge at various levels of codification and sharing has implications for the nature of the transactions that are based on this knowledge. At low levels of codification, knowledge is uncertain and ambiguous but these are reduced as codification increases. At low levels of diffusion power asymmetries exist but reduce as knowledge becomes more widely shared. These effects are revisited as part of the theory development and analysis of Chapter 3.

**Codification**

![Diagram of Organizational Knowledge in Knowledge Space](image)

**Figure 2.3: Organizational Knowledge in Knowledge Space**
2.3.9 Critique of knowledge management

The purpose of this section is to review and critique the ideas of knowledge management as they relate to innovation. It is not intended as a general review of knowledge management or its literature.

The emerging academic field of knowledge management makes a number of proposals and assumptions about the relationship of knowledge and innovation. First, that new knowledge is both source and purpose of innovation, and so the process of knowledge creation describes the process of innovation (Amidon, 1997; Leonard, 1995; Nonaka & Kenney, 1991; Nonaka & Takeuchi, 1995; von Krogh et al., 2000). Second, as a consequence of this reasoning the variables knowledge and innovation can be conflated into the concept of knowledge creation. This section argues that the knowledge management field has confused the dependent variable, innovation, to such an extent that any of the field’s findings may be misleading when applied to the subject of innovation.

The first part of the argument is that on at least seven counts knowledge is not, and cannot be, a sufficient explanation for innovation.

First, knowledge constitutes a ‘capacity for social action’ (Stehr, 1994) and no more than that. The conflation of the variables knowledge and innovation relies on an assumption that the capacity for action that is knowledge will be used for innovation. This is not a safe assumption, as the following points explain.

Second, any actor with knowledge must be in control of the contingent circumstances to be able to set something in motion. For example, in a large organization, it is unlikely that the person with the knowledge to generate a change will also have control over the means of developing the new product. If the person is unable to obtain the appropriate resources, then no change activity will be initiated.

Third, an actor with knowledge, whether in a position of control or not, is not obliged to take action and may choose not to do so. Experienced people in organizations understand that undertaking innovative change is a career-threatening quest. Ideas that are truly different are counter-cultural and threaten the status-quo of the organization. Resistance by the organization’s affected individuals means that diplomacy and persistence are necessary to have new ideas accepted and implemented. Failure is common (Howell & Higgins, 1990;
Pinchot, 1985) and innovators, more than others, are tagged with their failures (Kirton, 1984). Understanding this, it may be rational for an actor with knowledge about an innovation to refrain from sharing that knowledge.

Fourth, knowledge is not a neutral commodity. Taylorist influences on organizations mean that the perceived value of knowledge depends on its source. Management knowledge may be valued more highly than the knowledge of workers. The value of knowledge generated by professional groups may be inflated. As well, the distribution of knowledge within an organization may be influenced by political and ideological factors, as individuals and groups seek to control the knowledge relevant to the organization’s processes (Scarbrough & Corbett, 1992). Consequently, the organization’s knowledge becomes overlayed by interests, and the interests associated with the knowledge create barriers to its use for innovation.

Fifth, the concept of knowledge, cannot explain why some companies bring their knowledge to bear on the problem of innovation more effectively than do others. Pavitt (1990), for example, suggests that what distinguishes innovative companies is not their knowledge, but how they use their knowledge in shaping strategy (Pavitt, 1990). An organization’s performance in innovation or any other business activity can be expected to be based on the use of the organization’s knowledge, but success will depend on whether, how and where the knowledge is used. There is a great deal of evidence that the actions of organizations bear little relationship to the level of their knowledge (Pfeffer & Sutton, 2000).

Sixth, the knowledge management literature and its discussion of knowledge has its basis in objective knowledge and the rationalistic tradition. However, as was argued in Section 2.2.1.1, the assumption of rationality is not appropriate for innovation, and this raises the issue as to whether the rationalistic-based explanations of knowledge management can hold up in an essentially non-rationalistic context of innovation.

Seventh, the knowledge perspective on innovation introduces a paradox in that the knowledge that is said to be essential to innovation is the same knowledge that creates the barriers to organizational innovation. This paradox is contained in the argument that an organization’s core capabilities can also be its core rigidities (Leonard, 1995), or that at times knowledge can be seen as the source of organizational change while at other times to constrain the change (Hargadon & Fanelli, 2002). Consequently, one can argue that knowledge explanations of innovation are tautological, and that broad definitions of innovation such as ‘an activity geared towards the generation and application of new
knowledge’ (Kaltoff et al., 1997; p.31) may conceal as much as they reveal. For to be useful, a model of innovation needs to explain how barriers to innovation arise through knowledge, and how these barriers might be overcome. The concept of knowledge may help in explaining the former, but cannot explain the latter.

Each of these seven reasons throws serious doubt on the assumption that knowledge and innovation are correlated, and that there is any justification for conflating the two concepts as knowledge management systematically does.

This doubt is reinforced by a considerable body of empirical evidence from 12 large-sample studies in adaption-innovation theory that cognitive style, as measured on the adaption-innovation continuum, is not correlated with measures of cognitive level (e.g. intelligence, talent) and manifest level (e.g. management competence). These are studies that were aimed at delineating between style and level variables in individuals. While individual metaphors cannot be automatically transferred into the organizational sphere (Weick, 1991), the external validity based concept of management competence (Boyatzis, 1982) is intended to relate individual knowledge and skills to organizational outcomes, and thus bridge individual and organization performance. Consequently, the Schroder (1994) study that found no correlation between management competence and innovative behaviour throws weight behind the suggestion that knowledge and innovation are unrelated at the organizational level.

The foregoing critique is more aimed at understanding the limitations of the role of knowledge in explaining innovation than it is at reviewing the controversies of the knowledge management literature. However, it is of interest that the editors of the papers of two significant conferences eight years apart identify similar major objections with the popular conceptions of the mainstream knowledge management literature (Blackler et al., 1993; Swan & Scarbrough, 2001). One is the field’s broad definition of knowledge that leads to ‘something that captures everything is not necessarily very useful’ (Alvesson & Karreman, 2001; p.1014). A second is the field’s reification of knowledge as valuable in its own right, for this has the effect of separating knowledge from its use and hindering rather than promoting the use of the knowledge (Pfeffer & Sutton, 2000).

The results of a delphi study of academic and practitioner experts about the future of the field (Scholl, Konig, Meyer, & Heisig, 2004) indicated a lack of any broad agreement on future academic and practical approaches. This suggests that the field remains in conceptual confusion.
In summary, knowledge is fundamental to all human activity, and so that makes it a difficult enough variable to handle without confounding it with other variables such as innovation simply because inferring the relationship is helpful to promoting the field. That does not inform, rather it confuses. The knowledge management field would serve itself better by distinguishing between knowledge and innovation, and turning its attention to investigating the links between the two, helping to bridge the knowledge-action gap (Pfeffer & Sutton, 2000), the field’s most useful problem assignment.

2.4 Commitment research

2.4.1 Nature of commitment

The everyday use of the term commitment is as ‘the act of committing, pledging or engaging oneself’ (Macquarie Dictionary) to a behaviour or course of action, but this meaning tends to be diluted in business and public contexts where it is often used as a ‘weasel word’ (Watson, 2003). The purpose of this section is to define the concept of commitment as a psychological and organizational construct in the context of change in organizations.

In the organizational literature the term ‘organizational commitment’ invariably refers to the psychological state characterizing the relationship between an employee and an employing organization (Meyer & Allen, 1997). The bulk of the vast commitment research focuses on this relationship, what might just as well be referred to as an employee’s loyalty, allegiance or attachment to the organization. The term organizational commitment seems to never be used to describe the commitments of the organization itself, when it is perfectly clear that organizations do undertake commitments, of both formal and informal nature, to their employees, their industry and the community. One such commitment is to organizational change, and while change is usually not thought of in these terms, commitments are implicit in statements such as that successful innovating companies are committed to innovation (Kaltoff et al., 1997) or that successful companies have higher aspirations towards achieving innovative goals (Nonaka & Takeuchi, 1995). The literature tends to treat statements such as these as self-evident, but doing so does not help in understanding what this organizational commitment to change is about, or how it comes about, the purpose of this research.
Approaches to defining an organizational commitment to change have been based on whether or not organizations have adopted certain best practice approaches to innovation (Cottam, Ensor, & Band, 2001). Since best practices are subject to continuous change this approach does not reflect the fundamentals of the change process.

In traditional research into organizational commitment there is a long-standing distinction between two types of commitment - *attitudinal* and *behavioural* commitments (Meyer & Allen, 1997; Mowday, Porter, & Steers, 1982; Reichers, 1985; Salancik, 1977; Staw, 1974). Attitudinal commitment refers to the processes by which people think about their relationship with their organization, and the extent that their own goals and those of the organization are aligned (Mowday et al., 1982). Attitudinal commitments are essentially measured as attitudes and, consequently, can be expected to suffer the same inconsistency in predicting behaviour as do other attitude measures (Ashworth, 1979; Fishbein & Ajzen, 1975).

In contrast, behavioural commitment refers to the process by which ‘individuals become locked into a certain organization’ (Mowday et al., 1982; p.26). The behavioural approach takes the view that employees become committed to a particular course of action (maintaining employment with a particular organization in this case), and that attitudes that develop and are measured are a consequence of this commitment. Since people can be committed to many courses of action other than maintaining employment, the behavioural approach is more general and is the one adopted in this research study.

Katz (1964) suggested that organizations were concerned with three levels of motivation and types of motivational behaviour. First, they have to motivate employees to join and stay. Second, they need to motivate employees to perform their prescribed job in a reliable manner. Third, they need to motivate employees to go beyond the prescribed job to perform the spontaneous change behaviours that are necessary to filling the gap between what the organization can and cannot anticipate (Katz, 1964).

The first type of behaviour, about employees joining and staying, is the focus of traditional organizational commitment research, but the research also informs on the other two types of behaviour. Meyer and Allen (1991) describe three components of organizational commitment. One is *affective commitment* or the emotional attachment to and involvement in the organization. A second, *continuance commitment*, reflects economic rationalist thinking through the need to remain in the organization because of the high cost of leaving, and the third, *normative commitment*, or the feeling that one should stay because there is a
moral duty to do so (Meyer & Allen, 1991). Other researchers have also proposed the idea of three distinct forms of commitment using classification that are sufficiently compatible with the Meyer and Allen model to accept that generalizations can be made on the basis of that model (Caldwell, Chatnam, & O'Reilly, 1990).

Meyer and Allen (1991) hypothesized that each component of commitment represented a different psychological state and thus had quite different consequences for work-related behaviour. Those with a strong affective commitment would be expected to have greater desire to contribute to the organization in meaningful ways than would those with weak affective commitment. More recent research that investigated the motivational bases of affective commitment suggested that intrinsic motivation plays a mediating role in the strength of commitment (Eby, Freeman, Rush, & Lance, 1999). The role of personal and organizational values in reinforcing affective and other forms of commitment has also been established (Finegan, 2000).

Those with strong continuance commitment remain in the organization for economically rational reasons, but there is no reason for this to lead to any strong desire to contribute to the organization. As well, if continuance commitment is the sole reason for remaining in the organization then resentment, frustration and inappropriate behaviour may result. Meyer and Allen further argue that those with strong normative commitment will be motivated to behave appropriately and do what is right for the organization in their own work performance without the enthusiasm and involvement associated with affective commitment. Meyer and Allen (1997) reviewed the commitment research literature to find support for these hypotheses.

With the research associated with the Katz (1964) first level of motivational behaviour a number of reviews reported negative correlation between organizational commitment and both intentions to leave and actual turnover where the components of commitment were not distinguished (Mathieu & Zajac, 1990). However, organizations require more of employees than their nominal membership, and in a meta-analysis of 23 studies relating commitment and attendance at work the levels of correlation between commitment and attendance were quite modest (Mathieu & Zajac, 1990). This latter analysis did not distinguish between voluntary absences over which the employee had control and those absences that the employee could not control. A review of 4 studies relating affective commitment to voluntary absence showed correlations greater than those for involuntary absence and greater than the average correlation reported in the Mathieu and Zajac meta-analysis. In contrast to the favourable effect of affective commitment, a review of 4 studies involving
continuance commitment and absence from work showed no significant relationship, and in the limited work done with normative commitment one (1) study showed a positive relationship while 2 showed negative effects. The only thing clear at this level of behaviour is the strong role of affective commitments.

At Katz (1964)’s second level of motivational behaviour, in-role performance, the role of strong affective commitments is also supported by research that makes it clear that employees with strong affective commitments work harder and better at their jobs than those with weaker affective commitments (Meyer & Allen, 1997). In 5 studies affective commitment was positively correlated with self-reports of work effort, in another 5 studies affective commitment was positively correlated with self-reported, and in 2 studies affective commitment was positively correlated with self-reported adherence to strategic decisions and organizational policy. Using more objective indicators such as sales figures, operational costs and supervisor performance ratings criteria, another 7 studies show those with strong affective commitment outperforming those with weaker affective commitment. However there were a number of studies where affective commitment was not related to indicators of in-role performance. Meyer and Allen summarised the learning from the three studies reviewed as, first, that affective commitment is most likely expressed in those aspects of job performance that employees feel are important to the organization (rather than the supervisor who may report the performance). Second, that a performance indicator will only reflect employee motivation when the employee’s behaviour is not constrained by other factors such as lack of resources. And, third, that for affective commitment to influence employee behaviour the employee must be in a position to exert control over the outcomes being measured.

The research into continuance and normative components of research indicate few positive relationships with the level of in-role performance. Meyer and Allen (1997) review 6 studies of continuance commitment that report either non-significant or negative correlations, and 3 studies of normative commitment, two of which show weak positive relationships and another no significant relationship.

While commitment to spontaneous change activity, at Katz (1964)’s third level of motivational behaviour, has not been addressed until quite recently the research studies on extra-role behaviour make some important suggestions. In one study of citizenship behaviour Morrison (1994) examined the extent that employees treated extra-role activity as part of their jobs. In other words how broadly they defined their jobs. Results supported Morrison’s prediction that employees with strong affective and normative commitments
would see their job as encompassing more responsibility and range of activity than those with weak commitment (Morrison, 1994). In another relevant study Schaubroeck and Ganster (1991) examined the willingness of the membership of 21 volunteer organizations to engage in extra-role activity. One half of the sample belonged to community service organizations, the other half to organizations where the objective was fellowship or professional activity rather than service. The researchers predicted and found that the purpose and values of the organization influenced the extra-role behaviour of members. For service organizations, affective commitment and participation in extra-role activity was positively correlated, in non-service organizations it was not (Schaubroeck & Ganster, 1991). These latter two studies suggest that commitments of an affective and normative character may be associated with the motivational behaviour involved in spontaneous change activity. This suggestion was confirmed in studies by Herscovitch & Meyer (2002), who also demonstrated that employee commitment to change was a better predictor of organizational support of change than were the traditional measures of organizational commitment.

In summary, a point has been reached where commitments relevant to spontaneous change in organizations might be tentatively specified. First, the concern is with individual and organizational behaviours that bind the organization to a particular course of action. Second, the commitments are both affective and normative in involving emotional attachments of individuals, and a sense of duty related to both individual and organizational values. Third, these commitments need to be described by both psychological states and sociological forces, if the commitments are to go beyond the individual and be regarded as organizational in character.

### 2.4.2 Relevance of commitment

The purpose of this section is to demonstrate the relevance of the concept of commitment to explanations of organizational change.

If a model of innovative change is to capture the fundamentals of doing things differently, its contextual space must lie beyond conventional economic rationality (Nelson & Winter, 1977; Schumpeter, 1939). Economic rationality is concerned with both calculability and the maximization of self-interest, but since, as Schumpeter asserted, innovation provides no valid basis for calculation, the focus of economic rationality falls on the issue of self-interest. In organizations the cognitive climate is adaptive in nature (Kirton, 1984; Kirton &
de Ciantis, 1994), and innovative ideas that challenge the shared assumptions of consensus groups often give rise to derision and rejection. As well, research into management initiative has shown that those whose ideas challenge the consensus group and fail suffer greater penalties for failure than those who fail with ideas that do not challenge group assumptions (Kirton, 1984). Under these circumstances, self-interest would have people follow group consensus at all times and decline any opportunity of doing things differently, something that does not always happen in practice.

Furthermore, there is no evidence that the strict pursuit of economic self-interest is a successful strategy for achieving innovation. Rather the widespread consensus of psychology is that individuals are motivated towards creativity and change by intrinsic rather than extrinsic rewards (Amabile, 1988, 1998; Amabile et al., 1996; Robinson & Stern, 1997). This, together with many anecdotes of organizational individuals working in ‘skunkworks’ (Peters & Waterman, 1982), the emotional accounts of engineers obsessed by their projects (Kidder, 1981), and the lifetimes of scientists spent towards important discoveries, suggest that creativity of the innovative variety has little connection with economic self interest. Accordingly, much of the activity of innovative change can be seen to lie beyond the bounds of economic rationality, and needs to be analysed on that basis.

Weber (1968) accepted that much human behaviour lay beyond economic rationality when he proposed that people are motivated by both goal (economic) rationality and value rationality. In Weber’s terms social action is value rational when it is determined by people’s belief in the value for its own sake, independent of its chance of success (Weber, 1968). For example, goals such as those in ethical, moral or religious forms of behaviour are rewards in themselves, and the behaviour of religious martyrs or of soldiers who charge across a field under enemy fire can only be explained on a value rational basis. Such behaviours might also be thought of as the extreme limit of the influence of affective and normative commitments (Meyer & Allen, 1991).

In his critique of the conventional view of the individual in economic theory, Sen (1982) emphasized the importance of value rationality, expressed through commitment. For Sen, once the concept of commitment is admitted, ‘it drives a wedge between personal choice and personal welfare’ (Sen, 1982; p.94), for when commitment exists, personal choice is not an action aimed at increasing personal welfare. Rather, a person acting out of commitment may choose to follow a course of action that will result in less personal benefit than for other available courses of action. Individuals acting counter to their own best interests
contradict the rationalistic tradition, so the concept of commitment, like innovation, lies beyond the economic rational context.

Sen also saw the commitment motive as explaining the process by which people decide on courses of action without needing to traverse the entire process of reflection available to them. Weick (1995) supports this view, explaining commitment as part of the process of sensemaking. Commitment creates an orderly pattern from all of the unorganised and diverse cognitions (such as perceptions, attributions, experiences, reasons) that are connected with evolving situations. The commitment that develops around specific actions leads to these diverse cognitions becoming organized in support of the action. Thus commitment, becomes part of an individual’s background to interpretation, and focuses attention and imposes a selectivity that affects further sensemaking (Weick, 1995).

In summary, the concept of commitment can add to current explanations of innovative change in four ways. First, commitment is a means by which things get done, and thus provides an explanation of the knowledge-action gap. Second, commitment, as innovation, lies beyond conventional rationality, and thus reflects on the fundamental nature of innovation. Third, the selectivity of commitment guides decisions where, as in innovation, uncertainties exist. Fourth, commitment leads to persistence in a course of action that runs counter to the individual’s best interest, a hallmark of innovative behaviour. No other single concept accomplishes these four necessary explanations.

### 2.4.3 Individuals and commitment

The purpose of this section is to review the research literature as it relates to generation of commitment in individuals.

The pioneering experimental work of Kiesler and his associates demonstrated commitment as a stand alone concept that was able to be manipulated, and could thus be treated as a continuous variable (Kiesler, 1971). This finding was important because everyday usage of the term commitment works on the assumption that people are either committed or not committed to certain things, whereas the research evidence suggested that people are more or less committed.

The Kiesler experiments were also important in linking a precise definition of commitment (namely, the ‘pledging or binding of the individual to behavioral acts’ (pp.30)) to conditions
that create increased levels of commitment. The following conditions surrounding individual acts increased the degree to which individuals became committed to a behaviour (Kiesler, 1971; Salancik, 1977):

- Explicit and unambiguous
- Public or visible to others
- Important to the individual
- Not easily revoked
- Performed a number of times
- Perceived by individual as involving a high degree of volition

The Kiesler research suggests that an individual’s commitment is influenced by the individual’s perception of the choices that existed in the decision to take up the course of action. The individual’s knowledge that there was freedom to have acted otherwise appears to reinforce the individual’s sense of responsibility for the behaviour. The individual’s perception of choice and feeling of responsibility also mediated other effects. For example, commitment can be affected by the offering of incentives. The higher the incentive the more that Kiesler’s subjects appeared to feel their freedom threatened, and the lower the subject’s ultimate commitment. The central role of individual freedom to choose in commitment parallels its role as the primary factor in generating intrinsic motivation (Amabile, 1988)

The literature of goal commitment follows Kiesler’s experimental formulation to investigate the relationship between commitment and performance by varying external, internal and interactive factors (Locke, Latham, & Erez, 1988). Goal commitment refers to an individual’s attachment to or determination to reach a goal, and is highly relevant to activity such as organizational change projects that normally take place in a risk-managed environment in which short and longer term goals are set and monitored. However the experimental procedures of goal commitment researchers involve static goals of constant difficulty, and this is somewhat out of tune with the dynamic nature of organizational change projects. Despite that, the goal commitment literature, as summarized in Locke et al (1988), provides useful statements on how commitment to management goals may be increased. The Lock et al (1988) article summarizes 70 or more research papers, and the following findings are reported at the summary level.

The experiments varying external factors indicate that individuals usually commit to goals assigned by trusted authority figures because they judge the assignment as legitimate. As
Salancik (1977) demonstrated that assigning a goal to a person implies that the person is capable of achieving the goal, and if the person is also free to refuse the assignment, then the person will feel responsibility for the goal. Trust in the authority figure increases commitment. There is also limited evidence that supervisors can increase commitment by supporting and showing interest in the goal.

Investigations into the use of monetary incentives produced mixed results. While there was no evidence linking monetary incentives with increased commitment, there was evidence that monetary incentives could increase goal commitment and performance for some people. Also the evidence suggests higher goal commitment for high goal than for low goal conditions, and higher goal commitment to a high goal without tangible rewards than with a bonus on offer for attaining the goal.

The internal factor of self-efficacy influences the level of commitment. There are many studies indicating that commitment declines as the goal becomes more difficult, and an individual’s expectancy of success declines. Expectancy of success is closely linked to an individual’s self-efficacy (Bandura, 1986), an individual’s own judgment of how well they can execute the course of action necessary to achieving the goal, an individual factor. Consequently, one would expect that individuals with high self-efficacy would have higher commitment to a goal than those with low self-efficacy would have to the same goal. Studies indicate this to be so for self-set goals, but less so for assigned goals. The difficulty of controlling for differences in self-efficacy may underlie the findings of numbers of studies that do not support the declining commitment effect, or found that even impossibly high goals could generate high commitment in the short-term. Individual differences in self-efficacy may also help explain the role of key individuals in change projects, champions, who the popular management literature on innovation suggest maintain their commitment and succeed no matter what the odds (Peters & Austin, 1985; Pinchot, 1985).

Interacting with others, such as by participating in group decisions, increases commitment. However the experimental evidence shows the increase in commitment to be no greater than that achievable from the supervisor assignment of goals using “tell and sell” methods. It seems more important that goals be set rather than how the goals are set. There is also evidence suggesting that the effectiveness of goal setting styles may differ in different cultural settings. What is indicated here is that for effectiveness in goal setting, management style needs to be matched to the context.
Goal commitment studies show that when individuals work in groups they are influenced by a number of factors that lead to their increased goal commitment. The level of management support to the group influences commitment to high performance, as does the alignment of assigned goals with the desires of group members, and the perceived importance of the assigned goal. There are also peer influences within a group. As Bandura (1986) explains, any responsibility to others creates social pressures to follow through, and peers may act as role models of commitment.

Using the social group as a means of increasing individual commitment to tasks is a well-established management practice, and the use of teams, popularly defined as social groups with a shared commitment (Katzenbach & Smith, 1993a, 1993b), recognized as a best-practice approach to managing innovation projects (Carnegie & Butlin, 1993; Smith & Reinertsen, 1995). As well, so called ‘high commitment’ organizations (Walton, 1985) have become almost synonymous with team-based organizations.

In summary there is a strong literature knowledge base on how to influence individuals towards increasing commitment to a particular course of action, an important factor in the management of innovation. The fact of the perceived importance of the role of freedom to choose and the individual’s sense of responsibility to the findings of this research strongly indicates that the equivalent of the affective and normative commitments of the organizational commitment literature are at play (Meyer & Allen, 1991), while the uncertain role of external monetary rewards suggests that the equivalent of continuance commitment is less at play. This further indicates that the commitment research reviewed in this section is entirely relevant to the behaviours necessary in Katz (1964)’s third motivational level concerned with spontaneous change.

### 2.4.4 Knowledge commitments

This section reviews the literature that attaches commitment to the acquisition, accumulation and use of knowledge.

The concept of knowledge commitment is associated with the philosophy of Michael Polanyi (Polanyi, 1962, 1966). Polanyi established the distinction between tacit and explicit knowledge, and the importance of tacit knowledge in human cognition. These play an important role in recent theories on knowledge creation in organizations (Nonaka & Kenney, 1991; Nonaka & Takeuchi, 1995; von Krogh et al., 2000).
Polanyi argued that personal knowledge and commitment are inextricably linked, for commitment is the structure within which personal knowledge comes into existence. Polanyi recognized two forms of awareness and knowledge, namely ‘focal knowledge’ and ‘subsidiary knowledge’. For example, in using a hammer to drive a nail one has to attend to both hammer and nail but in different ways. One has focal knowledge of the act of driving the nail, as well as subsidiary knowledge related to the feeling of the hammer in the palm of the hand. In the practice of driving nails these two knowledges merge. As one learns to use any tool the tool becomes an extension of the self, and the user becomes unconscious of the actions taken to use the tool to achieve results. In this way an intellectual tool, a subsidiary knowledge, becomes an extension of the self that through the process of personal commitment is integrated into focal awareness and focal knowledge. From Polanyi’s perspective all knowledge is commitment, and all commitments knowledge commitments.

There has been little research attention to knowledge commitments, even though they clearly exist as is found in the scientific community. Its use of peer review and the “invisible college” to provide a collective occupational and quality control (Scarborough & Corbett, 1992) is acknowledgement that knowledge commitments exist, with a subsequent risk of biasing the scientist’s background to interpretation. However, the same bias that science guards against must exists for all knowledgeable people. Whether we call it a knowledge commitment or something else, it is clear that when faced with a decision people will attend to what they know, for they cannot attend to what they do not know, reinforcing Polanyi’s philosophy that having knowledge is a commitment to the use of the knowledge.

If the concept of knowledge commitments is admitted, then the question of its relevance at the organizational level arises. An analysis of that might start with the proposition that where organizations have accumulated knowledge for the purpose of improving operational effectiveness and achieving a competitive advantage, then it is very likely that when faced with decisions the people of the organization will attend to the organization’s knowledge rather than to other unfamiliar knowledge. As with an individual, an organization having knowledge also represents a commitment to its use.

This is the effect that resource-based approaches to business strategy seek to capture. In these strategy approaches organizations with foresight about the future seek to acquire and accumulate the knowledge that will enable them to build the core capabilities (Leonard, 1995) or core competence (Hamel & Prahalad, 1994a; Prahalad & Hamel, 1990) that will provide opportunity and a sustainable competitive advantage in the future. However,
understanding knowledge as commitment also leads towards an understanding of commitment as a “two-sided coin”. Acquiring and accumulating knowledge in order to build a capability or competence in a particular area may provide for the strong commitment of the organization and its members to its use as strategists intend. However, the unintended consequence is that having produced its own knowledge environment the organization then becomes constrained by the structure it has created. The commitment to the organization’s existing knowledge base raises barriers to the acquisition of knowledge from less familiar sources, so that as the organization’s environment changes what were core capabilities can too easily become core rigidities (Leonard, 1995).

The dilemma that Hargadon and Fanelli (2002) raise about the dual perspectives of knowledge in organizations – as source of change, as well as a constraint on that change – cannot be explained from the point of view of knowledge itself, but may be able to be explained from the viewpoint of knowledge commitments, as later theory development will show.

### 2.4.5 Language

This section reviews the literature that shows how commitments are generated and diffused through language acts and conversation.

Speech-act theory (Austin, Sbisa, & Ormsson, 1975; Searle & Searle, 1970) is concerned with explaining how meaning is derived from the structure of language acts. The theory points to a class of utterances, termed ‘performatives’, that, by their utterance, constitute acts such as promising or threatening (Austin et al., 1975). It further demonstrates that all speech acts contain so called ‘illocutionary points’ that can be classified under five categories (Searle & Searle, 1970) which are assertives, directives, commissives, expressives, and declarations. These commit the speaker in some way, attempt to get the hearer to do something or make pronouncements about something. According to the theory, the illocutionary point of an utterance can be distinguished from its ‘illocutionary force’ and its ‘propositional content’. Speech acts may differ in their force while having the same illocutionary point, while a proposition may or may not be involved. However, what is important is that the illocutionary point specifies meaning in terms of the patterns of commitment entered into by both speaker and hearer through their participation in the conversation. In speech-act theory, commitments are constituted by language and human interaction.
This connection between language and commitment is supported by Habermas who argues that every language act has consequences for participants that lead to immediate actions or to commitments to further actions (Habermas, 1979). Making any statement is making a commitment to act in an appropriate way in the future.

The ideas of speech-act theory are supported by the explanations of commitment from individual psychology (Kiesler, 1971; Salancik, 1977) that were covered in previous Section 2.4.3. Clearly statements made in the presence of others are explicit and presumably relate to matters that are important to the individual at the time of making the statement. There is also a reasonable assumption that individuals make statements of their own free will most times, and that a statement explicitly made is impossible to revoke and difficult to retract without loss of face. In other words, speech-act theory reinterprets the findings of individual psychology in the context of conversation.

2.4.6 Sensemaking

This section examines literature that explains how commitment contributes to the sensemaking processes of individuals and organizations. People make their own sense of things through their commitments, and, consequently, their commitments influence their interaction and relationships with other people.

In a literal sense, sensemaking is about making sense of a situation. The way that people do that is to construct events that are sensible in their own minds. What they construct, how they do it and what effect it has are the questions pursued by researchers into sensemaking processes (Weick, 1995). Many researchers treat sensemaking as involving people in using a “framework” of some type to organize stimuli to help them explain events. However the psychology of sensemaking goes further than that, for sensemaking is also associated with an individual’s need to maintain esteem and a sense of identity (Weick, 1995). This need is manifested in individuals ‘enacting’ their own version of the environment (Turner, 1987; Weick, 1969, 1995). Weick (1995) emphasises that the use of the word ‘enactment’ preserves the idea that people in organizations produce part of their own environment by constructing a reality based on their own pronouncements, in the same way as government legislators. Having produced their own environment, people then become constrained by the environment they have created.
The sensemaking process is influential in the way that people go about interacting and transacting with others (Ring & Van de Ven, 2000). At the beginning of a process of interaction the parties will enact their individual versions of the situation, and attempt to integrate these with the enactments of the other parties. If people’s enactments are not confirmed by the enactments of others then the sensemaking process may be reframed and re-enactments occur in order to secure confirmation. However, if people’s enactments fail to be reinforced by others, the situation will not make sense to them and the co-operation necessary to continuing the interaction will not be achieved (Turner, 1987).

The sensemaking process and people’s enactment are affected by their commitments, and this, in turn, will influence their social interaction. Weick (1995) points out that commitments are a source of both order and value. Before commitments are made cognitions of many kinds - for example, perceptions, experiences, reasons - are loosely connected to the evolving situation. However as a specific action attracts commitment these various cognitions become organized into those supporting, those opposing and those that are irrelevant to the action. This provides a basis for decision and action, and as Zimbardo says, deciding to act changes what people know (Zimbardo, 1969), and from Polanyi (1962)’s reasoning, what people know will be expressed in their commitment.

Making decisions imposes value on the knowledge involved (Weick, 1995). When choices are made people gather reasons why it was a good choice, focus attention on it to uncover more features in support of the decision, and the time spent on this is at the expense of other things. This raises the value of the knowledge involved at the expense of other knowledge. Consequently, commitments have the dual effect of organizing cognitions and focusing people’s attention on the objects of commitment, as well as imposing perceived value on the knowledge involved. These then become part of people’s background to interpretation (Gadamer, 1977), and impose an individual logic on the individual’s future interpretation of events and actions.
2.5 Organizations and Commitment

2.5.1 Organizational view of commitment

This section examines how an organizational level of commitment that is distinct from the individual commitments of its members might be defined, and what would constitute this commitment.

As discussed in previous Section 2.4.1 the literature provides no specific commitment term for an organization’s commitment to its members, to other entities or to organizational courses of action. These things are covered in business language through terms such as strategy, core competence, corporate values and corporate culture, that infer an organizational level commitment of some type towards a specific business direction or business behaviour. So as not to be confused with the conventional usage of organizational commitment as relating to the attachment of employees, this type of commitment will be referred to as organization level commitment in the following discussion.

An organizational level commitment must mean something more than simply the sum of the commitments of an organization’s members, although it must account for the commitments of individual members. Furthermore, as Weick (1991) points out, there is no valid basis for applying the metaphors of individual psychology to organizational level problems (Weick, 1991). Ideally, a model of organizational level commitment would have a sociological basis, and this would be derived from the things that the organization’s members share together in their social collective. A basis for understanding what is shared within the collective is the structure and sharing of the knowledge of the organization, referred to as the ‘culture space’ of the organization (Boisot, 1994a) and reviewed in previous Section 2.3.8. In the spirit of Polanyi (1962) one might immediately hypothesize that the different types of knowledge identified in that section also represent commitments, and because these different types of knowledge are of different character they may give rise to different types of commitment. And if Weick (1995)’s view of commitments and sensemaking is accepted (refer Section 2.4.6), then these commitments, by focusing the organization’s attention on the knowledge and imposing value on it, will help to define its culture and the identity that is linked to it (Hatch & Schultz, 2002).

However, an organization generates many other commitments in the course of its business activities. No business organization can exist in isolation. To establish and maintain itself it
must assume formal commitments with customers, suppliers, other business organizations and government instrumentalities. The organization’s members may be individually committed to meeting the organization level commitments, but customers, suppliers and others look to the organization, as well as its members, to fulfil its commitments to them.

Following sections of this chapter gather together the literature contributions to an organizational level view of commitment.

2.5.2 Commitment and innovation

In previous Section 2.4.1 it was reasoned that the types of commitment that the organizational commitment literature referred to as affective and normative were appropriate to generating the motivated behaviour necessary for spontaneous change. In previous Section 2.4.3 it was also shown that the descriptions of individual and goal commitments were compatible with descriptions of affective and normative processes. So it is clear that the menu of techniques provided by the individual and goal commitment literature provide the opportunity to raise the level of motivated behaviour in innovation projects with positive effect on both the frequency of their initiation, and the efficiency of their completion. But these techniques are, of course, the same as necessary to achieving high performance in any organizational activity.

Managers of innovation might claim that their task requires them to manage the sources of commitment more cleverly than do other business managers. The environment of an innovation task is likely less structured, the outcomes less predictable, the risk of failure higher, and thus the future less certain than other organizational tasks. However, relevant research such as that of goal commitment is about comparing commitment levels on the one task, and not about comparing level of commitment across different tasks. Consequently, the research does not inform on whether the task of innovation requires a different level of commitment than other organizational tasks. However, if, as this research study contends, commitment is a driving force of change, there is need to reason further with the issue.

In relating the concept of commitment to making of innovative change one needs to start with Kiesler (1971)’s founding principle that commitment is a continuous variable. So if we were to think of commitment in innovation as a continuum, at one extreme would be a simple willingness to act out the behaviour associated with a task. At the middle of the continuum there might be an enthusiasm for undertaking and completing the task. Finally, at
the other extreme, there would be a high level of persistence in undertaking a task, and in influencing others towards the completion of the task that might need to be extreme, unreasonable and irrational in nature. The scale that might thus be required to describe the range of commitment necessary for innovation goes from a mild agreement to do something, to a bulldozing, seemingly irrational aggression towards completing a task, despite all odds.

If innovative change is understood as an activity that involves overcoming individual and organizational inertias and resistance to change, and an activity that involves high levels of persistence in communicating with, interacting with, and influencing people at the various stages of knowledge creation, then high levels of commitment are clearly necessary. Moreover, the level of commitment to an innovation project that might be described as a driving force, will likely lie at the irrational end of any behaviour continuum. There are a number of reasons for that view.

First, both the popular and academic literature on innovation and change emphasize the key role of intrapreneurs (Pinchot, 1985), product champions (Howell & Higgins, 1990; Maidique, 1980; Peters, 1989), change masters (Kanter, 1983), and unconventional individuals (Steiner, 1995), who persist and succeed in implementing innovation no matter what the odds. For Peters (1989), ‘only the “unreasonable” champion can succeed’ (p.246), and while success might require admirable personal qualities of ‘energy, passion, and idealism’, it also requires qualities from the dark side of personality - ‘cunning, towering impatience, an unrealistic unwillingness to allow any barrier to set him back, and love-hate relationships among his subordinates’ (p.248). The words used by Peters, such as passion, idealism, towering impatience, and unrealistic unwillingness, all suggest highly committed behaviour.

Second, there is a healthy literature concerned with the results of over commitment or irrational commitment to a task. The literature on escalation of commitment, commencing with Staw (1976), and the literature on psychological entrapment, commencing with Rubin and Brockner (1975), inform on irrational commitment in the individual sphere. The literature on groupthink is concerned with the same issues in the group sphere (Janis, 1977, 1983). Each of these literatures extends the scope of their explanations to cover irrational decision-making at all levels of organization, and in national policy-making.

However, a significant feature of the three literatures is their focus on significant failures when judged against economic rationality. These literatures systematically neglect forms of rationality that lie outside the technical sphere, what Weber referred to as substantive
rationality - rationality based on value commitments, that can claim no support in a scientific sense yet have observable impacts (Brubaker, 1984). The commitment of a soldier, who charges across a field under enemy fire, cannot be explained on any formal basis of rationality. Any explanation lies in the terms of individual and cultural values and commitments. Similarly, economic rationality does not explain the development of extreme levels of commitment in religious cults and communities (Kanter, 1968, 1972) or even in strong business cultures (Collins & Porras, 1994). Also, since these literatures do not investigate other than failures, they do not preclude the possibility that the same forms of irrational behaviour that led to failure in the context studied might also have led to success in other instances. For example, the laudable qualities of perseverance that led Art Fry to spend over 8 years in the successful task of commercialising the well known 3M Post-it Note (Pinchot, 1985), would have been judged as irrational behaviour if he had failed. The point to be made is that much of the individual commitment in innovation might similarly lie in the irrational sphere of activity.

Third, previous Section 2.4.4 introduced the concept of knowledge commitments and the need for collective quality control in the scientific community. This need does not arise from any inherent dishonesty in scientific people, but rather that scientists, as other people, can become overly committed to their personal knowledge and act irrationally in promoting its use.

The reasoning above confirms the view that that commitments to innovation and change may be, and may need to be, of an extreme nature. Accordingly, for the purposes of modelling such behaviour it is reasonable to rely on that part of the commitment literature that deals with behaviour that is known to go beyond the bounds of formal rationality in actual situations – that is behaviour in escalation situations. The assumption is made that the underlying psychological and organizational mechanisms underlying escalation are the same as those that promote persistence in pursuit of a course of action.

Staw and Ross (1987) provide a comprehensive summary of research into escalation situations. They group the research literature and categorize the variables that promote over-commitment to or undue persistence in a course of action under the headings project, psychological, social, and structural determinants, and their terminology will be adopted in this research study. The Staw and Ross thesis is that these determinants, while ultimately acting together, move from the rational (project) to the more irrational (structural) in sequence. The problem with this interpretation is that any project starts from the creative acts of individuals and before there is a rational organizational basis on which to work.
Here, with the focus on innovative change, the concern is more about how the determinants of commitment relate to knowledge creation in the organization. The nature of these classes of determinants and their implications are explained in the following four sections. Their relationship with the organization’s knowledge base is shown on Figure 2.3 below.

Figure 2.4: Commitments in Innovation
2.5.3 Psychological factors

As the category name suggests, psychological determinants bind individuals to a course of action through psychological mechanisms, such as those covered in previous Section 2.6.3 as well as other processes that Staw and Ross (1987) review. Included in these latter determinants are errors and biases in individual information processing, such as biasing facts in the direction of their own beliefs (Nisbett & Ross, 1980), that cause people to persist in courses of action. Also, persistence can result from the framing of problems (Kahneman & Tversky, 1979). People are more likely to take risks, and persist, where problems are framed in terms of losses rather than gains. As well, there are the personal knowledge commitments that were discussed in Section 2.6.4.

Relating the psychological determinants to the knowledge creation cycle, it is clear that individuals are the problem solvers, and the knowledge that informs the problem solving process is, at the first stage, personal and uncodified. In the problem solving process, it is persistence in individual behaviour, or commitment, that sees the object of the commitment, the design problem, from its unstructured beginnings through to its completion as a finished design, a physical prototype or a formalized procedure. In other words, it is commitment that effects the transformation of knowledge from uncodified to codified forms. Without commitment the transformation would not take place. In summary, as defined here, the psychological determinants of commitment are associated with the problem solving process of knowledge creation, or in practical terms the design phase of a change process.

2.5.4 Project factors

Project determinants relate to the objective features of projects and have a basis in economic rationality. Where people have objective information that the outcomes of a specific project will be beneficial to them, then it would be rational for them to be committed to the project. Similarly, at an organizational level, if the analysis of a business project shows it to have an economic benefit, then in accord with economic rationality, one would expect the project to proceed. The decision to proceed, the justification of the decision to higher levels of management, and the planning and actions towards implementing the project, would both generate and demonstrate the organization’s commitment to the progress of the project.
However, a convincing business analysis can only take place where explicit knowledge about the project variables, and people who are capable of undertaking standard methods of financial analysis, exist. Furthermore, explicit knowledge about project variables exists only after the transformation of knowledge from uncodified forms to forms of codified proprietary knowledge. But a project needs resources well before this stage of the project is reached. How do managers overcome the dilemma that resource owners require business plans based on explicit codified knowledge, while those who need the resources can only respond to that requirement with incomplete and uncodified knowledge, conditions where conventional financial evaluation methods do not work (Myers, 1984)?

The answer to the dilemma is that formal business plans for new ventures are written primarily for the purpose of attracting resources, and secondarily for formalizing the internal and external relationships necessary to seeing the project completed (Tidd et al., 2001). This does not mean that financial evaluation is necessarily neglected, but it does mean that the evaluation needs to be tailored to the opportunity. It is endemic in new ventures and innovation projects for revenues to be overestimated and cost and completion times to be underestimated. Is this the result of the naiveté or biased judgments of innovators? One answer is that few projects get to start where the key people are pessimistic about its chances, or the resources required are unreasonable. For example, in 1957 the Sydney Opera House was estimated to cost $7 million and to be completed by the end of 1962. It was finished in October 1973 at a cost of $102 million. Clearly if the people of NSW had known the ultimate cost in 1957 the project would have never started. Was the Premier of NSW, Joe Cahill, who championed the project in 1957, a naïve dreamer or a clever pragmatist who knew what was necessary to get a great project underway? Every champion of an innovation project in its early stages is in Joe Cahill’s position. Maybe the only way to get commitment to a large and unreasonable project is to start by getting commitment to something that is relatively small and reasonable.

So if one takes a pragmatic view of innovation projects, the answer to the question of how do we get the project started is to do what is necessary to gain the commitment of the key people who control the resources. A purist might feel that the Joe Cahill technique was deceptive practice, but pragmatists might see it as simply what is necessary to overcome petty thinking in order to get great things done.

Finally, project determinants are associated with the process of creating market knowledge from an organization’s proprietary knowledge.
2.5.5 Structural factors

Structural determinants of commitment are concerned with the structural, institutional, administrative, and political forces that influence individuals and organizations to persist in a course of action. However, with structural factors the commitment forces are generally aligned with the status quo, so the result is to persist in what the organization has done well in the past.

Organizations are designed to respond in a consistent, habitual manner through standardizing their problem solving processes and solutions (March & Simon, 1958). Furthermore, the successful problem solutions of the past may influence the problems that the organization chooses to solve (Cohen et al, 1972). Consequently, organizations tend to persist in the behaviours they know best, and if an organization is practiced at an activity that have led to well developed organizational routines (Nelson & Winter, 1982), then it will conduct that activity more effectively than will other organizations with less well developed routines. Where such routines are embedded in the collective knowledge of the organization, and thus tied integrally to the norms and values of the organization, then it can be said to be institutionalised in the organization (Zucker, 1977). However, if the environment changes and causes the institutionalised activity to becomes less relevant then it will be difficult for the organization to change for the organization has to unlearn its old routines and learn new ones.

Becker (1960) has also pointed out that many organizational decisions have ‘side bets’ associated with them. For example, as an innovative project is designed, developed and implemented over time, many personal, economic, technological, and political side bets go along with it. People develop knowledge commitments during the design process, and implementation may require investments in new people, buildings and equipment, as well as in the development of new marketing channels. All of these commitments and investments are side bets that raise the stakes of any decision to persist or withdraw from the project. Side bets help lock an organization into its chosen course of action, but on the down side develop a feeling that there is ‘too much invested to quit’ (Teger, 1980) that can lead to inertia in decision making and delay in making necessary strategy changes.

The structural determinants of commitment influence the absorption process (Cohen & Levinthal, 1990) by which the codified public and market knowledge is transformed into the uncodified collective knowledge of the organization. However the organization’s tendency
to continue to do what it has done in the past, and the many side bets developed over time are commitments that focus the organization’s attention on the past and imposes undue value on the organization’s current knowledge base. These become part of the background to interpretation of key decision makers that influences their sensemaking, and subsequently leads them towards creating consistent responses from the environment’s varying stimuli. This is not the traditional way of learning that is about eliciting different responses to the same stimulus (Weick, 1991). Consequently the absorption process is a drawn out one that lends itself to time delay effects such as described by the term administrative inertia.

2.5.6 Social factors

Social determinants of commitment are concerned with the social pressures that hold an individual to a course of action. However, these social forces work towards reinforcing the social norms of the organization, so whether the commitments are for and against change depends on these norms.

Where the organization’s norms are ones that embrace change through such things as welcoming new ideas and encouraging risk taking, then social commitments will reinforce the norms. In contrast, where the norms are about avoiding risk, being critical of new ideas, hiding mistakes and face saving, things that might work against change, these will be reinforced. Clearly, any organization will show some tendency to demonstrate all of the things mentioned, for no organization will be devoid of resistance to new ideas, have no limits on risk taking or have no face saving, it is more a matter of how much and what balance results.

The research into escalation of commitment effects provides much information on the commitment mechanisms that bind people to courses of action in organizations. For example, people may go to great lengths to hide their mistakes from others, and look to save face by persisting in a losing course of action (Brockner, Rubin, & Lang, 1981; Fox & Staw, 1979). People have been shown to persist longer in a course of action where they are in personal conflict and competition with others (Teger, 1980). Modelling effects are important in organizations especially in ambiguous situations such as innovative projects (Bandura, 1977), and people are more likely to persist in a course of action where others have also committed to the course of action (Brockner et al., 1984). As well, organizations have norms that encourage consistency of behaviour, value persistence as a sign of strong leadership, and reward persistence that leads to ultimate success (Fox & Staw, 1979).
The social determinants of commitment are associated with the organization’s collective knowledge and work at an uncodified level. They influence how individuals interpret the organizations collective knowledge and what of it is relevant to be retained as personal knowledge, and what of this personal knowledge should be considered relevant to the problem solving process in the organization.

### 2.6 Chapter summary

This chapter’s review of the innovation literature indicates that the metaphor of innovation that was established by Schumpeter’s work has become abused by economic, political and ideological factors, and its definition subsequently confused. For the field of innovation research to accumulate knowledge it has to achieve consensus on a concept of innovation that has general applicability, as well as capture the fundamental nature of the innovation process in its models. The traditional models used in innovation research are also devoid of explanation of what motivates the innovation process.

This chapter’s review of knowledge literature has identified the knowledge necessary for innovation and organized it into an analytical framework that allowed the connections between knowledge and commitment processes to be examined. It has also demonstrated that the concept of knowledge is not capable of explaining innovation, even though the knowledge management and innovation literatures adopt this as a central stance.

The review of commitment literature explained why the concept of commitment is relevant to explaining the motivation of innovation processes. The research literature grouped under the heading of organizational commitment is not directly relevant to the problem of innovation since it focuses on relationships between an organization and its members rather than reflecting an organizational viewpoint. The literature on non-rational commitment behaviour was re-interpreted to accommodate an organizational level view as well as a basis for explaining the motivating forces involved in knowledge creation in an organization.

However, from the viewpoint of achieving an understanding of dynamics of knowledge and commitment in innovation, the relationships described by the current literature are not substantial enough to provide:
1. A strategic view of the role of knowledge and commitment in the development of organizations.

2. Descriptions of the internal relationships between knowledge and commitment other than for commitments of a generative nature. The literature provides no account of the role of commitment in the organization’s background to interpretation.

3. An explanation of how commitments are diffused throughout an organization over time, and the dynamics of commitment in organizational change processes.

Chapter 3 will extend on the literature of this chapter towards overcoming the above shortcomings and achieving a more comprehensive understanding of the role of knowledge and commitments in the internal change processes and overall development of organizations.
3 Chapter Three: Theory Development

3.1 Chapter introduction

This chapter takes ideas from the Chapter 2 literature review of innovation, knowledge and commitment, and with the help of additional literature extends it in two ways. First, towards re-conceiving innovation as a business practice that occurs on an adaption-innovation continuum, and thus providing a basis for a strategic level analysis of innovation, knowledge and commitment. Second, towards a model of the diffusion of commitments in organizations that informs the process of knowledge creation and the organizational change process.

The first theory development is covered in Sections 3.2.1, 3.2.2, 3.2.3 and 3.2.4. It begins by developing a proposal for a measure of innovativeness that will form part of the investigations of this study. The proposal is extended towards formulating a business practice continuum that recognizes that practical change programs on a continuum of innovativeness. This thinking is extended towards examining the modes of organization necessary for innovation, and defining the possible strategic routes to innovation of developing organizations.

The second development is concerned with the organization’s internal processes of knowledge creation and the role of commitments in motivating the process.

Sections 3.3.1, 3.3.2, 3.3.3 and 3.3.4 review the shortcomings of the traditional concept of communication, introduces the concept of transaction as the mechanism for resolving social values and generating commitments to action, introduces the concept of the social transaction and examines the organizational factors that influence its resolution.

Sections 3.3.5 and 3.3.6 develop an understanding of the internal workings of the social transaction, the differences between formal and informal styles of transacting, and how why and where social transactions arise in organizations.
Sections 3.3.7 and 3.3.8 develop an understanding of cognition as a social rather than an individual phenomenon, setting the basis for an organizational view of knowledge and commitment. The theory of autopoiesis, or self-reference systems, is introduced.

In Section 3.3.9 the theory developed in previous sections is applied to the formulation of an autopoietic model of knowledge and commitment in organizations, and this provides for the development of the commitment model of organizational change outlined in Section 3.3.10.

Final Section 3.4 identifies research questions that are suggested by both the strategic and autopoietic models of innovation, knowledge and commitment in organizations.

3.2 Innovation as an organizing principle

3.2.1 Re-conceptualizing innovation

As a result of the Chapter 2 review, the conclusion was made that since innovation cannot be defined with a reasonable degree of precision, any pronouncement about the relationship between it and other concepts will always be unreliable and inconsistent. Resolving this requires a re-conceptualisation of the problem, as Fiol (1996) suggested.

The question is how might researchers conceive of innovation in a way that does not conflate the variable innovation with other variables such as creativity, successful outcomes, and knowledge as does the business definition (refer previous Sections 2.2.1 and 2.2.2.1), without creating a discontinuity in innovation research? What is needed is a framework within which the definitions of past researchers may be able to be accommodated. The following treatment extends the work of researchers into the concept of product innovativeness (refer previous Section 2.2.2.1), the directions set by Waters (2001), and the suggestions of Salavou (2004).

The suggestion of this study is that researchers return to Schumpeter’s distinctions of creative response (Schumpeter, 1947), and adopt a framework in which innovation, as broadly defined, is conceived as occurring on a continuum of business practice. At one extreme of the business practice continuum is a hypothetical pure innovation in which everything is done differently, and at the other extreme pure adaption where things may be
done better, but nothing is done differently. This terminology corresponds with that of adaption-innovation theory (Kirton, 1976, 1984, 1994a, 2003). The framework would rely on the assumption that any management change initiative can be positioned on the business practice continuum between the extremes of pure adaptive and pure innovative change.

Schumpeter went to great length to explain that adaption can never add up to innovation (Schumpeter, 1947). However, while not denying that Schumpeter’s fundamental dictum might well apply to economic thinking, it is easily recognized that any business practice will be constituted of both adaptive and innovative responses, and the balance of the two will logically determine the innovativeness of the business practice. As a simple example, in the release of a new motor vehicle there may be new features introduced that represent different ways of doing things, or innovations, such as a different body design or a newly developed safer braking system. However, there may also be changes to basic elements that may be intended to do things better for safety, comfort and performance. The innovation literature would refer to these creative responses of the adaptive variety as incremental innovation. However, there will be very many more things that add up to the conventional concept of a motor vehicle that will remain unchanged. The new model will not change the concept of a motor vehicle or the existing practices of the industry yet will be different, in part, to vehicles that went before. So with a great number of adaptive responses and a few innovative responses the changed business practice (new model) would tend to be positioned at the adaptive end of the business practice continuum.

A business start-up provides an example of business practice that will mainly consist of innovative responses and be positioned at the innovation end of the continuum, for with a start-up there is no existing structure or practice. In contrast, in a mature organization a business practice will rarely, if ever, consist totally of innovation, for the change program will normally build on the existing practice and prevailing structures of the organization.

What are the factors that position a particular practice on the business practice continuum? Following the reasoning of adaption-innovation theory (Kirton, 1984), adaptive ideas that are sourced from within existing practice, are relatively easy to understand, thus are relatively easy to implement. In contrast, innovative ideas, challenge prevailing assumptions, may be difficult to understand, and will require additional knowledge to be generated before the practice can be implemented. The point is that the position of a practice on the business practice continuum is related to the knowledge shortfall that has to be overcome before the practice can be implemented. Lack of knowledge is what constitutes uncertainty (Perrow, 1967).
Researchers have identified a number of factors that contribute to the level of uncertainty of a particular business initiative, and can be used for estimating the initiative’s position on the business practice continuum, namely: business creation strategy (Porter, 1985, 1996); existence of structure (Perrow, 1967); novelty of technology and market (Tidd, 1997; Tidd et al., 2001); predictability of outcome and difficulty of process (Van de Ven & Chu, 2000b); level of performance increase and/or cost reduction (Leifer et al., 2000); level of user learning and behaviour change (Lee & O'Connor, 2003). In this study these factors are used to develop a measure of innovativeness based on the continuum described in the following section.

3.2.2 Business practice continuum

The following analysis extends on Perrow (1967)’s conceptual framework relating the uncertainty of process to the understanding of process, and on the work that extends it towards examining the organizational implications of turbulent environments (Boisot, 1994b). On the basis of the connection between uncertainty of process and turbulence (defined by Boisot as a lack of understanding) and innovation process, the framework has been further extended towards understanding the issues of knowledge and commitment associated with innovative practice (Waters, 2000, 2001), as summarized below.

The conceptual relationship between the level of business practice and the extent of new knowledge requirements is shown diagrammatically in Figure 3.1 below. On the vertical axis, business practice varies from the purely adaptive (A) to the purely innovative (I). On the horizontal axis knowledge, consisting of its various forms as discussed in Section 2.3.1, varies from a Low to a High level. The curve K K’ represents the minimum knowledge requirements for effective implementation of the business practice. Adoptions require a relatively low level of new knowledge; innovations require a relatively high level of new knowledge. At the limits of the continuum a fundamental innovation may require a great deal of new knowledge and time for implementation of the practice. For example, Einstein’s ideas on quanta were published in 1901, but it took over fifty years of further knowledge development before the first commercialisation of these ideas via the transistor. At the other limit of the continuum a business practice consisting purely of adaption would require little new knowledge for its implementation. The actual shape of the curve KK’ is a matter of conjecture, although it is reasoned that the curve would be asymptotic with the two axis as shown.
It follows from the above reasoning that if an organization operates on the curve KK’, or in the space to the right hand side of KK, then it has the knowledge to implement a business practice at the particular level denoted by its position on the continuum. It also follows that if the organization operates in the space on the left hand side of KK’ then there is a lack of knowledge, or uncertainty, the distance to the curve KK’ being a measure of that uncertainty. This conceptualisation allows the different modes of organizing necessary for effective implementation to be examined.

Organizations that operate in an adaptive mode with a low level of knowledge creation capability (that is in the lower part of curve KK’) and wish to become more innovative are limited to incremental, adaptive strategies, for they can only adjust to external events with a limited understanding of the implications of their actions. One might best describe their available strategy as “innovation improvement through small experiments”.

However, there are other organizations that operate in an adaptive mode yet have a high knowledge capability through many years of past learning. These organizations would be situated in the lower right region of the business practice space, and would have a strategic option of using their knowledge to fine-tune their business towards higher technical and dynamic efficiency. The electricity industry and the vehicle manufacturing industry are representative of this type of company.

There may also be organizations that operate at an innovative level of business practice (that is the upper part of KK’) that have a high level of knowledge creation capability and many strategic options based on that capability. This may be a description of those companies approaching systemic or fifth generation innovation (Rothwell, 1992), if there is such a thing. Many business writers perceive certain global companies such as Microsoft, Hewlett Packard, Nokia and 3M as approaching systemic innovation.

There are many organizations that operate at an innovative level of business practice without a commensurate level of knowledge capability (that is, situated in the top left hand region of the business practice space). The organizational resource necessary to dealing with innovative business practice of this nature, with its high level of uncertainty, lack of structure and low level of understanding of the task, is human creativity and risk taking. This resource is best referred to as entrepreneurship (Perrow, 1967), the human capability at the basis of all innovation for some authorities (Drucker, 1985; Schumpeter, 1928, 1947).
In summary, this analysis has identified at least four types of organizational activity within the scope of the business practice associated with innovation, as defined in business terms. The four activity types and operating principles, innovation improvement, technical and dynamic efficiency, entrepreneurship and systemic innovation are shown on Figure 3.2.

Figure 3.1: Business Practice Continuum
Figure 3.2: Organizing Principles for Innovative Business Practice
3.2.3 Organizing for innovative business practice

Since each of the types of activity identified in Figure 3.2 is associated with a different level of uncertainty and knowledge they represent different modes of coordination and present different organizational design criteria (Galbraith, 1973). One might ask whether the different types of activity and modes of coordination should be matched to a known organization typology (Mintzberg, 1979), or strategy-structure configuration (Miller, 1986), or whether it would be more effective to accommodate the different modes of coordination necessary for operational effectiveness?

This question is subject to an ongoing debate between the organizational typologists represented by Mintzberg and Miller, and structural contingency theorists (Donaldson, 1996; Lawrence & Lorsch, 1967). The detailed argument is beyond the scope of this review, although there is strong evidence of the advantages of organizational differentiation and diversity in innovative business practice (Kaltoff et al., 1997; Pavitt, 1991), and accommodating different modes of coordination may be essential to creating the knowledge necessary for innovation (Waters, 1997). At the same time, in the implementation stage of any change project integration, collaboration and coordination of organizational functions is essential. This strongly suggests that for innovative business practice it is simply inappropriate to use the same coordination device throughout an organization as typologists suggest. The point to be made is that in solving any problem, effectiveness is achieved when the style of problem solving (organizational structure) is matched to the problem (innovative business practice), but with innovative practice the problem is a moving target.

To illustrate the dynamic nature of the problem refer to the curve LL’ of Figure 3.1. This curve represents the locus of a typical innovative change project or new business start-up, over time. At position L, with an innovative idea, no structure and little knowledge to support the task at hand, the appropriate process for proceeding is entrepreneurship. The only possible path for progress is to create more knowledge about product, processes and market so as to reduce uncertainty. In other words, the project develops by moving to the right and towards the curve KK’. Over time, the project must be structured and seek the efficiency and stability necessary for a profit to be earned, and so the project targets the lower right region of Figure 3.1 – that of efficiency and relative stability. In the development of the project the organizational structure problem will have changed from position L to position L’, and maybe through an intermediate position similar to position K’, with each of these three positions representing a different mode of coordination. The
problem for innovative business practice is how to manage the organizational structure so as to be effective along the locus of development described by LL’.

If the separate modes of coordination suggested by the complementary business practice activities of Figure 3.1 are to be accommodated, then thinking has to go beyond any simplistic idea of a best practice organizational typology for innovative business practice. Rather, it may require the conventional thinking on organizational structure to be challenged by ideas such as the ‘hypertext organization’ (Nonaka, 1990; Nonaka & Takeuchi, 1995) that conceives of organization as interconnected and overlapping layers or contexts in which the layers of organization become different problem solving contexts that are available to match the organizational problems as they arise.

Other prominent authorities have suggested that the ideal organization for accommodating the necessary modes of coordination of innovative practice is a self-organizing system (Morgan, 1986; Quinn, 1997; Quinn et al., 1996), where disaggregated individuals and units come together naturally to respond to organizational problems as they arise. The practical basis for self-organizing systems is said to be appropriate coordinating software providing ‘superabundant’ information (Quinn, 1997; Quinn et al., 1996), appropriate incentives, and ‘letting go of control’ (Sherman & Schultz, 1998; p.85).

The popular management literature presents a more simplified view of systemic innovation as being obtained through certain practices of leading innovative companies, and offering these practices as normative best practice approaches to innovation. However, as this section has demonstrated, systemic innovation is only one of the modes of coordination necessary to innovative business practice, and best practice does not inform on how to get from one mode of coordination to another, or how to maintain the complementary nature of the necessary modes of coordination. Adopting a way of organizing that is appropriate to only one of the necessary modes of coordination of innovation practice will not lead to effectiveness.
3.2.4 Three routes to innovation

The Peters and Waterman (1982) analysis of ‘excellent’ companies was the forerunner of 20 years of popular management literature about how top companies go about successful business innovation (Christensen, 2000; Collins & Porras, 1994; Hamel & Prahalad, 1994b; Higgins, 1995; Jellinek & Schoonhoven, 1990; Kaltoff et al., 1997; Kanter, 1983, 1992; Nonaka & Takeuchi, 1995; Peters, 1989, 1999; Senge, 1990a; Zangwill, 1993). This literature is prescriptive in nature and emphasises descriptions of what successful companies are observed to do, while paying less attention to the essential questions of how and why that might allow the ideas to be transferred to new contexts (Van de Ven, 1986). One cannot plan a journey without an understanding of the starting point, however this literature, being normative in nature, pays great attention to the destination while neglecting the starting point, and how it might influence the processes of achieving the destination.

The Figure 3.3 suggests that there are three routes to a more systemic innovative practice and these involve three different processes (Waters, 2001). The three processes will be referred to as ‘strategic intent’ (Hamel & Prahalad, 1989), strategic learning, and paradigm breakout.

Process 1, strategic intent, follows from Section 3.2.2 that discussed how new business creation projects exist at the innovative end of the business practice continuum with additional knowledge required for their development. Entrepreneurship was the suggested way forward. Studies of radical innovations in small companies confirm that an entrepreneurial orientation is both the reason that such projects were chosen and the means by which such projects are managed (Salavou, & Lioukas, 2003).

Process 1 is a process of moving forward, despite the uncertainty, in the belief that sufficient knowledge will be generated to reach the curve KK’, and that a successful outcome will be achieved. This is a high uncertainty, high-risk, high-rewards route to systemic innovation.

It should be asked how an organization working in an unstructured, unstable environment sees its way forward in this way. Firstly, key people involved in its leadership must be capable of working with uncertainty and ambiguity, and without the guidance of formal structure (Kirton, 1994b). With the appropriate people, it becomes a matter of ‘riding the turbulence’ (Boisot, 1994b), and accepting that knowledge creation takes time. This knowledge will then build as an organizing pattern and focus that will override the
environmental uncertainty and instability. This is the process referred to as ‘strategic intent’ (Hamel & Prahalad, 1989). This is also a description of the process of generating commitment (Weick, 1995).

In explaining Process 2 - strategic learning – an organization may not start at the innovative end of the business practice continuum, rather it may find itself in a relatively stable environment by opting to produce established products for established markets (at position K of Figure 3.1, say). This strategy has the advantage that the organization can make incremental, low risk, moves towards a more innovative business practice by continually building its knowledge creation capability. In other words, Process 2 is about continuously improving knowledge and innovative business practice capability through moving up the curve KK’. An organization such as the 3M Company, that was founded over 100 years ago without the benefit of any original idea, provides an example of the process. The company’s history is of continually improving its performance in innovative business practice by following corporate strategies that recognized the value of innovative practice, and by adopting incremental approaches to knowledge creation (3M, 2002; Gundling, 2000). Process 2 is about commitment to innovation and learning.

To explain Process 3, paradigm breakout, in Section 3.2.2 the point has been made that many companies in relatively stable industries have a high degree of knowledge capability. The electricity generation and supply industries in any developed country would be the typical example. These industries are focused on technical efficiency and, as a consequence, have been successful adopters and major beneficiaries of management techniques at the adaptive end of the business practice continuum such as Total Quality Management (Hilmer & Donaldson, 1996). However, concentrating on adaptive management techniques will have the effect of reinforcing an adaptive culture at a time when the pace of environmental change might call for more innovative styles of thinking. That is the situation that existed in the NSW electricity industry, for example, as political forces drove it towards deregulation and privatisation.

The Process 3 of moving from the region of efficiency towards more innovative business practice appears straightforward in concept. Companies become efficient because they have accumulated knowledge. Accordingly, by careful selection of new streams of business activity that are higher on the business practice continuum, and that utilize the company’s accumulated knowledge or knowledge creation capability, an efficient company might be able to step its way towards a more innovative business practice.
However, in practice, any efficient company will have internal liabilities that raise barriers to the effectiveness of Process 3 in three ways:

1. Changing cultural knowledge from a focus on efficiency to an innovative orientation will meet resistance, and take time and effort to achieve.
2. An efficiency-oriented organization will have attracted and retained employees with a preference for adaptive thinking styles, and will have discouraged those with more innovative thinking styles (Kirton, 1980, 1994b). Such people have a preference for working within prevailing rules and structures and may resist when current assumptions and past customs are challenged (Kirton, 1976).
3. The established efficiency orientation will have become embedded into the routines and practices of the organization. There will be a large sunk cost in standard operating procedures and other written forms of proprietary knowledge that may need to be written off.

This suggests that the problem for Process 3 is breaking out of the prevailing consensual structures or organizational paradigm. This is not a problem of accumulating more knowledge but a problem of generating commitments to change.

In summary, achieving innovative business practice requires companies to adopt one or more of the routes to innovative practice shown on Figure 3.3 over. Mature companies with a claim to be considered innovative would need to focus on each of the three routes. Starting up new business ventures different to the mainstream business, and usually requiring some form of organizational spin-off arrangement for success (Christensen & Overdorf, 2000), requires the strategy of Process 1. Maintaining the momentum towards innovative practice of other more mature parts of the organization requires the strategies of Processes 2 and 3.
Figure 3.3: Three routes to innovative business practice
3.3 Diffusion of commitments

3.3.1 Communication in organizations

Most writers on organizations emphasize the important role of communication in the functioning of organizations. Barnard (1938), for example, explained how communication technique largely determines the ‘structure, extensiveness, and scope’ (p.91) of organizations. He proposed three necessary and sufficient conditions for formal organization, namely, (1) persons communicating with each other through language, who are (2) willing to contribute action (3) towards a common goal, and asserted that these conditions could only be fulfilled through communication. Barnard’s viewpoint was that inducing people to cooperate depends on communication, and the common purpose that makes the cooperation necessary must also be known to those involved, and so must be communicated in some way. Furthermore, it is only through the techniques of communication that the potential purposes that might be adopted as the basis of organization can be mediated, or the specialist functions of organization are made possible.

Simon (1947) supported Barnard’s general approach while pointing out its somewhat narrow focus on the formal elements of organization, and, consequently, its too ready identification of communication channels with channels of authority. He claimed that the information flowing through formal channels of authority was only a minor part of the total network of communications of any organization. Simon’s further claim was that, in organizations, ‘decision making’ and ‘managing’ are synonymous (Simon, 1960), and the tasks of deciding and doing inextricably linked. Consequently, the task of decision making and the doing tasks of the organization pervade the organization simultaneously (Simon, 1947). Simon defined communication as the process of transmitting ‘decisional premises’ from one member of an organization to another (Simon, 1997; p.208), and from this we arrive at a conception of organization as a network of decision-making centres connected through communication.

If we take a broad view of organizational structure as ‘the arrangements or relationships that permit the coordination and control of work’ (Perrow, 1967; p.195) then it suggests that the nature and effectiveness of an organization’s structure will depend on the effectiveness of the communication that connects its decision-making centres. This was the proposition that Burns and Stalker (1961) established in their groundbreaking study that demonstrated that
the nature of communications played an important role in the type of organizational outcome. Their descriptions of the 'polar extremities' (p.119) of the forms of management systems were essentially based on two different communication patterns. In one, the 'mechanistic' management system, communication takes place within a hierarchic structure, interaction tends to be vertical in nature, and the content of communication consists largely of instructions issued by the superior. In the other, the 'organic' management system, communication takes place within a network structure, interaction tends to be lateral in nature, and the content of communication tends towards advice and information rather than orders. The organic form of management system was shown to be more appropriate to situations where market or technological conditions continually change, the mechanistic form more appropriate to stable conditions.

The Burns and Stalker proposition, supported by later researchers (Hall, 1962, 1996; Lawrence & Lorsch, 1967; Woodward, 1965), is fundamental to two related schools of organizational thought. One, contingency theory, asserts that, for effectiveness, organizations should be designed to match the organization’s contingent circumstances. The second, viewing organizations as information processors, suggests that the way to match the organization and the contingencies of its environment is through understanding the organization’s information needs, and the means of their communication (Galbraith, 1973). Common to both schools is an emphasis on the related variables, task predictability and task uncertainty. If a task is well understood before it is undertaken then the activity can be pre-planned. However if the task is not fully understood then knowledge must be acquired during the performance of the task so that changes to schedules, priorities and resource allocations can be made. Accordingly, the greater the uncertainty and the lower level of predictability of the task the more information must be processed during the execution of the task, and the more effective must be the means of communication, for the same level of performance.

Contingency theorists developed the view that matching organizations to their context is a matter of choosing the appropriate communication means. Woodward (1965) showed that organizational structure and its effectiveness, and thus the nature of communications, depended on the stability of the production technologies used. Hall (1962) pointed out that differences in task predictability existed within organizations, and showed that the internal structure variations reflected Burns and Stalker’s communication system types. Lawrence and Lorsch (1967) extended this work by demonstrating that to the extent that subtasks vary in predictability so there is a call for different structures and communication means, but that
for effectiveness in performance of the whole task the differentiated subtasks need to be integrated.

The information processing approach to organizational design (Galbraith, 1973) builds on the work of contingency theorists by explaining the effects of uncertainty on the information needs of organizations. In this approach uncertainty is defined as the difference between the information that an organization requires to perform a task and the information that the organization already has. The effect of uncertainty is to reduce the organization’s ability to pre-plan and increase the need for information to be acquired during the execution of the task. At a given level of task performance, this means that the higher the level of uncertainty the more information that needs to be acquired during the execution of the task. Consequently, information processing and the enabling techniques of communication become key concepts for organizational design.

In addition to the above ideas from the organizational literature, other academic fields articulate the connections between communication and organization. For example, organizational communication theorists go beyond the point of regarding communication as something that takes place within organizations towards a realisation that ‘to communicate is to organize’ and that organizations are ‘communication events’ (Pepper, 1995; p.3). This view is implicit in the theoretical frameworks of communication researchers who conceptualise communication technology as organization (Beniger, 1990), and who would substitute communication technologies for organizational structure (Allen & Hauptman, 1990). Social theorists also recognise the fundamental connection between communication and organizing (Luhmann, 1995).

In summary, the literature on organizations and communication leaves little doubt about the inseparable connection between the two concepts. However the literature is less informative about the nature of communication itself. The theory of communication implicit in the organizational literature is the traditional, commonsense view of communication as a process that allows for the transfer of information or ‘decisional premises’ (Simon, 1947) from one person to another. The following section challenges this commonsense view of communication as inappropriate for explaining the role of communication in organizational change.
3.3.2 Reviewing the concept of communication

The traditional view of communication that follows from Shannon and Weaver (1949) is of an interaction in which a sender transmits a message to a receiver, who, upon receiving and decoding the message provides feedback to the sender indicating that the message has been received (Shannon & Weaver, 1949). Shannon and Weaver acknowledged that this metaphor is incomplete by identifying three additional problems that must be solved for communication to be effective. There is the technical problem of assuring that the message received is the same as that sent; there is the semantic problem relating to whether the message received is understood; and there is the effectiveness problem relating to whether the message leads to the behaviour desired. This metaphor has provided an adequate basis for the engineering of communication systems involving technical hardware and software interacting via electronic signals. However, the technical, semantic and effectiveness problems associated with the human element of communication systems are very much less fathomable, so that the Shannon and Weaver model is of greatly reduced relevance.

However at the level of everyday thinking about people communicating with one another, the technical, semantic and effectiveness issues are not salient, and the traditional metaphor of communication might also be described as the common sense view held by all but a few people in the academic community. The commonsense metaphor relies on two hypothesis, (1) that transmitted information (the message) is the same for both sender and receiver, and, (2) that processes of the mind are about the manipulation of representations of the world in the mind (Winograd & Flores, 1986). Both hypothesis are subject to theoretical challenges on several fronts.

The second hypothesis, is said to be so deeply ingrained in academic thinking related to the human mind that practitioners find it too difficult to contemplate its abandonment (Winograd & Flores, 1986). Fortunately, it is not necessary to do so to further the argument of this section. However, it is important to note that the philosopher Martin Heidegger rejects the idea that we relate to things primarily by having mental representations of them (Krell, 1993; Mulhall, 1996), as do researchers in organizational communication (Kreps, 1990; Pace & Faules, 1994; Pepper, 1995), in neurobiology (Maturana & Varela, 1980), and in social theory (Luhmann, 1995).

The first hypothesis, that the transmitted message is the same for sender and receiver is more easily rejected, and what follows relies on the work of Luhmann (1995) who argues that what is taken as ‘sameness’ in communication is not in the information content of any
message, but something that is constituted in the communication process. Luhmann’s analysis of communication starts with the concept of meaning as a social phenomenon. This approach finds strong support in the thinking of modern philosophy. For example, the non-objectivist school of hermeneutics (Gadamer, 1977) insists that in every hearing or reading of text is the process of giving it meaning through interpretation, and that interpretation is necessarily based on a pre-understanding that includes the traditions of the culture. Heidegger’s assertion that meaning is a given of the culture, rather than something generated through the activity of individuals (Krell, 1993), and Habermas’s explicit linking of meaning to cultural agreements rather than individuals (Habermas, 1979) also supports this approach. The views of Gadamer, Heidegger, Habermas and Luhmann stand in stark contrast to the commonsense theory of meaning that treats words and sentences in terms of their literal meanings, or objectivist schools of thought that see meaning as something independent of interpretation.

By basing his analysis of communication on a social concept of meaning, Luhmann is able to assert that communication is always a selective process, whereby meaning requires individuals to choose from a store of cultural meanings. The act of communication does not constrain the process of selection. The choice can be right or wrong. The only stipulation is that the choice be connected with further behaviours. Thus an utterance can be considered a selection proposal and, consequently, communication emerges to the extent that this proposal is taken up and its stimulation processed.

A full description of the Luhmann (1995) approach to communication is beyond the needs of this argument, but accepting it makes it clear that communication is realised only to the extent that understanding comes about. Consequently, if it is said that a communication has caused a change in a receiver’s state then this could be taken to infer that the receiver of the communication has understood its meaning. However, while it might be clear to an observer that the receiver is in a state that did not exist prior to the communication, only the receiver is in a position to determine whether understanding has actually taken place. Therefore, the concept of communication, alone, cannot explain whether or not a receiver accepts or rejects a communication, or takes any action as a result of it. For example, people can hear, read and express an understanding of the many communications about the health risks associated with smoking yet continue to smoke - obviously many do so. In other words the concept of communication, alone, cannot explain the gap between understanding and action. This represents the ultimate critique of the Shannon and Weaver model of communication, in that one must go beyond the model to explain or resolve the model’s own effectiveness problem.
Thus questions surrounding the acceptance or rejection of communicated meaning cannot be handled by the concept of communication, and Luhmann sees the need to handle such questions through the concept of ‘transaction’. Communication researchers agree, sometimes to the extent of collapsing the concepts, and following a ‘communication as transaction’ approach (Pepper, 1995). However, this latter approach would tend to conceal the connections between transactions and decision making and so, in the next section, the concept of transaction is treated as instrumental but separate to communication.

3.3.3 Concept of social transaction

From Luhmann’s viewpoint the transaction accounts for the acceptance or rejection of communicated meaning proposals. Within social systems, transactions are ‘interactions that react to value differences between the participants, especially exchange and conflict’ (p.149) and ‘a way of using the level of interaction to handle value differences and to deal with compliance and rejection’ (p.149). From a communication viewpoint, the transaction is the instrumental means of resolving differences in value between the participants to a communication so that, within a specific social context, meaning and understanding can emerge.

The treatment of transaction in this section will be in keeping with those approaches to the study of organizations that argue that transactions are a fundamental building block involving the social, economic and legal relationships of the organization (Commons, 1950; Ring & Van de Ven, 2000). However the term ‘social transaction’ will be used in recognition that the differences in values between participants to a communication are primarily of social origin. It will also be used to distinguish the treatment from that of the major use of the term transaction in relating to the narrow formal economic and legal view of organizations, rather than the broad informal and social view that is important to this study.

In general usage the term transaction is invariably associated with buying and selling activity. Essentially, this same economic view of the transaction is contained in the transaction cost approach to the study of organizations (Williamson, 1981). In this approach the transaction is regarded as the basic unit of organizational analysis, and ‘transaction cost economising’ (p. 539) a central aspect of understanding organizations. While broader claims are made, the essentials of this approach are an argument about efficiency (Perrow, 1986),
and the application of economic values to the resolution of transactions. In contrast, the sociological literature, such as that concerned with social capital (Coleman, 1986; Portes, 1998), contains the same broad view of a transaction as being subject to all nature of social influences that is adopted in this study. However this does not suggest that the two views are irreconcilable as the following explains.

With its narrow view of transaction, the scope of the transaction cost approach is limited to those behaviours attributed to ‘rational economic man’ (Donaldson, 1995; Granovetter, 1985), and consequently is most suited to the task of seeking economic efficiency. At the same time, the approach claims to focus on how people are organised and the resulting social relationships, but here it runs into the problem that ‘economic action is embedded in structures of social relations’ (Granovetter, 1985; p.481), and that ‘the behaviour and institutions to be analysed are so constrained by ongoing social relations that to construe them as independent is a grievous misunderstanding’ (p. 482). At the same time, it would be just as serious a mistake to treat all behaviours as totally embedded in structures of social relations (Wrong, 1961). This would be an over socialized view of the problem, as Granovetter points out. Consequently it is clear that the extent of embeddedness can vary, and this is implicit in Granovetter’s argument. In accordance with that position it will be assumed that behaviours attributed to rational economic man will occur by some people, at some time, and in some organizational contexts, whereas at other times and in other organizational contexts it may not.

For example, if a formal social transaction takes place concerning matters that are certain and unambiguous, with the explicit knowledge necessary to resolving the social transaction at hand, and shared by all parties to the transaction, then one would expect that economic values and the actions of rational economic man to prevail. In contrast, take the example of the resolution of an informal social transaction that concerns a matter of high uncertainty and ambiguity, with knowledge that is tacit to the parties involved in the transaction. It would be subject to the direct influence of a wide range of individual variables and social values, economic values being just one of them. In summary, this suggests that a wide range of individual, social and contextual factors influence social transactions in organizations, and the next section turns to analysing these factors.
3.3.4 Organizational factors and social transactions

As defined, a social transaction involves a social interaction. In organizations these social interactions, and the communications that sustain them, may be of either a formal or informal nature (Barnard, 1938; Simon, 1997). Formal communications, interactions and social transactions will be taken to be those that are involved in supporting the organization’s formal channels of authority. Social transactions of this nature would normally be based on explicit and codified formal policies, rules and procedures of the organization, and constrained by the laws of the community in which the organization is based. Such social transactions may arise in the following ways: in executing agreements with outside parties; formally organised work meetings; discussions and interviews between managers and subordinates that are based on the organization’s formal policies or rules; formal meetings between the organization’s employees when conducting the respective roles that are laid down in the standard operating procedures of the organization.

In contrast, informal social transactions may occur between anyone in the organization, at any time, by any communication means, and on any subject of mutual interest to its participants. These interactions might be best characterised as conversations between the organization’s people about their work and other matters. It would be deceptively simple to claim that social interactions on subjects other than those of direct interest to the organization are irrelevant here, for it is clear that matters important and beneficial to the organization, such as the development of friendships, mutual trust, and mutual loyalty between employees, may arise from social interactions on matters of common interest, whether work oriented or otherwise.

To summarise, any social interaction between the employees of an organization, whether formal or informal, or whether based on organizational issues or not, remain in the purview of a social transactions approach to organizations. However, it is also clear that whether communications are formal or informal, and whether the issues involved are work oriented or not, may introduce different values to the resolution of the resulting social transactions. Accordingly, it will be necessary to be precise about what will be referred to by the term ‘value’ in the context of social transactions.

Here we take the idea of values as ‘broad tendencies to prefer certain states of affairs over others’ (Hofstede, 1994; p.8). It is also understood that values are for the most part unconscious to those that hold them, and, for observers, only able to be inferred from the
way people act. On the basis of these understandings, it is proposed that there are three ‘value-like’ influences on the resolution of social transactions, (1) values themselves, as defined above, (2) individual preferences for action, and (3) prior commitments to action of a personal and organizational nature. An observer of an individual action has no way of inferring which one or more of these influences engendered the action.

The first of these influences, values, as defined by Hofstede, are fundamentally social. Values are taken to be at the collective level of mental programming (Sackman, 1991) and at the core of the concept of culture (Hofstede, 1994; Schein, 1985). Following Hofstede (1994), no distinction needs to be made between the view of values as cognitive and behavioural preferences, or as ‘behavioural rituals’ (Schein, 1985), for both approaches treat values in terms of consistencies in attitudes and behaviour of people in particular contexts.

At the organizational level, Hofstede (1994) has shown that the thing called culture has more to do with the organizational practices than the societal values reflected by its members. Thus when writers refer to ‘values-driven’ companies that place certain values paramount in their vision, and consistently act in accord with them (Collins & Porras, 1994), Hofstede might suggest that the discussion would better take place under the heading of practices and routines. Christensen (2000) also describes organizational values in terms of consistent organizational practice towards practical objectives such as achieving growth and a level of gross margin. But however we may refer to an organization’s perceived preferences, the outcomes in terms of influencing the resolution of social transactions will be the same. For example, in a company such as 3M, that is lauded for consistently exhibiting innovative behaviours, and considers its culture of innovation to be a distinctive competence (Coyne, 1996; DeSimone, 1995; Gundling, 2000), one would expect that values related to the desirability of innovation would be very influential in the resolution of its varied social transactions, whether formal and informal.

The second of these influences, individual preferences, is recognition that individuals have broad preferences for thinking, feeling and potential acting that are specific to the individual as the result of the individual’s inherited qualities and learning experiences (Hofstede, 1994). This is the level of individual mental programming that psychologists refer to as ‘personality’ - the individual’s consistencies and broad tendencies in behaviour across situations. These are not termed values, as values are normally defined, yet they manifest the same behavioural consistencies and behavioural outcomes in individuals that values tend to do. Without strong contextual clues, an observer is not in a position to understand or infer whether an observed individual’s behaviour results from the influence of social values or
individual preferences. Consequently, the division between the effects of personality (individual preferences) and the effects of culture (social values) is not at all clear, and a matter of continuing debate (Hofstede, 1994). So it is unnecessary here to attempt to distinguish between the two, and the term ‘individual preferences’ will be used to denote all individual differences.

In the discussion of individual preferences particular emphasis will be placed on the cognitive style variable of adaption-innovation (Kirton, 1976) as it relates to the resolution of social transactions within the process of innovation. Research in adaption-innovation theory indicates a strong relationship between the adaption-innovation preferences of individuals and the nature of their individual creativity (Kirton, 1984; Sternberg, 1997), the nature of their individual and organizational learning (Hayes & Allinson, 1998), and the nature of the ‘cognitive climate’ of their work groups (Kirton, 1994b). These are relationships that may be influential in social transactions in innovation.

The third value-like influence on social transactions are prior commitments of both an individual and organizational nature. In previous Section 2.4.1 and 2.4.6 it was explained how commitments work by focusing attention on the object of commitment, and by thus forming part of an individual’s or organization’s background to interpretation and sensemaking (Daft & Weick, 1984; Gadamer, 1977; Weick, 1995).

### 3.3.5 Anatomy of social transactions

#### 3.3.5.1 Introduction

Social transactions can be of both formal and informal nature, the formal variety being more readily associated with the transaction cost approach to analysing organizations (Williamson, 1981). Whether formal or informal, the social transaction can be understood within a general conceptual framework through which people negotiate and resolve value issues, and create and commit to future expectations (Ring & Van de Ven, 2000). The formality versus informality dimension describe different contexts within which the mechanisms of the social transaction operate, and the context will now be shown to be influential in the nature of the outcomes derived from the social transaction.
In their comprehensive analysis of the transaction mechanism, Ring and Van de Ven (2000) investigate the relationships among the transaction’s structure, process, and context. Within their analytic framework transaction structure relates to issues of ‘governance’ and ‘safeguards’, and the transaction processes are divided between the formal processes of ‘negotiation’, ‘agreement’ and ‘administration’ and the informal processes of ‘sensemaking’, ‘understanding’ and ‘committing’. Ring and Van de Ven see the transaction context as involving not only environmental constraints and prior outcome expectations (prior commitments), but also the ‘risk of the deal’ and the ‘trust in parties’ associated with the transaction. The roles of structure, process and context, and how they may relate to managing organizational innovation, will be separately discussed below.

### 3.3.5.2 Transaction structure

The issue of transaction structure concerns the forms of governance and the procedural safeguards that parties to the transaction require to participate in the transaction. The important observation about this is that the form of governance and the nature of the safeguards will vary with the formality involved in the transaction. High levels of formality may occur within and between organizations. Within organizations the social transactions associated with certain activities, such as the recruitment or dismissal of employees, or in the administration of workplace safety, may operate in accordance with formal codes of behaviour or formal policies of the organization that completely specify the conduct of the transaction. In the relationships and the conduct of business between organizations, and between organizations and their customers, there are laws relating to contracts, the conduct of corporations, and the sale of goods that rigorously apply constraints to the conduct of formal transactions between the parties. Ring and Van de Ven propose that for any potential deal the higher the economic importance and risk of economic loss, and the lower the level of trust between parties, then the more effective and secure a governance structure will be necessary for parties to enter into the transaction. However many more of an organization’s social transactions take place at an informal level, as in everyday life. Here social transactions are restrained only by cultural rules, and the routine practices of the organization as collectively understood by its members.

A central problem for managing an organizational innovation is developing and maintaining cooperative relationships both internally and with external entities (Van de Ven, 1986). The internal relationships are largely concerned with communicating and integrating the knowledge of the organization’s people and functions, and the level of formality of the
transactions involved will be in keeping with the nature of the organization’s structure. In mechanistic management systems communication follows the lines of hierarchic authority, so the structure of transactions will tend to be determined by formal instructions and decisions issued by superiors. In contrast, in organic management systems communication takes place within a network structure that continually changes through the interaction of those in the network. Consequently the structure of transactions will tend to be of lower formality. Extending these Burns and Stalker (1961) findings would suggest that a process involving social transactions of low formality would better provide the flexibility necessary to the successful handling of uncertainty than would processes involving transactions of high formality.

However, external relationships related to organizational innovation are largely concerned with obtaining additional resources from other organizations. These additional resources are usually in terms of new knowledge or additional capabilities that can be acquired through various licensing, outsourcing or alliance strategies. Usually, the economic significance and risks involved in such deals require a formal and secure structure covering the transactions involved.

### 3.3.5.3 Transaction process

Transaction process concerns the social and psychological processes that underlie the resolution of a social transaction. While Ring and Van de Ven (2000) describe separate formal and informal processes, it takes little reasoning to conclude that the division between the two is somewhat artificial. When describing formal process they use appropriate business and legal oriented terms, negotiation, agreement and administration, to indicate discrete stages of the process. In the *negotiation stage* the parties to the transaction argue out the terms and structure of the transaction. In the *agreement stage* the parties agree to the terms of the relationship and the procedures for future action. In the *administrative stage* the terms of agreement and the agreed procedures are carried into effect.

When describing the informal process of transacting, Ring and Van de Ven use social psychological terms appropriate to describing the stages of the process as sensemaking, understanding and committing. In a literal sense, *sensemaking* is about making sense of a situation. In the psychological sense it is also associated with an individual’s need to maintain esteem and a sense of identity (Weick, 1995). This need is manifested in individuals ‘enacting’ their own version of the environment (Turner, 1987; Weick, 1969,
1995). Weick (1995) intends that the use of the word ‘enactment’ preserve the idea that people in organizations produce part of their own environment by constructing a reality based on their own pronouncements, as do government legislators. Having produced their own environment, people then become constrained by the environment they have created.

The sensemaking process is influential in the way that people go about beginning the transacting process with others (Ring & Van de Ven, 2000). At the beginning of the process the parties to the transaction will enact their individual versions of the environment, while attempting to integrate these with the enactments of other parties. If people’s enactments are not confirmed by the enactments of others then the sensemaking process may be reframed and re-enactments occur towards securing this confirmation. However if people’s enactments fail to be reinforced by others, they may resort to defence mechanisms, and the co-operation necessary to progressing the transaction will not be achieved (Turner, 1987).

A previous section took the view that transactions are influenced by individual preferences and prior commitments. Weick (1995) also explains how the sensemaking process is affected by people’s prior commitments. These have the effect of focusing people’s attention on the objects of commitment and imposing value, consequently imposing constraints on interpretation. This is the same effect as occurs with individual preferences that manifest such things as social values and cognitive style and become part of a person’s background to interpretation. The sensemaking process is that part of the overall transacting process that is most open to external influence, and becomes the means of resolving values, that in Luhman’s theory is the primary role of the transaction (Luhmann, 1995).

In the Ring and Van de Ven scheme, the concept of understanding is about the parties to the transaction interacting, constructing a shared interpretation of the relationship, and coming to a joint agreement on the terms of their relationship. In organizations it is unlikely that this agreement will be readily and immediately obtained. Rather it is likely that the understanding will emerge in a gradual and incremental manner.

The process of committing brings together the expectations and assumptions held by the parties to the transaction about the obligations of each party to taking further action as the result of the transaction. Ring and Van de Ven view the committing process as creating psychological contracts (Kotter, 1973; Thomas, 1976) among the parties to the transaction. Psychological contracts are unlike the legally oriented contracts common in formal transactions. They are unwritten and often not even verbalised. Consequently, psychological contracts may tend towards ambiguity and to contain more commitments than the
individuals involved are aware. Individuals bring differing backgrounds to interpretation to the transaction, and may take away differing expectations from the transaction. The committing process may also be interpreted through speech-act theory (Austin et al., 1975; Searle & Searle, 1970). Social transactions are constituted by language, and acts of language have consequences for participants that lead to immediate actions, or to commitments to further actions (Habermas, 1979).

The differences between formal and informal transaction processes are substantial enough to require different treatment. Firstly, if we view the transacting process at a higher level of abstraction, then we might describe it as a process where people interact until such times as they have a joint understanding of a problem or issue, and agreement on the actions necessary to doing something about it. Out of the transaction comes either immediate action or a commitment to undertaking action in the future. Therefore, any difference between formal and informal transactions is in difference in levels of codification and subsequent ambiguity, and not in difference in character of the transacting processes.

Secondly, it seems clear that within the strung out formal transacting processes in and between organizations lies a great deal of informal transacting. A legal contract that signifies that a formal transaction is taking or has taken place may simply record the end point of many cycles of informal transacting in the negotiation and agreement stages of the contract, and, as well, the administration stage of the contract will not be able to be effected without many more cycles of informal transacting.

Consequently, it is suggested here that the cognitive terminology of informal process, sensemaking, understanding and committing, best describe the generic process of transacting. In terms of social transacting in organizations, formality might be considered a rare event, and the extreme case on a continuum of formality and level of codification. And in terms of organizational change processes, which start from a basis of uncertainty, ambiguity and informality, and work over time towards creating structure and certainty, any formality comes near the end of the process, and thus plays a relatively small part in the overall progress of the change process.

3.3.5.4 Transaction context

Ring and Van de Ven (2000) analyse context issues under the headings of risk in the deal, trust in the parties, outcome expectations and environmental constraints. These are things
that may influence the background to interpretation of parties to the transaction. In the theory under development here the interest is in describing the context in terms of the codification-diffusion framework (refer previous Section 2.3.8). The analysis will reveal that there are connections between this framework and the questions of risk and trust that Ring and Van de Ven raise.

In this analysis, transactions that take place in organizations between supervisors and subordinates will be examined. Work organizations are special cases in that there will always be past precedents, hierarchical structures and written procedures that make the terms of engagement between a supervisor and a subordinate explicit to some degree, and create a power asymmetry that favours the supervisor to some degree. The extent of this explicitness and the power asymmetry will depend on the subject of the interaction and the nature of the organization involved.

Starting in the context of a low level of knowledge sharing, the lowest level is that between two people. As an example, this may be a supervisor and subordinate focused on solving an organizational problem, where the level of codification of the knowledge pertinent to the transaction varies. Each transaction is of the nature of a sender (the supervisor) communicating a meaning proposal in order that a receiver (the subordinate) understands and accepts the proposal, and commits to action as a result of it. Assuming that the transaction process remains the same, the resolution of transactions will differ in relation to the degree of uncertainty and predictability associated with each, and this is related to the level of codification of the knowledge on which the transaction is based. The interest is in showing how the level of codification of the knowledge affects the nature of the outcome of the transaction in terms of commitment to action.

At the lowest level of codification, knowledge remains in people’s minds as tacit (Polanyi, 1962) or other unarticulated forms of personal knowledge, limiting its transfer to face-to-face communication. For example, a transaction between supervisor and subordinate in the R&D Department of an organization about the adoption of an innovative new idea. Innovative ideas lie outside of people’s general understanding and may not be readily understood and, in this example, all of the things pertinent to resolving the transaction, that is, knowledge about the idea, social values and individual preferences, remain in the heads of the parties to the transaction. The idea and the knowledge pertaining to it will be high in uncertainty and low in predictability, so one would expect that values and individual preferences would play a major role in resolving the transaction. Consequently, one might expect that the sensemaking stage of the transaction process will be relatively lengthy, and
that the resolution of the first transaction may be to simply reflect further on the idea. However, completing the sensemaking stage of the transaction will require values to be shared and individual preferences to be accommodated and tolerated. Accordingly, personal relationships may be fostered. After the understanding stage of the transaction is reached, any commitment to progressing the idea will involve raising the level of codification of the knowledge, maybe by setting the idea down in writing or creating a simple prototype, in order that the idea might be more easily communicated to a larger group of people.

Likewise in a transaction between a supervisor and a subordinate where the codification of the knowledge involved is at a much higher level. A pertinent example would be the case of a supervisor-subordinate transaction related to the subordinate’s failure to follow the work safety code. Here the rules of engagement will most likely be highly specified and codified through written documents such as safety rules, standard operating procedures, work agreements, job descriptions and even government workplace legislation. Accordingly, the transaction involves little uncertainty and is high in predictability in terms of what will be resolved. As well, the explicit procedures provide a level of formalism that reinforces the hierarchical power asymmetry favouring the supervisor. Consequently, while parties to the transaction may bring their individual preferences to its sensemaking stage, what makes sense in this situation is already set down in written documents, so values and individual preferences (especially those of the subordinate) are allowed only a minor role in its resolution. The transaction becomes an impersonal one. In a highly specified context such as this the understanding stage is easily reached. The nature of the commitments that ensue from the transaction may also be specified in terms of formal written warnings, agreements signed by the parties or notes placed on personnel files.

If the above two contexts and transactions are compared, where knowledge sharing is at a low level, then the following summary statements are suggested:

1. Low levels of codification of knowledge are associated with relatively high levels of uncertainty, and low levels of predictability and power asymmetry.
2. At low levels of codification of knowledge, the transacting process may involve relatively protracted sensemaking and understanding stages, and ensuing commitments that are psychological and informal in nature.
3. At low levels of codification of knowledge, social values and individual preferences play an important role in the resolution of transactions, and this leads to personal relationships.
4. High levels of codification of knowledge are associated with relatively low levels of uncertainty, high levels of predictability, and higher levels of power asymmetry.

5. At high levels of codification of knowledge, the transacting process involves less difficulty in sensemaking and understanding stages, and ensuing commitments that may be formal in nature.

6. At high levels of codification of knowledge, social values and individual preferences play a relatively minor role in the resolution of transactions, and this leads to relationships of an impersonal nature.

A second set of examples will examine transactions in an organization where the knowledge associated with the transactions is widely shared. The first example concerns a situation where the knowledge involved is not codified, as second where it is codified.

It is common practice for organizations to seek quality improvement by grouping relevant employees into problem-solving teams. The team members are chosen on the basis of their experience of the processes requiring improvement. Winter (1994) explained that the nature of the quality improvement process is one of articulating organizational routines that are understood at a collective and tacit level (Nelson & Winter, 1982), and subsequently incorporating the knowledge into written procedures.

The difference between this transaction and that of the R & D Department transaction is in the wider sharing of the relevant knowledge. As with the R & D Department example, with the underlying knowledge being uncodified, face-to-face relationships, values and individual preferences will play an important role in resolving the transaction, and in creating personal relationships. It will be these relationships, created in the sensemaking stage of the transaction process as values are shared and individual preferences accommodated, that provide the coordination of the team’s efforts. Having reached the understanding stage the team will create commitments to action. Any action other than the team thinking about their problem will require knowledge to be codified, and this will require the individuals in the team to undertake that codification. A team creates the social conditions for its individual members to take relevant actions.

In another example, a market, knowledge is widely shared and the level of codification high. The theory of markets suggests that they work best where knowledge about the market is codified, and participants in it are knowledgeable about how the market works. A close to ideal situation occurs with electronic marketplaces used in business-to-business marketing. Here the full list of the market’s product offerings, together with the product characteristics,
including price, is documented and made available to prospective buyers working from terminals in their own offices. The market system is driven by software that works to the rules agreed by both vendors and buyers. There is little or no ambiguity, uncertainty, or lack of predictability in the system.

Consider an organization’s purchasing department and its market transactions made within this highly codified market system. First, the knowledge involved is so diffuse and the rules of engagement so highly specified that participants in the market system can neither control nor vary the system. Therefore, values and individual preferences play no role at all in the resolution of transactions. Accordingly, relationships can only exist at an impersonal level, and the nature of the market is such that any relationships are competitive rather than cooperative. Coordination is driven by the system, but is reliant for effectiveness on participant’s understanding and following of the rules. The sensemaking and agreement stages of the transaction take place automatically within the market system and commitments that ensue are formal and codified.

The above description of working in a regulated market system might suggest that the purchasing department is redundant apart from the function of making keyboard entries into an automatic operating system. However, more happens as a consequence of the transaction than a formal commitment to supply an organizational requirement. The transaction provides an additional piece of information about the market to both supplier and buyer. It is from aggregating such information that knowledge of market trends is obtained and absorbed into the organization, creating a stimulus for change. So one might consider market transactions in a dual light. First as single transactions and commitments for immediate action, and second as aggregate transactions and commitments to acquiring knowledge about the market.

These two examples of transactions where knowledge sharing is at a high level suggest the following further summary statements:

1. Where codification is low and knowledge sharing high, values and individual preferences play an important role in resolving transactions, and creating the personal relationships that lead to cooperation and coordination.

2. Where codification is high and knowledge sharing high, values and individual preferences play no role in resolving transactions, and the relationships created are impersonal, and make no contribution towards cooperation and coordination.
3. Where knowledge sharing is high, power asymmetry plays a lesser role in the resolution of transactions.

In summary, the organizational context of a transaction influences the way in which transactions proceed and the nature of the commitments that ensue from the transaction. The extent to which knowledge is codified and shared between parties to a transaction is instrumental in determining the nature of the relationships that are established through the transaction process, and this has implications for the cooperation and coordination of people undertaking the tasks involved.

### 3.3.6 Social transactions in organizations

Having determined what constitutes social transactions in an organization, and the means by which these transactions are mediated, there is the question of when and where such transactions take place. Thayer (1979) points to at least five levels of analysis of human communication – intrapersonal, interpersonal, enterprise, enterprise-environment, and technological. Pepper (1995) adapts these to the following five levels of transaction that constitute an organization:

- **intrapersonal** level - the most fundamental – refers to the individual, internal dialogues and human perception. These transactions relate to the learning and adaptive capacity of individuals, and the development of personal knowledge.
- **dyadic or interpersonal** level concerns the mutual adaptation of the individual to both the environment and the influence of others. This is the fundamental level of organising, of person-to-person interaction of a formal or informal nature.
- **small-group** level brings into play the dynamics of organising and organisational variables such as hierarchy, roles, leadership, power and conflict. This is the level of formal meetings, task force work, and informal ad hoc group activity that is an important part of organizational practice in innovation.
- **inter-group** level involves the problems of bringing groups together to achieve a common understanding and purpose. This level introduces the issues of inter-cultural communication between specialist groups. These are subcultures that have developed their own way of perceiving and doing things. This level is the focus for resolving one of the central problems of innovation (Van de Ven, 1986) – the coordination of organizational resources.
- **technological** level concerns the human-technology interface. At the general level of organizational thinking, technology relates to the way work is done in the organization and to the techniques applied to the organization’s problems (Perrow, 1967). There are many technologies in any business organization’s value chain (Porter, 1985), all of which interface with the organization’s members in multiple and varied ways. However, as already argued in previous Section 3.3.1, communication processes are fundamental to the processes of organization. Accordingly, any analysis of this technological level of transaction will need to concentrate on communication technologies, and their influence on all levels of transactions. Consequently, the analysis of transactions at this level is integral with those of the other four levels, and will not be separately pursued.

- There is strong evidence that a major source of innovation for any organization is its associated customer and supplier organizations (von Hippel, 1988). Accordingly, the level of transaction between an organization and its industry environment cannot be neglected from any analysis of innovation, and it thus becomes necessary to define a sixth level of transaction, the *enterprise-environment* level, as per Thayer (1979). This level of transaction is also about intercultural communication, for all organizations have their own values and organizational practices, and consequently, unique cultures (Hofstede, 1994). The focus of this level of transaction is on building external relationships and trust that can lead to opportunity and competitive advantage (Nahapiet & Ghoshal, 1998).

The process of sensemaking, understanding and committing occurs at all levels of transaction and leads to commitments to action. These commitments to action include those that generate transactions at another level. Commitments from the intrapersonal level generate transactions at the interpersonal level and, in turn, these interpersonal level transactions create commitments that generate transactions at the small group level, and so on through the organization. As argued in the previous section, actions to communicate ideas more widely (the effect of moving to a higher level transaction) are about further codifying the knowledge involved. Each succeeding level of transaction creates a new context for the transaction in terms of the codification and sharing of knowledge. Figure 2.5 demonstrates how the knowledge and commitment in innovation are related on the codification-diffusion vector space. It describes the cycle of knowledge creation necessary for moving from one level of transaction to another.

Assuming that commitments to action precede the action and are instrumental in the action taking place, then the model of diffusion of knowledge and commitments of Figure 2.5
provides an explanation of the motivation of the popular ‘spiral of knowledge’ model of the diffusion of knowledge through an organization (Nonaka, 1991; Nonaka & Takeuchi, 1995).

The spiral of knowledge model explains knowledge creation in organizations. The diffusion of knowledge and commitment model discussed in this section further explains the how and why of the spiral of knowledge, and reduces the knowledge-action explanatory gap. So the knowledge-commitment model offers a great improvement in description of the change process. However, neither model can claim to provide a complete description of the processes involved in organizational change. Both models track the process of new knowledge creation without accounting for the effect on this process of the knowledge that existed in the organization before the renewal process commenced.

The diffusion of commitment model accounts for the commitments that ensue from transactions, but does not account for the effect of commitments on subsequent transactions. Furthermore, both the spiral of knowledge and diffusion of commitment models view the organization as essentially a passive medium for the gradual passage of commitments and knowledge to a greater numbers of people within the organization.

This view of things has a major shortcoming. It neglects the role of the organization in generating the commitments that underlie the creative actions of its members. In particular, individual creative actions may respond to commitments generated in transactions at any of the levels of transaction described in this section. One might view the starting point for change as somewhere ahead of the production of the idea that formed the basis of the change action. What is needed is an organization-centred view of the change process, and the following section pursues an alternative approach towards achieving such a view.

### 3.3.7 Cognition as a social phenomenon

To formulate the idea of an organizational knowledge distinct from the knowledge of the organization’s members, something strongly debated (Tsoukas & Vladimirou, 2001), or an organizational commitment to action distinct from the commitment that an organization’s members show towards their individual projects and their organization, there needs be a social level view of the social transaction’s cognitive operating processes. There needs to be an understanding of human cognition at a social level. Furthermore, if the motivations and generation of commitments necessary to spontaneous creative actions within organizations
(Katz, 1964) are to be understood, an ontological basis different to that provided by the external observer has to be adopted. There is a need for an internal view of organizational cognition.

The problem faced by this study is that the predominant view of organizations is of a system that is open to its environment, and one in which the system’s survival depends on achieving appropriate relationships with its environment (Morgan, 1986). In open-systems thinking, the capacity of the system to evolve depends on its ability to change its internal form so as to respond to the demands raised by the environment. The environment is the source of the stimulus for change. The open systems view thus makes it difficult to accommodate an evolutionary theory of internal spontaneous behaviour. Critics of the open systems view see this as the result of an insistence on understanding systems from the point of view of the external observer, rather than attempting to understand a system’s inner logic (Maturana & Varela, 1980). However, focussing internally by denying the openness of the system and treating an organization as a closed system, as did early 20th Century management thinkers (Taylor, 1947), also provides no basis for explaining spontaneous behaviours. A different systems perspective is therefore required.

The traditional concept of cognition as perception, or the process of knowing, comes from the study of individual cognitive psychology where it remains a fundamental tenet. However, implicit to that field is also the view that individual cognitions have social origins. This follows from the social interactionist view of psychology (Mead, 1934), and from the idea that social living is based on the consensual cognitive representation of individuals (Weber, 1947). The view is supported in the sociology of knowledge by its acceptance of the notion that formal bodies of knowledge are subject to social consensus (Kuhn, 1996). Such points of view support the relatively straightforward proposition that human knowledge is ultimately a social product.

This proposition has been further developed in terms of everyday understandings through the literature of social cognition (Forgas, 1981), and in organizational psychology following on from the work of Herbert Simon and his associates (March & Simon, 1958). However while these latter developments are said to cover the issues of individual and group cognition within organizations, the study of cognition in the organizational sphere has also been characterised as an ‘... interest in how organizational members conceptualise and make sense of their organizational worlds’ (Meindl, Stubbart, & Porac, 1996; p.iv). The focus remains on cognition as an individual phenomenon, and that is the same for studies that relate to the role of cognitions in decisions about innovation (Dougherty, 1992; Swan,
If an organizational cognition is to be formulated then an alternative theoretical explanation of cognition phenomena is required.

In the rationalistic tradition, mental and physical descriptions take place in different domains, a direct reflection of the philosophical separation of the mind and body that commenced with Descarte’s 17th Century philosophy (Cottingham, 2001). While modern philosophers such as Heidegger have rejected Descarte’s position (Krell, 1993; Mulhall, 1996), as has evidence from neurobiology (Damasio, 1994), in rationalistic-based fields such as artificial intelligence researchers take the position that there is a systematic relationship between the mental and physical domains (Winograd & Flores, 1986). One clear example is the rationalistic and commonsense assumption that when a person sees something there is a correlation with a particular activity on that person’s retina. This is the assumption that was challenged by theoretical biologists, and gave rise to a different systems approach - autopoietic systems (Maturana & Varela, 1980).

### 3.3.8 The autopoietic systems metaphor

On the basis of a series neuro-physiological of studies on frogs, Maturana and Varela challenged the validity of the commonsense understanding of perception. The commonsense view is that things in the environment have objectively recognisable properties that are captured in our minds through the process of perception. Maturana and Varela suggested an entirely different orientation. In their studies, vision could not be explained by the mapping of the world onto the retina, or nervous system, but rather from the activity of the nervous system in generating vision phenomena for the observer.

Maturana and Varela describe the nervous system as a closed network of interacting elements (neurons) such that any change to the state of relative activity of a collection of these elements leads to changes in the state of relative activity of other collections. From this standpoint the system is closed, and does not have inputs or outputs. Thus the term perception becomes inappropriate. However the nervous system can be ‘perturbed’ by structural changes in the closed network itself, as when light strikes the retina. The change will affect the activity of the system, but the sequence of system states will be determined by the relationship between system elements that is determined by the system’s structure rather than any external influence. This does not deny that systems have environments, but does deny that the environment has anything to do with creating the relationship between the system and the environment. Rather, the relations between the system and anything in
the environment are internally determined. Accordingly, since there is no interchange between the system and its environment the system is said to be operationally closed (Harrison, 1995).

The extension of this biological metaphor leads to the formulation of the general phenomenon of autopoiesis as characterising any living system. For Maturana and Varela, living systems are autonomous unities that are capable of specifying their own laws, and determining what is proper for their system. The mechanism that makes for this autonomy, and what makes the organization of living systems distinctive, is the process that Maturana and Varela named ‘autopoiesis’.

As Maturana and Varela define it, organization is the specific relations that must exist between the components of a system for the system to be a member of a specific class. Structure is defined as the components and relations that constitute a particular unity and make its organization effective. Thus with living systems being a class of things, their organization remains constant while their structures may differ.

An autopoietic system consists of ‘…a network of production (transformation and destruction) that produces the components that: (i) through their interactions and transformation continuously regenerate the network of processes (relations) that produced them’ (Maturana & Varela, 1980; p.79); and (ii) constitute the system as a concrete unity in which the components exist in a specified relationship that allows the network to be realised. That is, an autopoietic system holds its organization constant and defines its boundaries through the continuous production of its components. The system’s aim is to produce itself (Morgan, 1986).

A system that can change its structure over time without losing its identity (organization) must evolve in a way that is in step with changes to its environment. That means that its structure must change in a way that generates appropriate state changes triggered by perturbations in its environment. Structural coupling is the basis for these changes (Maturana & Varela, 1980). A way of expressing the idea of structural coupling is to say that the system is open (structurally) to its environment. Therefore the autopoietic system can be open and closed at the same time – open to structural interaction with its environment, and closed as regards its organization and identity.

In Maturana and Varela’s exposition of their theory of autopoietic systems, cognition is viewed as a pattern of behaviour that is relevant to the functioning of a living system. Living
systems are cognitive systems whose organization defines the domain of interactions in which to act with relevance to itself, and the process of cognition is the acting in this domain.

Observers generate descriptions of living things in two domains. One is the structure of the system and how the structure is related to behaviour without reference to the history of the system. A second is about the pattern of interactions that brought about the structure, and is concerned with the relevance of changing structure to the behaviour appropriate to survival. This latter description is referred to as the cognitive domain.

The sources of perturbation for a system include other systems. In the interaction between systems, each undergoes a process of structural coupling due to the perturbations generated by the other. This mutual process leads to interlocked patterns of behaviour that Maturana and Varela refer to as the consensual domain. They refer to behaviour in this domain as linguistic behaviour, for language is the clearest example of a consensual domain. To attempt to understand language purely within the cognitive domain conceals its role as an orienting behaviour. In Maturana and Varela’s terms the main function of language is not the transmission of information but the creation of a consensual domain.

Accepting Maturana and Varela’s view that language is primarily about creating a cooperative domain of interaction leads towards some understanding of the issue of organizational knowledge and organizational commitment. When we talk about the world we act as observers, and as observers we make distinctions that are not grounded in any reality but grounded in the consensual domain. Distinctions and discourse lie in the consensual domain. And the consensual domain exists for the social community rather than for individuals. Consequently, reality can be neither objective nor individual.

For Maturana and Varela, the central feature of human existence is that it occurs in both cognitive and consensual domains. Both domains are social in origin, and so both language and cognition are fundamentally social. In previous sections it was explained that commitments to action and subsequent knowledge creation follows from social transactions and a transacting process in which ‘sensemaking’ (Weick, 1995) is a fundamental part. Sensemaking is a process that relies on drawing distinctions and on discourse. If discourse and distinctions lie in the consensual domain then so do knowledge and commitment.

The question that arises here is whether a biological model pertaining to living systems has relevance to the problems of organization. In his influential text on organizations, Morgan
used autopoiesis as a metaphor of ‘organization as flux and change’. His interpretation of autopoiesis led him to considering ‘organizations as self-producing systems’ (p.240) and some ‘intriguing implications’ for the study of organizations. He suggested that organizations always attempt to achieve self-referential closure by enacting their environments in terms of their own identity, and that problems in dealing with their environments are closely related to the identities that they try to maintain. Importantly, he suggested that explanations of evolution and change in organizations needed to give ‘primary attention to the factors that shape an organization’s self-identity’ (p.240). This thought reflects on the critique that pointed to shortcomings in the initial model of diffusion of commitment (refer previous Section 3.3.6). This model was shown to neglect the history of commitments that influence the background to interpretation, and, consequently, the sensemaking stage of the transaction process. This is equivalent to neglecting the history of the system and thus the system’s identity.

The autopoietic approach has been applied in a number of different fields of social science; for example, law (Teubner, 1988), politics (Jessop, 1990), public policy and administration (Kickert, 1993), evolutionary change in organizations (Morgan, 1986; Wheatly, 1992), organization theory (Hernes & Bakken, 2003), strategy and knowledge management (Vicari, von Krogh, Roos, & Mahnke, 1996; von Krogh & Roos, 1996a), computer-human interfaces (Winograd & Flores, 1986). All of these applications acknowledge a debt to the work of Niklas Luhman and his general theory of self-referential systems (Luhmann, 1990, 1995). It was Luhmann’s work that extended autopoiesis from the physical to the social domain.

Maturana and Varela were divided in their opinions on whether their theory could or should be extended into the social domain, as made clear in the introduction to the major publication of their work. The reasons behind the disagreement are not trivial and are covered by writers such as Bednarz (1988), but a detailed coverage lies beyond the purpose of this section. It will be sufficient to outline the problem as Maturana and Varela saw it, and how Luhmann overcame it.

By Maturana and Varela’s account all living systems are autopoietic, but not all autopoietic systems are living systems. The reason for this is that the components of any system must satisfy the particular requirements of the domain in which the system occurs. An autopoietic system in the physical domain that satisfies the thermodynamic requirements of that domain gets to be called a living system. However, as Bednarz (1988) points out, there is nothing in this that restricts autopoietic organization to the physical space alone. However if the scope of autopoiesis is to be extended from the physical domain, then it can only be into domains
where the requirements for autopoiesis can be met. While disagreeing about whether or not such an extension should or could be made, neither Maturana nor Varela could see how the conceptual difficulties in doing so could be overcome, especially in the extension of the theory to the social domain.

An intractable problem occurs if social systems are regarded as composed of human beings, that is, a social system composed of biological components (Bednarz, 1988). If autopoiesis is to apply then the autonomy and unity of the system has to be demonstrated by means of the recursive production of the processes and components. To do that social processes must be shown to produce social rather than biological components. This is impossible to demonstrate even in the simplest of social systems (Bednarz, 1988). Bednarz sees the overall problem in terms of ‘confusion of domains’. Autopoeitic systems can operate in only one domain. If the domain is biological then all aspects of the system must be biological. If the domain is social then all aspects of the system must be social. Regarding social systems as composed of human beings means that processes are in one domain (social) and components in another (physical) and the conditions for autopoiesis cannot be satisfied. However, stating that human beings are not the components of social systems, and that social systems are not constituted of the relations between them, flies in the face of several thousand years of traditional thinking starting with Aristotle (Bednarz, 1988).

Luhmann (1995) overcomes these theoretical obstacles by taking the view that action in social systems is not brought about by people directly, but by their communications. For Luhmann, communicative action is an ‘exclusively social operation’ (Luhmann, 1989; p.29), for linguistic behaviour occurs in the consensual domain. Thus Luhmann’s theory of social systems, based on communications as system components and communicating as the fundamental process, confines itself to the social domain.

### 3.3.9 Diffusion of commitment in organizations

Whether Luhmann’s radical view of social systems is accepted or not, it is obvious that people in organizations participate in linguistic processes that generate different kinds of commitments (Flores & Ludlow, 1981). These linguistic processes are associated with social transactions that are instrumental in the acceptance or rejection of communicated meaning proposals, and in the generation of the commitments to action that follow from this acceptance or rejection. Commitments become pervasive in an organization as their
generation in one transaction leads to further transactions and the generation of further commitments. Thus organizations can be regarded as ‘institutional settings that orient the structure of commitment’ (Flores & Ludlow, 1981; p.96), and, for members of the organization, commitments can be seen as creating their organizational world. Creating and maintaining commitments go hand in hand with organizing, and thus organizations shape and are shaped by the network of commitments so created. Organizations can be said to be composed of social transactions and commitments.

Consider the possibility of autopoietic processes in an organizational system that consists of a network of commitments with social transactions as system components. Both commitments and social transactions exist in the consensual and social domains, and this fulfils a test of relevance for the use of the autopoietic metaphor. Maturana and Varela’s definition of an autopoietic system set two other tests of relevance.

First, the recursive production of the processes and components needs to be demonstrated. Following the analysis of previous Section 3.3.5 one can state that the organizational network of commitments produces the components of the system, that is, social transactions. Through the transformational processes of social transactions (the components), commitments are created that regenerate the network of commitments that originally produced the social transactions.

Second, the components (social transactions) must constitute the system as a unity. Here we will fall back on Luhmann’s (1995) reasoning on how communications constitute the autonomy and unity of social systems, and the reasoning of the previous paragraph that social transactions and communications are intimately connected, as communication researchers assert (Pepper, 1995). The requirements for autopoiesis appear to be satisfied.

The implications of an autopoietic model is that organization, as defined by Maturana and Varela (1987), and consequently identity, that is linked to the organization’s historical antecedents and culture (Hatch & Schultz, 2002), can be treated as a closed system, while structure, as defined by Maturana and Varela, can be treated as an open system. The question is what constitutes organization and structure in the commitments-transactions model under review.

First, regarding organization and identity, this relates to the specific relations existing between the social transactions of the system so that the system can be classed as an organizational unity, as more generally defined. In this model, these relations are established
by commitments generated in the past that have - through the transformational processes of social transactions - created commitments for the creation of the knowledge that is now embedded in the organization’s people and processes. These relations are determined by the commitments generated from current organizational knowledge, and these commitments influence the organization’s background to interpretation. Consequently the sensemaking stage of its social transactions is also affected. Furthermore, these commitments relate to the input side of social transactions. Those commitments that are associated with the organizational systems organization and identity will be referred to as ‘structurated commitments’. This term derives from Gidden’s structuration theory (Giddens, 1984), and recognises that these commitments are themselves structured, and create a structure of relations between social transactions over time.

Second, regarding structure, this relates to the relations between the social transactions that make the unity effective. Again these relationships are established by commitments. However these commitments are those that result from the transformation processes of the social transaction and associated with the regeneration of the system. The commitments that are associated with the regeneration of the network of commitments constituting the organizational system will be referred to as ‘creative commitments’. The use of the term creative here recognises two things. First, that these commitments motivate knowledge creation. Second, that Joseph Schumpeter used the term creative response to describe spontaneous commitments to change within the economic system (Schumpeter, 1947).

It is now possible to propose a model of commitments in organizations that prescribes two separate circuits of commitment and, consequently, two separate levels of analysis.

The circuit of structurated commitments has the following characteristics:

- It is essentially a closed system.
- It does not change in response to environmental demands.
- It establishes and maintains the identity of the organizational system.
- It forms the organizational system’s background to interpretation.
- Commitments are historical, and have their basis in the existing knowledge of the organization.
- Commitments tend to be embedded in the structures, routines and processes of the organization, and are thus relatively difficult to change.
It provides the basis for an organization theory that excludes the possibility of a theory of innovation.

The circuit of creative commitments has the following characteristics:

- It is effectively an open system.
- It represents an internal ‘spontaneous’ response to data from the environment.
- It can change without affecting the identity of the organizational system.
- Commitments are non-historical, and focused on future action and knowledge creation.
- Commitments are not embedded in the structures, routines and processes of the organization, and are thus relatively easy to change.
- It provides the basis for models of innovation that are divorced from the organizational context.

This model provides a different way of looking at how commitments work in organizations and clarifies the role of commitments in organizational change processes. Commitments have to be understood and managed at two different levels.

First, a circuit of structurated commitments works towards enhancing the organizational system’s unity, and towards achieving stability and improving efficiency. In pursuit of these objectives the circuit is highly resistant to change. Conventional theories of organization focus on this circuit of commitments. The structurated commitments are largely described by the existing knowledge base of the organization, and the commitments that have caused it to be embedded in the structure and processes of the organization over time. As a consequence they contribute to organizational rigidities. The components of the circuit of structurated commitments are reasoned to be:

- Personal Knowledge (non-tacit elements) (Section 2.3.4).
- Proprietary Knowledge (Section 2.3.5).
- Collective Knowledge (Section 2.3.7).
- Structural Commitments (Section 2.5.5).
- Social Commitments unfavourable to change (Section 2.5.6).

Second, a circuit of creative commitments works towards regenerating the organizational unity in response to data from the environment. This is the circuit of commitments through
which adaption and innovation takes place. Consequently, this circuit may threaten the unity and identity of the organization by competing with and sometimes dismantling the network of structurated commitments. The components of the circuit of creative commitments are reasoned to be:

- Personal Knowledge (tacit element) (Section 2.3.4).
- Psychological Commitments (Section 2.5.3).
- Project Commitments (Section 2.5.4).
- Public Knowledge (Section 2.3.6).
- Social Commitments favourable to change (Section 2.5.6).

### 3.3.10 Knowledge - commitment model of innovation

Previous Sections 3.3.6 and 3.3.9, when taken together, outline a comprehensive theory of the role of commitments in the creation of new knowledge, and the development processes of an organization. Section 3.3.6 describes the operative processes creating the short-term patterns of change. Section 3.3.9 describes the overall and longer-term development process.

The knowledge-commitment theory of change is based on the view that organizations consist of networks of commitments that bind the organization, and transform the organization’s knowledge into action. This network of commitments generates social transactions that, through their transformational processes, lead to the network of commitments being continually regenerated. This is a view of organization as a self-reference or self-producing system (Morgan, 1986). The term ‘self-reference system’ will be adopted in further discussion.

Organizations have knowledge of problems that are widely shared amongst its members. Individuals have personal knowledge that is idiosyncratic, and under the conditions of serendipity ideas emerge and a creative action or change initiative occurs. The initiative will only survive if commitments to action are generated and diffused. This occurs first from one individual to another and subsequently to and between relevant work groups and the organization’s functions, therefore enabling the initiative to be implemented. It is these same commitments to action that motivate the creation of the various forms of knowledge necessary to developing the change program.
Commitments are diffused throughout the organization through the processes of social transactions. Social transactions occur at various levels of sharing of organizational knowledge, intra-personal, inter-personal, group, inter-group and enterprise-environment. At each level two separate circuits of commitments influence the resolution of the transactions. Structurated commitments reflect the history of the organization and work to protect the identity of the organization. Creative commitments that are forward looking, and focused on action and future actions, work towards changing the structure of the organization.

The relative forces of competing commitments will determine the resolution of social transactions. If structurated commitments prevail then the ongoing commitments that result from the transformational process of the social transaction will favour either (1), the rejection of the initiative or (2), a revision of the initiative so as not to threaten the organization’s identity. If the creative commitments prevail, then ongoing commitments will favour the acceptance and continuation of the initiative.

Figure 3.4 is a conceptual model showing how commitments influence the knowledge creation process and the short-term patterns of change. The creative commitment links that motivate knowledge creation are shown as C1, C2, C3 and C4. The structurated commitment links that resist the knowledge creation process are shown as S1, S2, S3 and S4. This model of knowledge creation will be referred to as the knowledge-commitment cycle.

Figure 3.5 provides a conceptual model of the overall organizational change process. The model incorporates the knowledge-commitment cycle of Figure 3.4, and thus shows the mechanism underlying the short-term patterns of change in the context of the overall development process. Spontaneous creative actions arise from the organization’s existing stock of knowledge and these lead to creative commitments that motivate knowledge creation. At the same time, structurated commitments that have their basis in the existing knowledge base resist knowledge creation. The outcome of this interaction process in additional knowledge and organizational change is dependent on the relative strengths of the creative and structurated commitments.

Change initiatives that arise spontaneously in an organization will be of varying levels of innovativeness. At one extreme, initiatives that are purely adaptive pose no threat to the organization’s identity, and will not be resisted by the structurated commitments. At the other extreme, an initiative that is outside the range of existing practice will be resisted by
the structurated commitments as a threat to the organization’s identity. If an innovative initiative is to succeed then sufficient creative commitments must be generated to overcome the influence of structurated commitments, motivate the knowledge creation cycle, and alter the organization’s structure so as to accommodate the change.

The knowledge that is the outcome of the process becomes incorporated into the organizational knowledge base, as indicated by the feedback loop of Figure 3.5. The effect of this additional knowledge on the knowledge base depends on the level of innovativeness of the initiative. Where the level of innovativeness is low, and the initiative expands on current practice, then the effect will be additive. And as more knowledge about current practice is accumulated so will the level of structurated commitments rise.

Where the level of innovativeness is high, and the initiative is mainly about doing things differently, the effect will be subtractive, as knowledge associated with past practice is made redundant. As the knowledge about past practice declines so will the structurated commitments associated with that knowledge. The effect of initiatives of high innovativeness may be a destruction of the organizational knowledge base, echoing the creative destruction of the economy that Schumpeter stated as the role of innovation.
Figure 3.4: Knowledge - Commitment Cycle
Change
Outcome

Knowledge-Commitment Cycle (Figure 3.4)

Structurated Commitments

Organizational Knowledge Base
Spontaneous Creative Action
Change Outcome
Creative Commitments

Figure 3.5: Organizational Change Process
3.4 Research propositions

In response to the research aims of this study, three separate models have been developed, namely the business practice continuum (Section 3.2.1 and Figures 3.1, 3.2 and 3.3), the knowledge-commitment cycle (Section 3.3.10 and Figure 3.4) and the organizational change process (Section 3.3.10 and Figure 3.5).

These models need to be critically evaluated. Popper (1959) distinguished four separate ways in which the deductive testing of theories can be carried out. First, the theory needs to be internally consistent as demonstrated by the logic of its conclusions. Second, the theory needs to be logical in form and not tautological. Third, the theory needs to represent an advance on previous theories. Fourth, the conclusions of the theory can be empirically tested.

The analysis of the literature in Chapter 2, and the development of theory and models in previous sections of Chapter 3, have been conducted in a careful and logical way in order to stand up to examination in terms of Popper’s first three requirements, and establish internal validity. The concern now becomes the limited empirical testing of the model.

If the three models relating knowledge, commitment and innovation, and the concepts used in their formulation, are to be useful then two general questions need to be addressed:

1. Do the model descriptions reflect on managerial practices as conducted in real-world organizational change projects and do the models explanations have external validity and wide applicability?

2. Do business organizations behave in accordance with autopoiesis, the conceptual basis of the model? If so, this would confirm the relevance of the theory, and the appropriateness of any conclusions drawn from the models.

The first of these questions can only be answered by observing organizational change programs in action.

On the second question, autopoiesis suggests that change in organizations is internally and spontaneously generated. It also suggests that the outcome of an internally generated change
depends on to what extent the internal processes protecting the identity of the organization allow a new structure of relationships to emerge.

In the knowledge-commitment theory outlined in this study, when an organization is faced with an internally generated disturbance, its future is shaped by the competition between creative commitments and structurated commitments. It would be logical to assume that the nature of the disturbance would be influential in the interaction between creative and structurated commitments, and thus affect the ultimate outcome. Furthermore, the effects of a disturbance of greater dimension will be different to that for a disturbance of lesser dimension.

Any internally generated initiative that arises within an organization will represent a system disturbance that will be accompanied by creative commitments. The extent to which this initiative challenges the organizational system is the extent to which the initiative departs from the organization’s current practices and traditions and, consequently, the extent to which structurated commitments are challenged. The dimension ‘innovativeness’ refers to an initiative’s position on the business practice continuum (Section 3.2.2), and can thus be taken as a measure of the extent that the initiative challenges the closed system of structurated commitments.

At the adaptive extreme of the continuum an initiative is essentially within the range of current practice and traditions, so is not strongly resisted by the organization’s structurated commitments. It therefore can be implemented providing there is a sufficient level of creative commitments generated to see the task through. An initiative that is further towards the innovative extreme of the continuum and departs from current practice and traditions will be resisted by the organization’s structurated commitments, and the extent of that resistance will correspond to the extent that the initiative departs from current practice and tradition. Again, for the initiative to be implemented there has to be sufficient creative commitments generated to see the task through. It follows from this reasoning that the higher the level of innovativeness of the initiative the greater will be the resistance from structurated commitments, and the greater the creative commitments that need to be generated for the initiative to be implemented. Confirmation of these relationships would support the autopoietic character of the commitment model, and the relevance of its conclusions.

Under the conditions of autopoiesis, structurated commitments are associated with an organization’s knowledge base; creative commitments are associated with the spontaneously
arising initiative, and the knowledge creation that it generates. It has been previously reasoned that the spontaneously arising initiatives are responses to shared problems from the collective knowledge of the organization (see Section 2.3.7). There is no suggestion in this that either the conditions of autopoiesis or the organization’s collective knowledge applies any constraints on the responses that may arise. Accordingly, the change responses that arise may occur anywhere on the business practice continuum. The proposition that follows from this (and from Section 2.3.9) is that an organization’s existing knowledge plays no role in determining the level of innovativeness of internal change responses.

Drawing the discussion of this section together, support for the following four research propositions would validate the use of the three conceptual models presented in this Chapter, and establish the relevance of any conclusions drawn from them.

**Research Proposition 1:** The model descriptions reflect on actual managerial practices and processes as conducted in practical organizational change projects in accordance with the following sub-propositions:

- **Proposition 1a:** The three routes to innovative business practice model of Figure 3.3 describes the strategic directions that the project follows.

- **Proposition 1b:** The knowledge-commitment cycle model of Figure 3.4 describes the knowledge creation processes involved in the development of the project.

- **Proposition 1c:** The organizational change process model of Figure 3.5 describes the dynamics of overall organizational change.

**Research Proposition 2:** The models apply generally to cases of doing things differently in organizations in accordance with the following sub-propositions:

- **Proposition 2a:** The three routes to innovative business practice model of Figure 3.3 describes the strategic directions that change projects follow.

- **Proposition 2b:** The knowledge-commitment cycle model of Figure 3.4 describes the knowledge creation processes involved in the development of change projects.

- **Proposition 2c:** The organizational change process model of Figure 3.5 describes the dynamics of organizational change that result from change projects.
**Research Proposition 3:** An organization’s structurated and creative commitments are positively related to the level of innovativeness of spontaneously arising change initiatives.

**Research Proposition 4:** An organization’s knowledge is unrelated to the level of innovativeness of spontaneously arising change initiatives.

### 3.5 Chapter summary

This chapter has taken ideas from the Chapter 2 literature review of innovation, knowledge and commitment, and has introduced additional literature on communications in organizations and autopoietic systems to extend these ideas in two ways.

First, innovation has been re-conceived as a business practice that occurs on an adaption-innovation continuum. This development has provided the basis for the measurement of an innovativeness variable that is a necessary part of this investigation. It has also provided a model and means for a strategic level analysis of innovation, knowledge and commitment in developing organizations.

Second, through the ideas of autopoietic systems theory a view of organization as a self-reference system constituted of social transactions and commitments was developed. In this view the organization consists of a closed system of commitments that protect the organization’s identity and an open system of commitments that leads to organizational renewal.

From this theory development two models of the diffusion of commitments in organizations were developed. One, a knowledge-commitment process model (refer Figure 3.4) demonstrates how commitments motivate the knowledge creation cycle. Two, a model of organizational change (refer Figure 3.5) demonstrates the dynamics of the change process as the open-system creative commitments motivate the change process while closed-system structurated commitments work to restrain the process.

Section 3.4 developed the research propositions that will guide the further conduct of this study.
Chapter Four: Research Design

4.1 Chapter introduction

This chapter outlines the design of the investigation covering the research questions derived from the theory development of Chapter 3. Emory and Cooper (1991) point out that the expectation of a good research design is that it will include three things. First, the plan for selecting the types and sources of information appropriate to examining the research question, second, a framework for specifying the relationships between the research variables, and third, an outline of all of the research procedures from the research proposition to the analysis of the data.

This chapter’s coverage of these three requirements proceeds in the following manner.

Section 4.2 identifies the research questions, and reviews the nature of the problems that the research investigation needs to overcome to throw light on the questions.

Section 4.3 reviews the methods that are available to investigate the research questions, and the stance that the researcher has adopted in approaching the selection of appropriate methods of investigation.

In Section 4.4 the selection of the particular method of investigation is discussed and justified, and Section 4.5 develops the proposal to use the case study method and outlines the reasons why a multiple case study approach was chosen.

Section 4.6 outlines the thinking behind the selection of type of case studies and the number of cases that need to be studied.

Section 4.7 outlines the thinking behind the procedures adopted for recruitment of participants and the obtaining of their consent.

Section 4.8 is an account of the development of the Case Study Protocol that is intended to standardize the data collection processes for each of the multiple case studies.
Section 4.9 is an account of the design and development of the survey questionnaire that will be verbally administered during the interview process.

Section 4.10 is an account of the approach to pilot testing of data collection processes, through survey content and protocol procedures, and to the refining of the documentation involved.

Final Section 4.11 outlines the approach taken to data analysis and the procedures to be adopted.

### 4.2 Review of research questions

The research questions follow from the three conceptual models developed in Chapter 3, namely, the business practice continuum (Figure 3.1) and its extensions (Figures 3.2 and 3.3), the knowledge-commitment cycle (Figure 3.4), and the organizational change process (Figure 3.5).

For a model of change to be perceived as relevant and useful to a management audience it must have a measure of both face validity (Anastasi, 1982) and content validity (Anastasi, 1982; Emory & Cooper, 1991). Face validity does not establish the validity of the model, but is about ensuring that the model appears superficially to be valid from the audience viewpoint, and reflects on their needs. A management model is useful only to the extent that a manager sees a purpose in using it.

In contrast, content validity of the model is the technical issue of determining whether a model is actually worth using in terms of its relevance to the domain of action that it purports to cover. Content validity can only be established by a systematic examination of the content of the model to determine whether it covers a sufficient sample of the behaviours involved in the intended domain of action (in this case, change processes in organizations) so that the model might be regarded as representing a “typical” or “representative” example of the domain of action.

Face and content validity can only be determined by comparing the terms of the model with what actually occurs in the real-world of the intended domain of action of the model. The research design issue that underlies the evaluation of the first two research propositions,
Propositions 1 and 2 below, is the observation of the real-world events surrounding the change processes of organizations.

Proposition 1: The model descriptions reflect actual managerial practices and processes as conducted in practical organizational change projects.

Proposition 2: The models apply generally to cases of doing things differently in organizations.

The propositions that follow relate to the extent to which the workings of the models corresponds with the workings of organizations that conduct actual change programs. This is a problem of construct validity (Anastasi, 1982; Emory & Cooper, 1991), that is, the extent to which the theoretical constructs of the model are reflected in real-world events. The two propositions intended to demonstrate the validity of the self-referencing models’ constructs were derived in Section 3.4 as:

Proposition 3: An organization’s structurated and creative commitments are positively related to the level of innovativeness of spontaneously arising change initiatives.

Proposition 4: An organization’s knowledge is unrelated to the level of innovativeness of spontaneously arising change initiatives.

The research design issues raised by these latter propositions are of both observation and measurement. Organizational processes need to be observed, and the variables of innovativeness of the change, knowledge and commitments need to be measured.

4.3 Review of strategy and available methods

While the management research literature tends to draw a sharp distinction between quantitative and qualitative techniques of data collection and analysis, the distinctions are less clear in practice (Easterby-Smith, Thorpe, & Lowe, 1991). Quantitative data, that involves counting and measuring, can be gathered by such means as interviews, observation, questionnaires, surveys, experiments, psychological tests and archival search. Qualitative data, that focuses on what people say and do, is gathered mainly by interviews and observation, and with these latter techniques being used to gather either quantitative or
qualitative data, the distinction between the two types of data can become clouded. This study will involve each of the forms of data gathering.

The stark difference between quantitative and qualitative techniques is in the relationship between data gathering and data analysis. With quantitative techniques the process of data gathering is distinct from the process of data analysis. On the other hand, with qualitative techniques the investigator must make sense of the phenomenon being investigated in terms of the meanings that the people involved bring to the situation (Denzin & Lincoln, 1998). Here data gathering and data analysis are not distinct activities, and, on the face of it, subject to the prejudices of the investigator. Consequently, qualitative techniques have been perceived as providing a lower level of objectivity and scientific merit than quantitative studies, a position that qualitative researchers strenuously attempt to rebuff (Denzin & Lincoln, 1998; Yin, 2003).

Denzin and Lincoln (1998) argue against any hierarchy of merit in research techniques, pointing out that both quantitative and qualitative researchers have useful things to say, but they emphasize different things in the telling. Quantitative studies emphasize measurement and causal relationships between variables rather than processes, whereas qualitative studies emphasize the writing of rich descriptions of situations and processes that quantitative research methods cannot obtain.

Yin (2003) proposes that selection of appropriate research strategies in the social sciences revolves around three contextual conditions. First, the nature of the research question, second, the extent to which the researcher can control actual events, and third, whether the focus of the study is on contemporary or historical events. Yin uses the terms experiment, survey, archival analysis, history, and case study, to represent the general classes of technique.

On the first of these conditions, Yin categorizes types of questions under the familiar headings of who, what, where, how and why. The who, where and what questions, that lead to derivative questions such as how many or how much, are raised when the intention of the research is to describe the frequency or incidence of a particular phenomenon. To identify outcomes such as this, the strategy of using surveys or archival analysis would likely be superior.
However, the questions how and why deal with more than frequencies and incidences. Rather these questions call for explanations, and for tracing the behaviour of processes over time. Obtaining outcomes such as this would most likely call for strategies involving case studies, histories, or a series of experiments.

On the second of the conditions for selection, the extent that the researcher can control events, differentiates the research strategies that are appropriate to answering the how and why questions. If the researcher has absolutely no access or control, as in focusing on past events, and where the events are beyond the memory of the people involved, then the only strategies available are history and archival analysis.

Where the researcher has access to and a focus on contemporary events, but no control over any of the behavioural events involved then an appropriate strategy is the case study. When the researcher can control behavioural events, directly and precisely, then the strategy of the experiment is most appropriate.

Experiments can be best conducted in artificial laboratory settings, and where a ready supply of students exists on which to conduct the experiments (Easterby-Smith et al., 1991). However, with management research, the relevant people - managers and employees – are less available than students, and there are lesser ways in which they may be manipulated without breaking ethical codes (Emory et al., 1991).

However, the range of experimental techniques is not limited to laboratory experiments. It extends to experiments in field settings where researchers look for effects by treating different groups of people in different ways (social experiments (Yin, 2003)), and to field-oriented techniques where the researcher may not be able to control any behavior, but can apply the disciplines of the experimental method – the, so called, quasi-experimental designs (Campbell & Stanley, 1963; Cook & Campbell, 1979).

The nature of the research questions and propositions discussed in previous Section 4.2 now need to be matched with the range of available techniques that have been discussed in this section in order to determine the appropriate methods for investigating the research question and propositions.


4.4 Selecting methods of investigation

The first research proposition of Section 4.2 concerns the question of the extent to which the process of change described by the theoretical models corresponds with the processes evident in typical organizational change projects. Questions concerned with operational process involve identifying the links between operational elements, and tracing how these links change over time, in the interest of determining how and why the process works.

The Yin framework would suggest that three general categories of research strategy, experiments, history, and case study are appropriate to considering how and why questions. However, in moving to the second stage of the decision framework, and the question of the control that the researcher is required to exert, it becomes clear that if real world events are to be observed in some way then the researcher can exert no control over the behavioural events, and the possibility of using standard forms of experiments is denied.

But lack of researcher control does not immediately preclude one from considering quasi-experimental field procedures (Campbell & Stanley, 1963; Cook & Campbell, 1979). The nature of quasi-experimental designs is in measuring the effects of treatments or interventions in the process under investigation, usually by pre-test – post-test measurement, or by examination of the time series of repeated measurement before and after the treatment or intervention. However, treatment or intervention plays no part in examining the proposition at hand. Accordingly, all forms of experiment, standard or quasi-experimental, are ruled out of consideration.

On the face of it, moving to the third stage of Yin’s decision framework and the degree of focus on contemporary versus past events would immediately rule out history techniques for the focus of the research study is on contemporary organizations, leaving the case study as the only viable design approach.

The other propositions in this research study relate to the issue of level, or in Yin’s terms the question of how much. With the researcher having no control over the behavioural events involved in the change process, the data being gathered after the events have occurred, and with a focus on contemporary events, appropriate strategies would appear to be those of survey and archival analysis.
In summary, the appropriate research methods for examining the research propositions of this study have been reasoned to be a case study design supported by additional data collection through survey and archival analysis designs.

4.5 Development of case study proposal

Yin (2003) cautions that the case study continues to be stereotyped as the weakest of the social science research methods, and investigators doing case studies as similarly compromised. However, Yin also says that one should ask why, if case studies have serious methodological weaknesses, are they so widely used? Yin argues that the stereotype is simply wrong, but advises readers to do case studies with an understanding that the choice of method will be challenged.

One of the issues with putting forward the case study as a research strategy seems to be the different interpretations about what the method actually is. Stake (1998) thinks that the majority of researchers using case studies actually call their work something else, commonly simply fieldwork (Stake, 1998). Confusion is also raised by researchers defining the case study by the topics to which the case study method is applied (Yin, 2003). An example from Yin is of the case study method applied to the topic of decision-making that leads to a definition of the case study as the means of exploring decision-making.

Case studies are also sometimes confused with qualitative research in general, and with one of the research methods of qualitative research, ethnographies and participant observation (Yin, 2003). Ethnography and participant observation are forms of social research that claim to bring a unique humanistic and interpretive philosophy to a research task (Atkinson & Hammersley, 1998). Ethnography puts emphasis on exploring the nature of social phenomenon rather than testing hypothesis, and participant observation recognizes the interactive roles of observers and participants within the ethnographic method. Clearly these and other philosophical approaches and methods of data gathering may well be effective within a case study. However, as Stake (1998) says, the case study method is ‘defined by interest in individual cases, not by the methods of inquiry used’ (p.86). The use of the case study requires no ideological commitment to the means of data gathering and analysis used.

Neither should the decision to use a case study here be interpreted as an expression of an ideological commitment to the case study method. The case study is the preferred strategy
only when the research problem and other circumstances are appropriate (Platt, 1992). The question for this study is whether the research problem and the circumstances are appropriate.

4.5.1 Case study approach

There are two reasons that suggest the appropriateness of the case study approach to addressing the research propositions of this study.

First, Yin outlines the logic of the case study as an investigative tool involving observations of current behaviour in real-life contexts and especially in situations where it is difficult to discern the boundaries between phenomenon and context (Yin, 2003). The choice of the case study method becomes a deliberate choice to include the context of the phenomenon being studied. This is in stark contrast to the idea of experiment that seeks to keep the phenomenon and its context completely apart.

This research study is concerned with the change process in organizations. Such processes are dynamic and complex, with many relationships of many types between the people involved in the process and between the people, their work groups, their work environment, and the organization itself, all varying over time. The change process may affect all of these interrelationships. Furthermore, in organizational change processes it is not possible to isolate a set of relationships called a ‘change process’ phenomenon and distinguish it from a separate set of relationships called ‘context’. One set of relationships is always connected and entirely dependent on the other, so they cannot exist independently. Accordingly, the choice of case study is appropriate.

Second, the complexity of the organizational change process as just described means that there are potentially more variables of interest than can be possibly gathered with any single data gathering method. This leads to three further characteristics of the case study. These are, first, the need for multiple data collection methods, second, the need for the data gathering to be prioritised and guided by theoretical propositions, third, that these theoretical propositions are used to guide the data analysis. These are the logics of design that will be followed in this research study. Further questions remain as to the purpose and type of design and the number of cases required.
4.5.2 Purpose and type of design

Stake (1998) identifies three purposes for studying cases. One purpose expressed in *intrinsic case study* is about gaining understanding about a particular case. Another purpose that leads to an *instrumental case study* is about examining a case in order to throw light on a theory. The case is analysed in order to pursue other interests. A third purpose is expressed by what Stake terms the *collective case study* where the emphasis on a particular case is reduced by the study of a number of cases in order to expand the inquiry to a higher level of generalization.

In this research study the research question focuses attention on the theoretical models developed in the study. The only purpose of the case study or studies is as the source of data to assist in confirming the theory and its propositions. The case studies will be clearly instrumental in nature. In terms of the study’s seeking of knowledge about the phenomenon of change in organizations, the purpose seems best met by the idea of a collective case study.

Whether to a study should involve a single or multiple cases depends on which is best to address the research question. Where the purpose of the case is instrumental then Yin (2003) sets out a number of rationales for considering a single case, none of which are applicable to the research questions of this study, confirming that multiple cases are the appropriate approach for this study.

4.5.3 Number of cases

Yin (2003) suggests that the decision about the number of cases required for a collective case study should be based on a ‘replication’ rather a ‘sampling’ logic. A sampling logic is used where the prevalence of a certain phenomenon is to be determined. In effect, this is about answering the question of how much, and according to Yin (2003) the case study is not the appropriate method for doing that.

The replication logic is based on treating multiple cases in the same way as multiple experiments, rather than as multiple subjects within in experiment or multiple respondents in a survey. By replication of experiments, one aims to gain more certainty about a significant result from a single experiment by replicating the result in another experiment.
Some replications may seek to duplicate the conditions of the original experiment others may alter some of the experimental conditions to determine the sensitivity of the result. Greater certainty lies in a greater number of replications.

In following the replication logic each case is regarded as an entire study in its own right, and a study in which the data gathering and analysis of the case leads to conclusions. It is the conclusions of each case that then becomes the information that needs to be replicated by other cases. Whether or not the research propositions are met must be demonstrated in each case.

The question of what might be an appropriate number of cases turns on whether it is literal or theoretical replications that are being sought. If meeting the demands of the research question issue simply requires a series of literal replications to achieve some certainty in the result, then on the basis that the more replications the more certainty of judgment, then three or four replications would achieve a high degree of certainty.

However, the context of organizational change processes may be too complex to assume that different contextual conditions will not produce different case study results. For example, some organizations may have developed certain practices that are conducive to change, whereas other organizations have not. As well, the literature on organizational change suggests that there may be differences in process between different types of changes, administrative and technical types for example (Damanpour, 1988). Therefore, if a multiple case study is to investigate whether a particular theoretical model has general applicability to organizations, then it may need to include subgroups of cases that vary along both organizational and type of change lines.

The approach taken in this study is to analyse multiple cases within an organization that has a global reputation for innovation. This organization will be referred to as the benchmark organization. Projects from this organization will represent one sub-group of the study, and its five literal replications will provide a relatively high degree of certainty about the relevance of the theoretical models. A second subgroup of cases of equal number will be drawn from a range of organizations of different size, and involve both technical-based and marketing-based change processes. These theoretical replications will provide either confirmation or falsification of the theoretical models when applied to the particular circumstances of the case, and indicate the extent to which the theoretical models apply to different organizations and types of change processes. Overall, the study will call for a minimum of 10 cases.
The case study design will also include the survey that is necessary to addressing the how much question of the research propositions (see Section 4.4). The survey data will become part of the findings of a particular case, and will be used alongside interview information to interpret the case. As well, the use of a survey will allow across-case data to be analysed in order to uncover possible relationships. The low number of data points (minimum 10) is not intended to make sense on the basis of sampling logic, but may provide confirming evidence and constitute an exploratory study that sets a direction for further research.

4.6 Selection of cases

While the primary consideration for selecting cases is maximizing the opportunity to learn, the opportunities will be highly determined by whether access to cooperative organizations and relevant people can be achieved (Stake, 1995). There will be a limit to being able to select cases with the desired degree of uniqueness or the desired characteristics of its context to achieve the typical case. However, the multiple case study approach will provide an opportunity for achieving a high level of representation, if not typicality.

One way of achieving better representation would be to restrict the population of cases by selecting case studies whose characteristics were within certain defined limits. However, the more restrictions placed on the case’s characteristics the more difficult it might be to find cases, and the more resources will be required to locate an appropriate case.

In this study, the primary consideration in determining case selection criteria was the theory development, and the research questions that are based on that theory. The cases selected must provide the opportunity for testing the research propositions, and thus the characteristics of the cases must lie within the boundaries that the theory purports to cover.

The criteria for the selection of cases for this study are as follows, with the reason for each criterion stated:

1. The case involves a change project that was substantially completed in the previous 12 months. This is to ensure that all important knowledge creation cycles are covered.
2. The project had a recognized project manager or leader who is willing to participate in the study. The project manager should have the widest view of the project so as to act as primary data source.

3. The change process was clearly about doing things differently, the definition of innovation adopted in this study, and involved knowledge creation.

4. The change process was about marketing or technical change.

5. The informant’s involvement with the project is reasonably current so as to limit any memory loss of the informant.

6. The organization involved is hospitable to the study.

4.7 Recruitment and informed consent

The approach taken to consent was that an ethically responsible research design should anticipate ethical dilemmas (Emory & Cooper, 1991), and that these should be addressed during the planning process rather than if or when they occur. The Ethics Protocol Guidelines of the UWS Human Research Ethics Committee guided the work. The application covering the work of this research project, Protocol No. HEC 03/072, received final approval on 28 July 2003.

Three potential ethical dilemmas were recognized:

i. That the researcher, having a personal network of contacts that will be used to identify cases meeting the selection criteria, remains at arms length from the decisions of companies or participants as to whether or not to participate in the research study.

ii. That through participation in the research a company may inadvertently disclose important proprietary information.

iii. That through participation in the research individuals may be compromised in ways that threaten their ongoing work relationships and employment.

The approach to identifying potential cases was the use of personal contacts. These contacts were current business contacts, current colleagues in community service work, past work colleagues and past students. In order to resolve the first potential ethical issue above, having identified a potential case and contact name, the recruitment process, itself, was conducted at arms length. A letter of invitation was forwarded to the contact inviting the
addressee to contact the researcher, from whence discussions of the merits of the case, and whether the organization would be hospitable to the researcher’s work.

There were two pieces of documentation supporting the consent process. First, the Invitation Letter and Information Sheet that outlined the research study, the terms of confidentiality and consent, and the invitation to participate. The Invitation Letter and Information Sheet were provided to all participants. Second, a consent form intended to be signed by the informant.

The potential ethical dilemmas recognized at the beginning of this section bring the issues of confidentiality and anonymity to the forefront. For companies, the Invitation Letter and Information Sheet assures them that they will not be identified, and that any data gathered from them will not be used outside of the research study. For individuals, the Information Sheet assures them that they will remain anonymous, and that any information they share with the researcher will not be discussed with any other person. Accordingly, providing data to the research study will compromise neither the organization nor a participant employee.

4.8 Design of case study protocol

A case study protocol is important to increasing the reliability of the case study design (Yin, 2003). The protocol is intended to standardize the data collection activity involved in each of the single cases of the multiple case studies. The protocol will contain the standard procedures to be adopted in conducting a single case study, the standard procedures for data collection, and the research instrument that is necessary to facilitate the data collection. The design of the research instrument necessary to this study, a survey questionnaire, is covered in following Section 4.9.

Apart from setting down the procedural elements of a single case study, the major design feature of the protocol is the list of interview questions that address the issues raised by the research questions. These questions are of two types, those that are oriented towards and asked of the researcher, and those that are oriented towards and asked of the interviewee. Both types rely on eliciting verbal data from interviewees. Verbal data collection can take place along a continuum of structure (Gillham, 2000), that at one extreme is the completely unstructured interview, and at the other end the structured questionnaire where the
interviewee is asked to answer simple closed questions. The data collection of this study is at neither extreme but tends towards the unstructured.

Those questions that are posed to the researcher are essentially reminders about the information that needs to be collected during interviews to answer the protocol questions. These provide answers to the questions of what concerning a specific case. Since the “what” things differ for each case the means of collecting the data must be flexible. The orientation of questions towards the researcher also allows the researcher to approach issues in an open-ended manner and allows interviewees to frame their answers in any way they wish, without the inhibition of question structure. This part of the protocol might be best described simply as open-ended questioning, and allowing scope for new theoretical ideas to emerge.

The protocol questions that are posed of the researcher rather than the interviewee relate to the case narrative and changes that occurred during the progress of the project:

- The idea for change.
- The people involved.
- Key agreements with others.
- Work group organization.
- Industry/market issues affecting the project.
- Events critical to the success or failure of the project.

The protocol questions that are posed of the interviewees are concerned with questions of how much, and these are contained in the survey questionnaire outlined in the following Section 4.9. This part of the protocol tends towards the structured end of the verbal data collection continuum. The survey questionnaire cannot be classed as structured for the questions remain open to the interpretation of the interviewee through multiple-choice responses.

As well, verbal administration of the survey questionnaire allows for discussion of the question, helps in overcoming any misunderstandings about the question, and thus adds to the reliability of the survey questionnaire and case study. The discussion of multiple-choice questions will provide additional data to that of the questionnaire item, for discussion provides an opportunity for gathering data about why the choice was made, and of statements and opinions that might add to or throw light on the case description.
The Research Protocol for this research study is included in this report as Appendix 1 - Case Study Research Protocol.

**4.9 Design of survey questionnaire**

This section outlines the process that was followed in moving from the general research question to the specific measurement questions. This involved moving through a number of levels of questioning (Emory & Cooper, 1991). The starting point is the research question and its propositions. These were the necessary levels of questioning and analysis:

i. The investigative questions that must be asked in order that the research question is answered.
ii. The theory-derived questions that must be asked in order that the investigative questions are answered.
iii. The observed behaviours that explicitly model the theoretical concepts utilized in the theory-derived questions of (ii). This level of question relates to measurement of knowledge and commitment variables only, and its justification is covered in Subsection 4.9.1 below.
iv. The measurement questions about observed behaviours that respondents need to answer for data to be obtained.

The development of the latter three levels of questions is included in this report as Appendix 2 - Research Question Mapping.

The investigative questions (i.) relate to the main variables of the theoretical models developed in Chapter 3 and outlined in the logic models of Figures 3.1, 3.4 and 3.5. These questions involve the nature of the change process (or innovativeness), and the various forms of organizational knowledge and commitment derived in the theory development.

The variables addressed by the investigative questions must be further examined in terms of the theoretical constructs on which they were derived. For example, the concept and variable named *personal knowledge* is constituted of at least four theoretical constructs of common character in that the knowledge resides only in the minds of individuals. If the investigative question about personal knowledge is to be answered then questions must be asked about the four theoretical ideas on which it is constructed.
The next stage of questioning relates to the behaviours associated with the theory-derived questions of (ii), for reasons covered in following Subsection 4.9.1. This stage of questioning is about identifying behaviours associated with the investigative questions, for these that are the subject of the measurement questions.

The measurement questions were the final stage of the design process. Issues covered in question construction were the question’s content and the wording used for the question (Emory & Cooper, 1991) that were checked for relevance and the extent that the question contributed towards answering the investigative questions. The approach taken was if the investigative question could be answered without recourse to the intended measurement question then the question was redundant and could be removed from the survey without loss of information.

With all intended questions meeting the test of relevance, the content issue revolves around whether the question provides sufficient and appropriate coverage of the territory of the concept being measured by the question. Too much question content may lead to ambiguity and to the respondent having difficulty with interpreting the question. Too sparse question content may lead to respondents making inappropriate assumptions and misleading responses. The content of the question was matched to the prior understanding of the intended respondents, project managers in control of organizational change processes.

The aim of each measurement question was to minimize measurement error by making the question as clear and understandable as possible. In the intended verbally administered survey questionnaire the task of minimizing distortion was about ensuring that the words used and their meaning would be perfectly understood by the respondent. The vocabulary used was intended to match the educational and experiential background of the respondent, and to encompass the vocabulary of technical terms that project managers in organizations use in discussing change processes.

Having satisfied the test of appropriate vocabulary, the wording of the questions needed to be tested to ensure that the expression of the question was clear, that no unwarranted assumptions were made, that the questions did not contain a bias, and that there was no confusion about to whom the question was addressed (Emory & Cooper, 1991). It was recognized that it is only the survey respondent, who can really judge whether the question is clear and does not mislead. Accordingly, pilot testing of the survey questions was a necessary part of the design process, and this is covered in following Section 4.10.
4.9.1 Measurement of commitment variable

The approach taken to measuring commitment is the Benkoff (1997) method of asking people for third party reports on observed behaviours. With this approach, the behaviours to be observed are those explicitly predicted by the theories used to develop the research models. The reasoning for this follows.

The effectiveness of the measures of commitment used within organizational commitment research is suspect. Reviews and meta-analysis of commitment research have concluded that, in most instances, commitment seems to have little direct influence on behaviour (Mathieu & Zajac, 1990; Randall, 1990). So either the instruments used for measuring commitment are not measuring what they are intended to do, or there are other intervening variables that have not been controlled in the conduct of the research studies. Randall (1990) prefers the latter conjecture, whereas others suggest that commitment needs to be measured in different ways (Benkhoff, 1997).

Of the large number of studies examined in the Mathieu and Zajac (1990) review (174 samples) it is significant that nearly 60% of them involved the same measuring instrument, the Organizational Commitment Questionnaire (OCQ) (Porter, Steers, Mowdray, & Boulian, 1974). The OCQ measure is based on employee self-reports of opinions and feelings. It measures attitudinal commitment that is concerned with the process of how people think about their relationship with their organization.

Experimental social psychology suggests that there is little practical value in pursuing the link between attitudes and behaviour, and more productive to measure ‘behavioural intentions’ that have a much stronger link with behaviour (Fishbein & Ajzen, 1975). The difference between attitudes and intentions is that in responding to a question about intentions one must focus on specific behaviours and take the given circumstances into account. That is less the case in responding to questions about feelings.

A further important point is that commitment research draws a sharp distinction between attitudinal commitments that instruments such as the OCQ are intended to measure, and behavioural commitment that is about how people become committed to a particular course of action (Meyer & Allen, 1997), the effect that is of greater interest to this research study.
The behavioural commitment process is not about attitudes influencing behaviour but of behaviours influencing attitudes, a process that the research evidence more favours (Ashworth, 1979). Action creates commitment; so observing the act is a strong predictor of the generation of commitment.

This reasoning leads to a way of measuring commitment pioneered by Benkoff (1997). His scale is based on people reporting observations of commitment behaviours in order to provide a more direct link between specific commitment measures and specific performance measures. Since Benkoff’s study was aimed at measuring attitudinal commitments, one might predict that the link between measure and performance would be even stronger for studies focused on behavioural commitments, as this one, where the theoretical link between behaviour and commitment is more clearly defined.

### 4.9.2 Measurement scales

The survey questionnaire scales provide the means by which respondents can express judgments as to the extent of the commitment behaviours that they have observed. Determining “how much” requires the data to be collected in at least ordinal form, with the numbers on the scale depicting a positioning on a hierarchy of numbers.

Ordinal data has the limitation that while positioning on the scale has meaning, the intervals of the scale do not. It follows that a calculated mean also lacks strict meaning, even though it can be nominally calculated. The question to answer was whether this limitation is important to this research study. Why would one not seek to obtain interval data where the scale intervals are meaningful, or ratio data where numbers can be multiplied and divided with meaning?

The decision made here was to match the characteristic of the data with the requirements of the research questions. There is no implicit merit in achieving the highest level of measurement, where this needlessly increases the challenge and cost of participation of interviewees. In this research study the concern is simply with greater or lesser values of certain theoretical concepts. These are not concepts where a unique origin can be mathematically defined. The concept of “nil knowledge” or “nil commitment” has little meaning even if it could be measured. Accordingly, ordinal data and an ordinal scale were considered to adequately satisfy the requirements of the research questions.
The most frequently used ordinal scale is the Likert-type scale (Emory & Cooper, 1991). The classical Likert-type scale uses a series of statements or items, each one of which expresses an opinion that is clearly favourable or unfavourable to the respondent (Anastasi, 1982). The response is usually expressed in terms of the following five categories: strongly agree, agree, undecided, disagree, strongly disagree. The scale is scored 5, 4, 3, 2, 1 from the favourable to the unfavourable end with a favourable statement, and reverse scored for an unfavourable statement. The item scores are summed to obtain a total score that can be interpreted in terms of empirically based norms. The Likert scale is used in this exact form in the survey questionnaire of this research study.

Likert-type scales can be developed with more or less gradations than the traditional and frequently used 5-point scale. The higher the number of gradations the more discerning the response but the greater the challenge for the respondent in discerning differences. However in this study, that is simply concerned with greater or lesser values, the more common 5-point scale was felt appropriate.

### 4.10 Pilot testing

The final preparation for data collection was the conduct of pilot testing of the research survey documentation and the case study research protocol. This pilot testing was intended to test the relevance of the language of the survey documentation, and hence the content of the data obtained, and the standard procedure to be followed in the collection of the data. The pilot testing was conducted in a way that would allow for refinement of the language and procedures as the testing proceeded. The general approach to the pilot testing is covered in the following, while the full detail of the pilot-testing program is reported in Appendix 3 - Pilot Testing of Research Questionnaire. The report on pilot testing makes reference to the first draft survey documents that are contained in Appendix 3A - First Draft Survey Questionnaire.

The criteria for selecting the test cases were firstly a range of projects that covered the potential workspace of the research study, and secondly access to people experienced in managing projects, and conversant with the management language currently used in change programs. The relationships with the latter people needed to be congenial in nature, so that a less structured approach than the actual research study could be adopted, and the interaction
between subject and researcher could be flexible enough to allow the researcher to trial different approaches to questioning.

The researcher recruited the four test subjects from personal contacts. Each was a recently retired senior executive who had spent a lifetime of work in large companies, and associated with programs of organizational and technological change. These test subjects brought diverse case studies to the test environment. Each case study met the criterion of “doing things differently”.

The pilot testing was conducted in three phases. In the first phase the pilot subjects were asked to review the consent documentation and the draft research survey without help from the researcher. They were first asked to comment on their understanding of the survey questions, and second, to comment on the relevance of the questions to the case study that they brought to the pilot testing. After review of their responses revisions were made to the format of the survey and to individual questions.

In the second phase of pilot testing both the content of the revised draft research survey and the standard procedures for data collection as set out in the Case Study Research Protocol were tested. As set out in the protocol, the revised draft research survey was verbally administered. In essence, this phase of pilot testing consisted of full-scale practice sessions of the interview process. The interviews were tape-recorded and timed in order to test the full mechanics of the data collection process. While no concerns arose from the data collection process, further minor revisions of the language of the survey were made.

The third phase of pilot testing was to conduct an analysis of the data collected to test whether the data was consistent with the case description from which the data was collected, and whether the data appeared to be appropriate for examining the research questions. The preliminary data analysis indicated that the calculated scores of key variables were generally in accordance with case descriptions and expected relationships.

In summary, the Case Study Research Protocol, and the associated tape recording and written recording processes, were tested, found to run smoothly, and able to be completed in the time specified in the Information Sheet.

The tested Research Survey Questionnaire is included in this report as Appendix 4 - Research Survey Questionnaire.
4.11 Data collection methodology

This section explains the researcher’s stance towards the collection of data, and the extent to which this influenced the choice of methods and conduct of the research.

The researcher’s background to interpretation (refer Section 1.1) makes only two claims of personal commitment - first an admiration of practical people and work and, second, scepticism about the way managers of organizations go about their tasks. This might be expressed as the realistic position that the work of organizations involves practical things that can be observed, modified by a pessimistic view of managers’ ability to describe them objectively. This realistic position was extended to the selection of methods of investigation and the conduct of the research.

The researcher had no ideological commitment to any available research method. The choice of method was made on the basis of what was appropriate to investigating the research propositions, and what was practical in terms of time and effort. The choice of instrumental and multiple cases as the primary method of investigation supported by secondary data collection through a survey design followed from a logical selection process (refer Section 4.4).

The selection of cases was also based on realistic criteria (refer Section 4.6). The primary consideration was that the case provided an opportunity to test the research propositions. At the same time it was necessary to have access to cooperative organizations and relevant people. A practical way of achieving this was to use personal contacts to identify appropriate cases followed by a recruitment process conducted at arms length. This approach together with the conditions of confidentiality and anonymity ensured that potential ethical dilemmas were addressed in the planning process (refer Section 4.7).

Testing the research propositions required the broadest view possible about the conduct of the case project. A case selection criterion was that the project had a recognised project manager who was willing to report on the details of the case and the behaviour of people participating in the project. While a project manager will provide only one, possibly self-serving, view of the case, only a project manager is in a position to view the behaviours of all people involved from a potentially objective standpoint. Observing these behaviours from a uniform standpoint was considered more important to testing the research propositions than was the possibility of observer bias in overall case descriptions.
Additional participant observers would have enhanced the details of the case, but not have assisted the reliability of the observation of behaviours necessary to testing the research propositions.

With the project manager being the primary source of data, self-serving and attribution biases were expected. Several strategies were adopted to minimise this bias and standardise any effects across cases. First, objectivity was encouraged. Interviews were conducted in environments nominated by and comfortable to the subject, and under conditions of cordiality, confidentiality and anonymity. Second, the interview questions were set down in a research protocol that emphasised open questioning and encouraged dialogue, allowing the researcher to evaluate and answer the question (refer Section 4.8). In keeping with the case study method (Yin, 2003), the question orientation was towards the researcher rather than the subject. A taped record of the dialogue allowed the researcher to revisit the question and reconsider judgments. Third, the survey questionnaire was verbally administered and tape-recorded with the researcher determining the questionnaire response. Again this provided a researcher orientation, with the researcher able to review and reconsider the subject’s responses, and to identify any obvious individual bias. Fourth, the questionnaire steered clear of attitudinal questions in favour of measurement questions based on the observation of actions, an approach favouring objective responses (refer Section 4.9.1).

In this study the researcher was responsible for all recording and transcription of data. The subject’s descriptions of the case and the dialogue between researcher and subject concerning the protocol and survey questions were tape-recorded. Written transcriptions of interview were not made. Case reports and case analysis were written from the researcher’s interpretation of the interview dialogue and follow-up questions. Written case reports were provided to subjects for their verification and additional comment.

### 4.12 Data analysis

The strategic approach to data analysis of this research study follows the Yin (2003) preferred strategy, namely, following the theoretical propositions.

The Chapter 3 development of a theoretical view of change in organizations was built on earlier organizational and other literatures. The development of the case study protocol and the associated survey questionnaire was based on the theoretical propositions that inform this different theoretical view. Consequently, the newly developed theoretical view
permeates all of the work of this research design chapter. It follows that the significant purpose of the data collection and analysis work of this research study is to either garner support for or falsify this newly developed theoretical view.

The analytical technique that will be used to process the qualitative data will be logic models (Yin, 2003). A logic model specifies the sequence of events that a theory purports to demonstrate by mapping the events in cause-effect stages. The logic model is thus a statement of predicted events based on the theory underlying the logic model. The associated analytic technique involves matching these theoretical predictions with empirically observed events.

There are three logic models associated with this analysis.

i. The logic model of routes to innovation shown on Figure 3.3.
ii. The logic model of the knowledge-commitment cycle that creates development patterns in the short term, as shown in Figure 3.4.
iii. The logic model of self-reference process and organizational change, as shown in Figure 3.5.

The data analysis of the case studies will consist of understanding the actual events of the case, and the sequencing and linking of the events, in order to match the pattern of actual events with that predicted by the theoretical model. The coincidence of predicted events and observed events will support the internal validity of the theoretical model.

Each case will be separately described and analysed and the conclusions drawn from each case used to test the research propositions of the research study. The conclusions of each case will be compared to determine the extent that case replication has been observed and where it has not, what distinguishes the case from other cases. Pattern matching will be conducted across all cases to investigate the effect of both the benchmark organization and the dependent variable of the study, innovativeness, on the processes observed.

The quantitative data gathered by the survey questionnaire will be used primarily to support the analysis of the case from whence the data was gathered. However cross case comparisons will be made to explore other possible relationships. The quantitative data will be recorded and analysed using a spreadsheet software program (Quattro Pro 10) that provides a sufficient range of statistical tools to meet the needs of this research study.
4.13 Chapter summary

This chapter outlined the design of the investigation into the research questions, and how the expectations of a good research design were met.

The chapter reviewed the research methods that were available, and the approach taken to selection of appropriate methods. The reasons for choosing a research strategy based on multiple case methods were explained and justified. The thinking behind the selection and number of case studies was outlined, and the procedures adopted for recruiting participants explained.

The chapter also outlines the design and development of the Case Study Protocol and Survey Questionnaire, the approach taken to testing and refining them, the data collection methodology and the strategy and procedures for analysing the data obtained.
5 Chapter Five: Results

5.1 Chapter introduction

This chapter reports on the results of the investigation outlined in Chapter 4, and on the analysis of data collected.

The chapter is divided into two main parts. Section 5.2 covers the qualitative analysis of the multiple case studies, and Section 5.3 covers the across case quantitative analysis of the survey questionnaire data.

Section 5.2 provides descriptive data about each of the cases studied, reports on the process and results of the case analysis, and examines the validity of the results.

Section 5.3 outlines the study of correlations between the innovativeness variable and the knowledge, commitment and outcome variables.

Section 5.4 summarizes this chapter.

5.2 Case analysis

5.2.1 Description of cases

Ten (10) cases were selected for this study in accordance with the intentions of Section 4.5. Five cases (Codes M1, M2, M3, M4, M5) were selected from one organization, a further five cases (Codes X1, X2, X3, X4, X5) were selected from different organizations of different size and of different types of change.

The organization that hosted the five projects, Codes M1, M2, M3, M4 and M5, was the Australian subsidiary of a long established global company with a reputation for innovation. Its innovation credentials include being in the top ten of the Fortune magazine’s list of America’s most admired companies in ten of the first fifteen years in which the list was published, and in several of those years being first for innovation (Gundling, 2000), its
normal ranking in the top ten of American companies for patents granted, its long list of national awards for technology and innovation in USA and many other countries, and the wide acknowledgement of ‘its historic role as one of Corporate America’s most inventive and innovative companies’ (Arndt, 2004; p.42). While in 2003 its revenue exceeded US$18 billion and it employed nearly 70,000 people worldwide, it has a highly diverse divisional and product portfolio that leads, it is claimed, to it operating as many smaller businesses connected by a common culture (Coyne, 1996).

The researcher was a past employee of the company, but had no prior involvement with the projects selected for study, that had all been conceived after the researcher had left the company’s employ.

The projects of this study were conducted primarily in the Australian subsidiary, but four of the projects also involved collaboration with the US parent company or other overseas subsidiary companies or partners to complete the project. Accordingly, these projects do not only reflect on the practices of a company that is used as a global benchmark for innovative practice, but also provide a contemporary view of how things are done in global companies operating in global markets.

Contrasted with these five cases from one organization are five cases selected from different organizations providing variations in organization size and type of change project. It is not claimed that these projects represent typical cases for their class of organization. Rather, the projects are ones that represent a major investment in organizational resources relative to the size of organization, and are projects important to the organization’s future.

- Project X1 – a small, established and experienced engineering-based company designing and commercialising a different process machine.
- Project X2 – a small, more recently established, R&D-based company developing and commercialising a radically improved electronics component.
- Project X3 – a large public company, with a relatively large R&D group, making a major investment in changed product formulation, and the design and construction of matching process plant.
- Project X4 – a small education-based company changing its business model to revitalize revenue and profits.
- Project X5 – a large public company designing and implementing a different brand positioning strategy.
All ten projects have a number of important things in common. They are all about doing things differently, albeit at different levels on the business practice continuum. All projects involve a level of knowledge creation that was significant in relation to the size of the organization. The informants were all involved at the very beginning of the projects, and thus could reliably report on the important initiation, design and initial implementation stages of the project.

Appendix 5 - Case Descriptions, provides a brief outline of each organization and a brief description of the project that constitutes the case.

5.2.2 Variation on research protocol

During the progress of the research it was found necessary to vary the case study protocol in two ways. Both variations were considered to improve rather than detract from the research study or its results.

i. In the selection of cases, meeting the criteria of a project completion within a particular timeframe proved unduly limiting. While it might be essential for effective project management to talk about a project as having a formal beginning and end, in practice projects start informally, and sometimes progress for many years on an informal basis before formalization (for example, Projects M1, M3, M4, M5), and the end point can be just as uncertain. From the project management point of view, the formal end of a change project is usually taken as the end of the project’s implementation, after which people other than the developers become responsible for the ongoing activity. For a product project (such as M2 and X2) this may be the product launch, for a process innovation project (such as X3) this may be the commissioning of the new plant, for a marketing exercise such as brand positioning (X5) this may be the initial public relations and advertising program.

However, if such a formal approach is taken there is no way of properly evaluating the project against the business criteria on which the project was formally established. Such things as the extended approval periods for pharmaceutical products (M2), the market collapsing (X2), the expectation of long pay-off periods (X3), the inability to reliably measure short term results (X5), and the nature of advanced technology projects that appear to require continuous development
activity, and, in practice, may never reach a stage of completeness (M3), mean that an appropriate end point for a development team may not be a meaningful endpoint for the organization.

Consequently, Projects M1, M2, M3, M4, X1, X2, X5 remain identified projects for their organizations and remain in implementation even though implementation may have been initiated some years earlier. Whatever may be lost from lack of precision about endpoints is gained by the currency of the project information provided. Accordingly, the criteria for all projects was taken that the analysis must cover the important knowledge creation cycles of initial creative action, the design of the project, and the initial implementation of the project, and that the informant must have been associated with these activities.

ii. Question 16 of the Research Survey Questionnaire records the criteria used to judge the outcomes of the project. Question 17 grades the success of the project based on that criteria. Without exception the discussion of Question 16 led to criteria of both technical (knowledge creation) and business nature. In most cases this led to the Question 17 discussion being about the differential success against knowledge creation and business criteria. Informants tended to give two answers to the question of success; one based on knowledge creation criteria, another on business criteria. Accordingly, two separate sets of data were collected from Question 17, namely, knowledge creation outcomes (17b) and business outcomes (17a).

5.2.3 Case analysis process

The minimum data collected for each case consisted of the recorded interview with the case informant and the Research Survey Questionnaire completed by the researcher. The analysis of the data of each case followed the procedure outlined in the following subsections:

5.2.3.1 Case reports

A case report was prepared covering the facts of the case and quotations of interest, as provided by the informant. This report was written under the same headings as used in the Case Study Protocol. The case report also contained a preliminary analysis of responses to Part 2 - Commitment Behaviour Survey of the Research Study Questionnaire under the
heading of ‘commitment behaviour’. This preliminary analysis listed the types of knowledge that were indicated as important to project outcomes, the commitments that had promoted the project, and those commitments that had worked against the project. Appendix 6- Case Report - Project X1 is an example of one such case report.

The appropriate case report was forwarded to each informant by email requesting that it be read, and the details verified. Only one informant commented on the commitment behaviour section of the report (X5), and identified commitment forces additional to those reported. Two informants (M3 and X1) requested that several items be cut from the report, as they were considered sensitive. These items were not of essential interest to the research study, and were cut as requested, and revised case reports were forwarded to the informants. Other informants indicated agreement with their reports without additional comment.

5.2.3.2 Recording numerical data

For each case, the numerical data obtained from Parts 1 and 2 of the Research Survey Questionnaire of each case was recorded on a spreadsheet. Calculations were made to determine scores for the following variables. These were expressed both as a raw score and as a percentage of the maximum score available for the variable to indicate the relative strength of the score:

- Project innovativeness
- Personal knowledge
- Proprietary knowledge
- Public knowledge
- Collective knowledge
- Psychological commitments
- Project commitments
- Structural commitments
- Social commitments
- Creative commitments (as per Section 3.3.9)
- Structurated commitments (as per Section 3.3.9)
- Organizational knowledge (sum of the four knowledge variables)
The data gathered and the calculations made for each case are included as Appendix 7 - Case Data and Calculations.

5.2.3.3 Analysis of case data

A complete analysis was prepared for each case based on the case interview, case report, the recorded numerical data, and the calculated levels of innovativeness, knowledge and commitment. As well as achieving a deeper understanding of the case, the analysis was aimed at examining the causal links between knowledge, commitment and knowledge creation (refer Figure 3.4), and at testing the research propositions.

One example of a complete analysis is included as Appendix 8 - Case Analysis - Project X1. This analysis relates to the same project as the example case report of Appendix 7.

The conclusions of this particular analysis were that the theoretical models on which this study is based provide appropriate and relevant explanations of the internal knowledge creation processes, and that these explanations do not appear to be unique to this case.

The theoretical models can also explain the effect of organizational commitments that were identified but not measured in the case, and this suggests that while explanations of commitments associated with the knowledge creation process may be generalizable, there may also be commitments conflicting with the motivation of that process that may be different in each business setting.

It was reasoned that the innovativeness of the project was related to the business context of the project and the problem to be solved rather than organizational knowledge, for while perceptions of the organization’s knowledge may have played a role in the decision of what problem to solve, the evidence is that the solution, and how to go about implementing it, was determined by the circumstances of the case.

The evidence connecting creative commitments and innovativeness was not transparent. While the calculated strength of creative commitments exceeded that of structurated commitments as the theory predicts, the analysis suggests that the level of creative commitments may have been insufficient to achieve the planned outcomes, and that this may be the result of misunderstanding the innovativeness of the project or the effect of other commitments identified as affecting the motivation of the process. The evidence thus
connects higher creative commitments with higher levels of innovativeness. Evidence connecting structurated commitments with innovativeness could not be resolved in this case.

5.2.3.4 Case comparisons

The first step in making comparisons between cases was to compare the conclusions of the benchmark group of cases M1, M2, M3, M4 and M5 to show that these replications provide evidence to support the theoretical models and research propositions for one company. The conclusions of each of the cases X1, X2, X3, X4 and X5 were then compared with the conclusions from the replications in one company, to support or falsify the proposition that the theoretical models represent a general model of change in organizations.

Summary statements of all cases and the conclusions derived are included as Appendix 9 - Summary Analysis - All Cases.

The replicated cases of the benchmark group provided compelling evidence for the proposition that the theoretical models were capable of explaining real-world change projects. The theoretical models were also capable of explaining the role of commitments of both a creative (external commitments of customers) and structurated nature (parts of organization trapped in inappropriate paradigms) that were identified through the case interviews rather than from the survey questionnaire. The key to their integration in the theory is the commitments being readily identified as creative or structurated in nature.

The evidence from these cases points to the descriptions and explanations based on the theoretical models being general in organizations.

The evidence from the cases is of the innovation ideas being a response to an organizational problem rather than the organization’s knowledge, and the level of innovativeness of the solution being a response to the circumstances of the problem rather than organization knowledge. The proposition that knowledge and innovativeness are unrelated is supported.

The proposition that creative and structurated commitments are positively related did not receive convincing support, but at the same time there was no evidence to falsify the proposition, so the question remains an open one.
Projects of the non-benchmark group (X projects) were individually analysed and compared with the summarized results of the benchmark group. Overall, this analysis added weight to the conclusions drawn from the benchmark group discussed above, and did not deny any of them.

The analysis of two cases (Project X1 and Project X2) identified another form of commitment that was not identified by the survey questionnaire, and thus not measured. In both cases the person most influential in the project had a personal agenda that conflicted with the stated objectives of the project. In essence these were creative-type commitments that addressed a different project to the one at hand, and thus detracted from the commitments motivating the stated project. These competing commitments can be accommodated in the theoretical models by treating them as a negative influence on the creative commitments motivating the knowledge creation process.

The non-benchmark group covered cases in both small and large organizations, low and high innovativeness, and technology-based and marketing-based projects. These provided no evidence to deny the research propositions of this study, and add support to the proposition that the theoretical models on which the study is based apply generally to organizations.

5.2.3.5 Pattern matching

The purpose of the pattern matching exercise was to compare the empirically based patterns of responses to 33 questions covering the features of each case regarding strategy and innovativeness, referring to the theoretical models of Figures 3.1 and 3.3, and regarding creative actions, knowledge, commitment, outcomes and explanations, referring to the theoretical model of Figure 3.5. The response to each question for each case was listed on a spreadsheet.

The 33 questions were answered by either yes (Y), to indicate that a particular effect has been identified in the case analysis, or where the intensity of the effect had been measured by calculation of questionnaire data, by low (L), moderate (M), or high (H) to indicate the relative intensity of the effect. The indication of intensity was based on across-case comparisons. The indicator high (H) or low (L) was used when one or more of the 10 cases had calculated values of an item that were clearly higher or lower than the remainder of the sample. Where there was any doubt about such differences the indicator of moderate (M)
was used for all cases. Where the particular effect had not been identified in the case analysis (that is, the answer was no) the spreadsheet cell was left blank so as not to clutter the analysis.

The first analysis was conducted to compare the nature of the cases from the benchmark organization (M1, M2, M3, M4, M5) with other cases in the study to support or deny the conclusions drawn from the previous analysis and comparison of cases. The pattern matching is included as Appendix 10 - Across Case Patterns

**Results 1:** There were marked differences between the benchmark projects (M group) and other projects (X group) that need to be taken into account in comparisons with the benchmark group.

The benchmark group projects differed from other projects in the following tendencies for:

- The original innovative idea to change (Q3).
- The ultimate idea to have higher novelty (Q7).
- The technology difference to be greater (Q8).
- The intended performance increase to be higher (Q9).
- The strategy to be based on paradigm breakout (Q14)
- The projects to face more internal conflicting commitments (Q25).
- The projects to receive more external support from customers (Q26).
- The explanations from the case analysis to involve the roles of conflicting internal commitments, and supporting external commitments (Qs 32, 33).

A second analysis sorted the case information from the first analysis into an order of lowest innovativeness score to highest innovativeness score without regard to organization, in order to examine the pattern of effects that results from increasing project innovativeness. This pattern matching is included as Appendix 11 - Across Case Innovativeness Pattern.

**Results 2:** There were strong pattern changes as the level of innovativeness of the project increased. Comparing the group of projects at the higher end of the innovativeness scale (Projects M5, M1, M3, M4 and X2) with those at the lower end of the scale (Projects X4, X3, X5, M2, X1) it becomes clear that for this sample of projects with those projects of higher innovativeness:
• The original innovative idea changed (Q3).
• It was more likely that the project involved new business creation (Q4).
• The innovative ideas had higher novelty (Q7).
• The technology difference was greater (Q8).
• The intended performance increase was higher (Q9).
• The level of uncertainty was higher (Q10).
• The behaviour change required of users was slightly higher (Q11).
• Strategies of entrepreneurism and paradigm breakout were more likely used (Qs 13, 14).
• The higher the level of Personal Knowledge noted (Q16).
• The lower the levels of Proprietary Knowledge, Public Knowledge and Collective Knowledge noted (Qs 17, 18).
• The project more likely faced internal conflicting commitments (Q25).
• The project more likely received external support (Q26).
• The more likely that case analysis explanations involved internal conflicting commitments and external supporting commitments (Qs 32, 33).

In summary, the three important effects noted from this analysis were that:

• The elements of the composite innovativeness measure (represented by Qs 4 - 12) changed in the direction expected for increasing innovativeness, and this effect goes some way towards confirming the internal validity of the measure.
• Projects with higher levels of innovativeness were more likely to need the full range of strategic means - entrepreneurism, paradigm breakout and strategic learning – to achieve their objectives.
• Projects with higher levels of innovativeness were more likely subject to conflicting commitments internally, as well as more likely subject to external commitments.

5.2.4 Validity of results

The purpose of this section is to review the design and conduct of this case study research to ensure that the results and the conclusions drawn from them have merit.
Starting with the internal validity of the work, the major precaution against loss of validity has been to focus the research on the theoretical models shown as Figures, 3.1, 3.4 and 3.5, and for the theory to inform the measurement questions of the research interview.

The fact that the theory-derived measurement questions were readily discussed and evaluated by the ten management informants in this study indicates both a high level of face validity, and an indication of construct validity in that the constructs underlying the research appear to have been identified and measured. Construct validity was also affirmed by having informants review the draft Case Reports (refer Section 5.2.3.1). The inclusion of preliminary commitment diagnosis in the Case Reports was intended to make the theory constructs more salient to the informants, and the fact that no informant raised objections to this diagnosis information (other than one, X5, who suggested further points of discussion) indicates that the informants saw the diagnosis, and its underlying constructs to be relevant to their experience.

Further support for construct validity came from the analysis of case data (refer Section 5.2.3.3) in which the causal links of the theoretical models were inferred and analysed. The ability to do this across ten real-world cases is another link in the chain of evidence supporting construct validity.

Another necessary element of internal validity is content validity, the extent to which all items relevant to the study have been covered. In the design of the Research Protocol it was necessary to use judgment in the selection of questions in order to limit interview length, so the possibility of a poor judgment exists, as is the possibility that those questions omitted may have proved more relevant than those chosen. However, the flexibility of the case method allows for the disclosure of matters that were not covered by protocol questions, and each of the case analysis uncovered additional matters. For example, in eight of the ten cases studies, commitments that were not covered by the Research Survey Questionnaire were identified as playing a role in the outcomes of the project. While this might represent a critical comment on the shortcomings of the Research Protocol, it does not detract from the content validity of the overall study.

Finally, external validity, the extent to which the findings are generalizable, is supported by the logic of the research design. The literal replications of five cases within one company, and five theoretical replications of cases covering different organization size and type of change provide strong evidence that the theoretical models and the findings of this research study have wide application in organizations.
5.3 Quantitative analysis

This study makes no claim about the adequacy of ten cases and data points from the viewpoint of sampling logic, and therefore makes no claim about the generalizability of the quantitative results beyond the ten cases of is study. The purpose of the analysis is to determine whether there are significant relationships in the questionnaire data for the ten data points that provides information useful to supporting or denying the research propositions.

The first section of analysis investigates the differences between the group of projects from one organization (the M group) and the group of projects from five other organizations (the X group). The further sections of analysis are about examining relationships in the questionnaire data through correlation analysis.

The theoretical models and research propositions of this study are about; the relationship between knowledge and innovativeness, the relationship between commitment and innovativeness, and the relationships between innovativeness, knowledge and commitment and project outcomes. The interest is in whether or not relationships exist, so the testing is of two hypothesis; one, that the correlation is zero and the variables unrelated, and, two, that the correlation is not zero and that there is a high level of confidence in a relationship existing. An effect of the low number of data points is that high levels of correlation are necessary to achieve a 95% level of confidence in the relationship.

Using a one-tailed test of the Student’s distribution at a .05 level, the t statistic for 10 data points and (10-2 = 8) degrees of freedom is 1.86. Therefore, the hypothesis that a correlation is zero would be rejected when t > 1.86. The value of t reaches 1.86 when the correlation number is +/- 0.55. Accordingly, with the small number of data points the hypothesis that a correlation is zero can be accepted up to the correlation number of +/- 0.55 with a 95% confidence level.

If the hypothesis is that the correlation is not zero, then the hypothesis would be rejected for t < 1.86 and accepted for t > 1.86. That is, for correlation numbers above +/- 0.55. At +/- 0.55 there is confidence level of 95% that the correlation will not be zero, and the confidence level that the correlation is greater than zero will increase as the correlation number increases.
Following similar reasoning correlation numbers can be calculated for the 90% and 99% confidence level as +/- 0.45 and +/- 0.71 respectively.

The results of the correlation analysis are shown in Appendix 12 - Correlation analysis.

### 5.3.1 Difference between case groups

The question is whether and in what way do the M group of projects differ from the X group of projects, and does this add to any evidence obtained in the qualitative examination of the same question in Section 5.2.3.5.

Comparisons were made between the M and X case groups for each of the innovativeness, knowledge, commitment and outcome variables. The hypothesis that the sample groups came from the same population was tested using a t-test paired two-sample for means procedure at a 95% confidence level. In all cases the hypothesis was accepted, as shown in Appendix 13 – Differences between case groups.

However, there is one set of relationships between groups that deserves noting. The M group of projects has a mean level of innovativeness substantially higher (+12%) than the X group of projects, while, at the same time, the M group is lower in all means of the knowledge measures. The group comparison of means of the composite knowledge base measure indicates that the M group is substantially lower (-10%) than the X group, and the test hypothesis that the means are equal can be rejected at the 90% confidence level.

### 5.3.2 Knowledge and innovativeness

The research proposition is that an organization’s knowledge is unrelated to the level of innovativeness of spontaneously arising change initiatives. To examine this proposition, the correlations between innovativeness and each of the types of knowledge measured in the study, were calculated using the across-case data and reported in Table 5.1 below. The hypothesis to be tested is that the correlation between innovativeness and the types of knowledge is zero.
Correlation of Innovativeness and:

<table>
<thead>
<tr>
<th>Knowledge Type</th>
<th>Correlation</th>
<th>Accept or reject at .05 level?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Knowledge</td>
<td>+ 0.23</td>
<td>Accept</td>
</tr>
<tr>
<td>Proprietary Knowledge</td>
<td>- 0.63</td>
<td>Reject</td>
</tr>
<tr>
<td>Public Knowledge</td>
<td>- 0.56</td>
<td>Reject</td>
</tr>
<tr>
<td>Collective Knowledge</td>
<td>- 0.36</td>
<td>Accept</td>
</tr>
<tr>
<td>Organization’s knowledge base</td>
<td>- 0.67</td>
<td>Reject</td>
</tr>
</tbody>
</table>

Table 5.1: Correlations of Innovativeness and Knowledge

The results for uncodified forms of knowledge, Personal Knowledge and Collective Knowledge, give support to the research proposition, but the results for the codified and objective forms of knowledge, Proprietary Knowledge and Public Knowledge, do not.

The significant negative correlations between innovativeness and knowledge were unexpected, and need explanation.

The organization’s knowledge base was calculated as the simple sum of the four constituent knowledges, and as would be expected significant positive correlations relationships existed between the knowledge base and Proprietary Knowledge (+ 0.69), Public Knowledge (+ 0.72) and Collective Knowledge (+ 0.70). However, the correlation with Personal Knowledge was not significant (+ 0.20).

5.3.3 Commitment and innovativeness

The research proposition is that an organization’s creative and structurated commitments are positively related to the level of innovativeness of spontaneously arising change initiatives. The hypothesis to be tested is that the correlation between innovativeness and the different forms of commitment is not zero.

The hypothesis was rejected at the 95% level of confidence for all of Psychological Commitments, Project Commitments, Structural Commitments, Social Commitments,
Creative Commitments and Structurated Commitments. One relationship, the correlation between innovativeness and Psychological Commitments (+ 0.46) would have been accepted at a 90% level of confidence. These results do not support the research proposition.

The correlation between Creative Commitments and Project Commitments is positive, strong, and significant (+0.89), indicating an important role for Project Commitments in the Creative Commitment composite measure.

The correlation between the composite Structurated Commitments and the constituent Structural Commitments was also significant (+ 0.56).

### 5.3.4 Project outcomes

There is no explicit research proposition about the outcomes of the project, but implicit in the theoretical model of Figure 3.5 is that change outcomes result from the interplay of creative and structurated commitments, and so relationships between all variables and project outcomes are of potential interest in supporting the theoretical model. The test to be applied is whether the correlations between project outcomes and other variables are not zero.

Section 5.2.2 explained why project outcomes were considered under two headings - knowledge creation outcomes and business outcomes - and these are treated separately.

The correlations between knowledge creation outcomes and innovativeness, and between knowledge creation outcomes and all types of knowledge were relatively low and did not approach significance. This would appear to add some support to the proposition that the organization’s knowledge is unrelated to innovativeness.

The correlations between knowledge creation outcomes and commitments show some significant effects. The correlations with Project Commitments (+ 0.61), and Social Commitments (- 0.67), are significant, but other commitment variables, including the composite Creative Commitments, show relatively low correlations that do not approach significance.

With business outcomes the correlation with innovativeness is negative and significant (- 0.78). The correlation between business outcomes and Creative Commitments is positive,
strong and significant (+ 0.81). Project Commitments are also positively correlated with business outcomes (+ 0.72), indicating the importance of Project Commitments, and the project management that helps generate them, to achieving project outcomes whatever the objectives may be.

5.4 Chapter summary

The qualitative analysis of the ten cases studied provided strong support for the Research Propositions 1 that the theoretical models underlying this study provide appropriate explanations of real-world change projects. The evidence from organizations of different size, projects of different types and of both low and high levels of innovativeness, supported Research Proposition 2 that the explanations are applicable to organizations generally.

The evidence from the case analysis supported Research Proposition 4 that an organization’s knowledge is unrelated to the innovativeness of projects. However, the evidence supporting Research Proposition 3 that creative and structurationed commitments are positively correlated with innovativeness is not substantial, although the proposition is not denied.

The extent of the quantitative analysis of the survey questionnaire data was constrained by the low number of data points, but some significant relationships were identified at a 95% level of confidence. The analysis of innovativeness and knowledge supported Research Proposition 4 that knowledge and innovativeness was unrelated for the uncodified forms of knowledge. With codified forms the results suggest that knowledge and innovativeness are negatively correlated, a result that requires further interpretation. The low correlations between the various forms of knowledge and knowledge creation outcomes, and between innovativeness and knowledge creation also provide positive support for the Research Proposition 4.

The case analysis produced patterns of relationships that were informative about the connections between innovativeness, knowledge and commitment, and these provide some support for the self-reference view of organization.
6 Chapter Six: Discussion

6.1 Chapter introduction

This chapter evaluates what was learnt from the results of Chapter 5, in order that conclusions can be drawn from the study. The discussion is undertaken in seven sections.

Section 6.2 is the major section of the chapter that evaluates Research Proposition 1 and the evidence supporting the knowledge-commitment models of change, and the self-reference view of organization. The evaluation proceeds by following the logic of the organizational change model of Figure 3.5, and then evaluates the strategic and operational models of Figures 3.3 and 3.4.

Sections 6.3, 6.4 and 6.5 extend the analysis of Section 6.2 in evaluating Research Propositions 2, 3 and 4.

Section 6.6 discusses a number of theoretical issues that arise from the evaluation of the research propositions.

Section 6.7 suggests ways in which the findings of this study can inform practice.

Section 6.8 reviews the limitations of this study, and the future research directions that are opened.

The conclusions of the study are outlined in Chapter 7 – Conclusions.

6.2 Research proposition 1

That the model descriptions reflect actual managerial practices and processes as conducted in practical organizational change projects.

The three different models of change that were developed and presented in Chapter 3 provide different perspectives on the relationship between innovative change, knowledge
practice model represented by Figure 3.3 describes the relationships at a strategic level, and frames the strategic directions that might be followed to achieve innovative change. The organizational change model of Figure 3.5 describes the relationships at the organization level, whatever strategic direction is chosen. The knowledge-commitment cycle model of Figure 3.4 is essentially part of the organizational change model, and describes the knowledge and commitment relationships at a more detailed operational level. Taken together these models can claim to provide a comprehensive theory of the role of knowledge and commitments in organizational change, and to describe the processes involved in practical change projects. To assist in the reading of this chapter, Figures 3.3, 3.4, and 3.5 are repeated at appropriate places in the discussion.

In evaluating that claim the starting point needs to be the organizational level model, for it relies on a self-reference view of organization that must be shown to be a credible if the organizational and operational level models are to have merit. The evaluation will proceed by following the logic of the organizational change process of Figure 3.5, repeated below, starting from the Organizational Knowledge Base, and then turn to evaluating the strategic model of Figure 3.3 and the operational model of Figure 3.4.

Figure 3.5: Organizational Change Process
6.2.1 Organizational knowledge base

As introduced in previous Section 2.3.8, the knowledge base of the organization consists of the entire knowledge of an organization that has been embedded in its people, structure and processes over time. Section 3.3.9 focused on its role as a source of the closed-system structurated commitments that protect the organization’s identity. However, if the knowledge base is all encompassing, then for change to occur the source of creative action must also be the knowledge base. So how can the source of an organization’s rigidities also be the source of its inspiration to change? This is the dilemma that Hargadon and Fanelli (2002) also seek to explain.

In this theory the answer lies in the role of individuals and their use of Personal Knowledge in solving organizational problems, but this will be more fully discussed in the following section. The starting point is that all organisms, including humans and human groups, survive by solving problems (Kirton, 2003). When people are faced with problems they need a structure within which to think through and resolve the problem. This structure is their language, and the knowledge residing in their minds, both personal and collective. When faced with problems people and organizations must fall back on what they know and how they define the problem is constrained by what they know. The organizational knowledge base provides this background to interpretation.

For example, Project X1 was instigated by a CEO who discovered that there was a problem to be solved if the organization was to progress. As explained in Section 2.2.1.3, finding problems is a motivated activity and the essence of spontaneity (Katz, 1964). Problem finding is also constrained by the knowledge base, and this provides a clue as to the effective purpose of the organizational knowledge base in providing an organization’s capability to find appropriate problems to solve. What was clear from Project X1, and the nine other cases examined, was that the problem that inspired the project was found from what the organization knew. How could it be any other way? However, the CEO defined the problem in his own terms.

If it is the organizational knowledge base that determines the organizational problems that can be and are found, then the source of change is the organizational knowledge base, a system that is closed other than for the Personal Knowledge of the organization’s members.
The basis of the self-reference model is that all change arises internally and spontaneously. The reasoning of this section, and the analysis of the ten cases of this study confirm that.

In every case interview the informants indicated the salience of the organizational knowledge base by making positive responses to each of the 16 questions that related knowledge base components to project outcomes. In every case, the initial creative action occurred internally. This does not mean that all of the ideas on which the creative actions and projects were based were original and internally generated. In Projects M2, M3, M4, M5, X3 and X5 creative action was a response to problems introduced from external stakeholders, for the circuit of Creative Commitments is open to data from the organization’s environment. However, whether data is transformed into information and knowledge depends on the prior knowledge of the viewer or receiver (refer Section 2.3.1). In other words, data from an organization’s environment is always interpreted through the organization’s knowledge base.

6.2.2 Creative action

This study used the term creative act (refer previous Section 2.2.1.3) to recognize that it is action rather than ideas that initiates change in organizations. The logic model of Figure 3.5 shows spontaneous creative actions stemming from the organizational knowledge base. This section seeks to explain how and why this is so.

A single problem can be defined in multiple ways. For Project X1 the problem could have been defined as uncertainty about the future through the loss of the founder’s patronage, as a need to reinvent the company and attract more resources, as a problem of declining revenues, as an opportunity to enter a new market segment, or as a need to expand the product offering. However, each of these problem definitions is constrained by what the organization and its members knew, so every definition remains within the organizational knowledge base. It could be argued that there is such a thing as ‘lateral thinking’ (De Bono, 1975), so why must the definitions be so constrained? An answer is that all thinking takes place within structure. For example, if the only structure we know is the English language, it is not possible for us to think in the Japanese language. Applying lateral thinking to defining the problem that Project X1 addressed may have provided different and maybe better definitions to those listed, but ones that necessarily remain within the constraints of the knowledge base.
Through the idiosyncratic lenses of individuals, and their Personal Knowledge, a single problem in a single context, no matter how described, may lead to a variety of interpretations about what constitutes the problem, and how it is best resolved. For some people it may be obvious that the way to resolve the problem is to work within current practice and do things better. For other people it may be just as obvious that resolving the problem requires current practice to be changed and things done differently. This is simply the statement that people have different styles of problem solving (Kirton, 1976). The CEO who instigated Project X1 had many choices about how to resolve the problem he had found. He had choices about how to define the problem, and he had choices about how to resolve the problem as defined. All decision makers have these same choices; if all were free to follow their own preferences they would make different choices. Previously reported studies by Shane (2000) and Howell & Shea (2001) demonstrated this effect.

Within organizations individuals are constrained in their choices by what is the Collective Knowledge about such things as maintaining consistency with strategy, following routine procedures, and minimizing risk, as well as the Social Commitments about how to behave in various organizational contexts. These will influence the choices of decision makers. So in any organization there will be many people who will maintain consistency, follow the routine and be risk averse as a matter of preference, or in order to conform to group consensus. But there will be some people, who because of their style of problem solving, will reject the group consensus, and make choices that are outside the current strategy, routine and risk tolerance of the organization. That is, they are capable of taking creative action towards doing things differently. Organizations foster the idea that they need individuals with such independent ways, but do a good job of rejecting them when they are at hand (Kirton, 1984). However, if things are ever to be done differently then the organization must have some members who are prepared to reject the group consensus.

### 6.2.3 Creative commitments

Implicit in this model of change is the idea that for outcomes to be produced the creative commitments must overcome the structurated commitments that arise to protect the organization’s identity. At first sight, the measurements taken in this study strongly support this view of the theoretical model. For every one of the ten cases of this study the strength of the responses for the composite creative commitments variable greatly exceeded the strength of responses for the composite structurated commitments variable (refer Appendix
7 - Case Data and Calculations). The across case averages of 72% versus 45% is indicative of the differential strengths between creative and structurated commitments.

Assuming some validity in these measures then one might regard the fact of the differential scoring, as well as the fact that the ten projects involved survived to become successful or partially so, as evidence that projects in which creative commitments exceed the structurated commitments survive whereas projects where structurated commitments are dominant may not. There is merit in this view inasmuch as commonsense dictates that any project that becomes too difficult for an organization, a situation that may be described by strength of structurated commitments exceeding that of creative commitments, may simply be discontinued. However, the only way that the question can be properly answered is by comparing cases of discontinued projects with cases of projects that have survived to completion, and this study does not do that.

As well as this inability to establish the relevance of the measures beyond doubt, the case analysis identified shortcomings in the descriptions of the theoretical model as implemented in the survey questionnaire. In short, there were more commitments identified than were measured, so there cannot be complete confidence in any comparison of creative commitments and structurated commitments based on measures alone, and the case analysis had to take this into account. The additional commitments identified are discussed in this and following sections.

For creative commitments, the model and measurements did not predict or explain the presence of two additional types of commitments. First, there were creative-type commitments that competed with the commitments motivating the project under study. Second, there were creative-type commitments that provided strong support for the project from external stakeholders. Each type will be discussed separately.

### 6.2.3.1 Competing commitments

Examples of the first type were observed in Projects X1 and X2. In project X1 the CEO appeared to have an unarticulated agenda, and associated commitments, that interfered with the project that the business plan described. In Project X2, the Chief Technology Officer who managed the project appeared to be more committed to following his own research interests than meeting the business plan objectives. In both cases the commitments involved were creative in intent, but both cut across and detracted from the commitments motivating
the stated project. For Project X1, it seemed to be in the interest of the CEO’s competing agenda to starve the stated project of resources. For Project X2 the CTO diverted his own attention away from the business plan objectives in order to follow his own creative interests and detracted from the management resource necessary for success with the main project.

The competing agendas apparent in Project X1 and Project X2 were manifested in low project commitments for both projects. The strength of the project commitments (27% and 58% respectively) was the lowest of the ten-case sample (average 73%), and these subsequently led to levels of creative commitments that were again the lowest end of the ten-case sample. Associated with this lowest level of creative commitments was also the lowest level of business outcome, an effect that is strongly supportive of the dynamics of the theoretical model.

Competing objectives are, of course, an anathema to effective project management, and it is only through project management that Project Commitments are established and maintained. As well, the across-case correlation analysis indicated that Project Commitments had a greater effect on project outcomes than other creative commitments. It also showed Project Commitments to be significantly correlated with both knowledge creation and business outcomes. So the evidence points to interference with Project Commitments as the mechanism by which competing commitments detract from performance.

The idea of competing commitments would thus be best accommodated within the model descriptions associated with Project Commitments. In the revised knowledge-commitment model of Figure 6.1 they are shown as interacting with Project Commitments. However, the question of how competing commitments can be readily identified and measured is a question for further research.

### 6.2.3.2 External supporting commitments

The second type of commitment identified in the study but not contained in the theoretical model was of creative-type commitments that were reinforcing to the project but external to the organization. Half of the projects studied, Projects M3, M4, M5, X3 and X5, had strong support from external stakeholders for various reasons. Projects M3, M4 and M5 involved co-development activity with key customers. Project X3 had customers with a crucial need for the reformulated product, and thus future orders were guaranteed. Project X5 had
external affiliates and agents whose businesses would increase substantially in value if the project were successful.

While these externally based supporting commitments are clearly creative in nature, the question is whether and by what means they reinforce the internal creative commitments motivating the knowledge creation process? All of the supporting commitment situations described above benefit the knowledge creation process through reducing uncertainty in an organization’s business and project planning process. It is safe to assume that external stakeholders only provide support for an organization’s projects where it is in their interest to do so, and the pooling of interest during the development of a project means a high probability that the project outcomes will be acceptable to the stakeholder, and makes it more likely that the organization will be assured of future business. Those projects that can demonstrate a greater assurance of a business result will more likely attract a higher priority in the use of the organization’s limited resources. In other words, the most likely effect of external supporting commitments of the type discussed will be to boost Project Commitments.

The question of how external commitments can be incorporated into the theoretical model of organizational change, again directs attention to Project Commitments and the leverage it appears to apply to business outcomes. The idea of external supporting commitments would thus seem best accommodated within the descriptions associated with Project Commitments and in the revised knowledge-commitment model of Figure 6.1 external commitments are shown as reinforcing Project Commitments. However, the question of how external-supporting commitments can be readily identified and measured is a question for further research.

6.2.3.3 Creative commitments explanations

The model shortcomings having been declared, the case analysis was conducted under the assumption that competing commitments detracted from overall creative commitments, and that supporting commitments boosted them. All of the case explanations demonstrated that Creative Commitments and their relationship to Structural Commitments followed the logical pattern expected, with the above assumption included in the reasoning. While this supports the ideas about competing and supporting commitments developed in previous sections, since neither were measured a level of conjecture remains. However, this does not
take away from the case analysis that was positive in its support of the dynamics of the theoretical model and the role of Creative Commitments.

Further evidence supporting the dynamics of the theoretical model came from the across-case correlation analysis that indicated a strong correlation (0.8 at a 99% level of confidence) between the composite Creative Commitments measure and the level of business outcome for the ten cases. This result would suggest that Creative Commitments play an important role in motivating projects towards successful outcomes. However, there are some reasons why this result needs to be treated with caution. First, the measure of business outcome is not very precise, as a later section will discuss. Second, the theoretical model links commitment more directly to knowledge creation outcomes than it does to business outcomes, yet the correlation between creative commitments and knowledge creation outcomes was insignificant. Third, the measured levels of creative commitments were insufficiently informative to explain all of the cases, as discussed above, so their correlation with other variables may lack meaning.

As well as these three reasons for caution, the possibility of biased responses exists. All of the case study informants were responsible for the knowledge creation element of the project but only two of the ten were also directly responsible for the overall business outcomes of the project. It would simply be in accordance with the findings of the cognitive bias literature (Jones & Davis, 1965; Ross, 1977) for informants to accept personal responsibility for successes, and shift the responsibility for any failures to others. The fact that across the ten cases knowledge creation outcomes were rated 4.4/5 and business outcomes 3.7/5 may be partly explainable by such bias.

### 6.2.4 Structurated commitments

Implicit in this model of change is the idea that when the organizational system is challenged structurated commitments arise to protect the organization’s identity. As discussed in the previous section the measurements taken in this study support the dynamics of the model and the relationship between Structurated Commitments and Creative Commitments but the results are inconclusive. Neither does the case analysis provide strong evidence of the suggested role of Structurated Commitments.
The uncertainty about the role of Structurated Commitments stems from the case analysis of Projects M1, M3, M4, M5, X2 and X5, the higher innovativeness projects, that clearly demonstrated that not all structurated-type commitments were being measured, and consequently there is no information about the strengths of these unmeasured commitments in comparison with the measured commitments.

The theoretical model and measurements did not predict or explain the presence and role of additional structurated-type commitments that arose in various ways. In Project M1 the collaborating marketing groups were not able to escape an outdated paradigm of information management; in Project M3 the collaborating parent company group generated a range of conflicting commitments that might be described as the ‘not-invented-here-syndrome’; in Projects M4 and M5 the parent company’s commitment to its own strategy raised barriers to the implementation of the projects; in Project X2 the parent network organization appeared to lack purpose, and generated commitments that opposed the creative commitments of the project; in Project X5 the parent company’s commitment to a global positioning strategy conflicted with the commitments motivating a local project. The common feature of the commitments identified here was the conflict with the creative commitments motivating the project, similar to the structurated commitments defined by the theoretical model. They will be referred to here as ‘conflicting commitments’.

The presence of unmeasured conflicting commitments and their relationship to innovativeness was demonstrated in across-case pattern matching (refer Appendix 11 - Across Case Innovativeness Patterns) where the projects with higher levels of innovativeness appeared more subject to conflicting commitments described above. This would also suggest that this study’s measures of structurated commitment are more meaningful at lower levels of innovativeness than at higher levels of innovativeness.

There are two possible reasons why these conflicting commitments were not identifiable and measured by the survey questionnaire. First, the survey questionnaire, as it related to Structural Commitments and Social Commitments, was based on the commitment literature that describes how organizational resistance is raised when the status quo is challenged. For example, projects that require an organization to change its structure, pioneer new markets, write off past investments and displace people from their jobs will be more costly, economically and emotionally, and thus less attractive to organizations than projects that do not require such things. These are structural commitments that must be overcome if things are to be done differently. As well, organizations may have developed a climate where face saving, hiding mistakes and playing the blame game is paramount in people’s thinking.
These are social commitments that must be overcome if things are to be done differently. The survey questionnaire was thus based on general and known effects, whereas the conflicting commitments were specific to the context of each case and difficult to anticipate.

There is also a point to be made about the general and readily identifiable structural and social commitments. Essentially these are things that the managers of an organization use as criteria for determining what projects are or are not of interest to their organization. It is clear that any project underway is likely to have been filtered by these criteria, and shaped to fit within the constraints of the structural commitments and social commitments of the organization. So organizations may prefer to select projects that fit within the existing structure and market, and enhance rather than destroy its past investments, and these preferences will be built into their project evaluation processes. That was certainly the case with the ten cases of this study that were noteworthy for the fit to their organization, and consequently the low strength of measured Structural Commitment responses in comparison to other types of commitment.

Since there is no information on the differential effect of each type of commitment, comparisons could be misleading. The differences between the average strength of responses of Structural Commitments (16%) and other commitments (Psychological, 81%; Project, 73%; Social, 62%) are quite marked. It becomes clear that in taking a rational approach to finding structurated commitments one will identify those commitments that the organization has already sought to minimize. Accordingly, a relatively low level of Structural Commitments might be the norm for most projects. Of course, that does not rule out those cases where an organization might need to transform itself by restructuring and entering entirely new markets. However, these are relatively rare events, and not ones covered by any of the cases examined in this study.

A second reason why it might be difficult to identify conflicting commitments with a general questionnaire is that the commitments may be concealed until triggered by the events of the project. For example, Project M1 commenced as collaboration between technical and marketing groups and progressed in an incremental and satisfactory manner until, again in collaboration, a decision was made to upgrade the project to utilize the Internet. This raised the innovativeness of the project, but with the marketing groups an integral part of decision making one would anticipate cooperation rather than resistance on the further project. Why did the marketing group find it too difficult to deliver on its own promise? One answer may be that the marketing group did not anticipate that altering the flow of product information would cut across their relationships within their distribution
channels. Another way of expressing this problem was that the marketing group was unable to escape from the web of consensual relationships that had been established over many years. They found themselves trapped in a paradigm about how product information should be handled and could not escape. These conflicting commitments appeared only when the marketing group was required to act.

The pattern of development of conflicting commitments described for Project M1 is paralleled in Projects M3, M4, M5, X2 and X5. Parties that supported the projects in their initial phases raised barriers to the progress of the project when they were required to act. One might claim that a project leader, experienced in an organization, should be able to anticipate that conflicting commitments such as these might arise. That might be so, but that does not help a project manager to dissolve the commitments. An understanding of the nature of the commitments will help in finding ways to overcome them.

The analysis of the pattern of development of conflicting commitments above may also be describing the more general effect by which creative-type commitments and structurated-type commitments come together. By their nature as forces protecting the organization’s identity, structurated-type commitments will not arise until the system is challenged and there is something to resist. That is, structurated-type commitments are triggered by action, as reasoned for conflicting commitments, and so creative commitments must exist for structurated commitments to arise. This is in keeping with the dynamics of the self-reference system.

In incorporating conflicting commitments into the theoretical model, it is clear that conflicting commitments are structurated-type commitments and need to be accounted for under that heading. However, the six examples observed in this study were all concerned with existing pockets of consensual relationships that were difficult to change. That is, the examples were about structure, and the difficulties of changing it. Accordingly, conflicting commitments need to be considered as an additional element of Structural Commitments, and in the revised knowledge-commitment model of Figure 6.1 they are shown as reinforcing Structural Commitments. The question of how to identify and measure conflicting commitments is a matter for future research.
6.2.5 Knowledge-commitment cycle

The conceptual model of organizational change outlined in Figure 3.5 incorporates the conceptual knowledge-commitment cycle of Figure 3.4 above. The latter model describes the logic of how the Creative Commitments motivate the knowledge creation cycle and how the Structurated Commitments resist it.

The fact that the measures taken for each case showed the strength of responses to creative commitments to be much greater than the strength of responses to structurated commitment would be strong evidence to support this aspect of the model if it were not for the misgivings about the measures that were outlined in Section 6.2.3. However, the analysis of each case provided support for the model by finding that the logic of the knowledge-commitment cycle provided a framework within which the dynamics of each project could be described, and found that the descriptive framework appeared to make sense to practitioners in their review of case reports (refer Section 5.2.3.1, Appendix 6 - Case Report - Project X1, and Appendix 8 - Case Analysis - Project X1).
The logic of the conceptual model of organizational change of Figure 3.5 suggests that the knowledge-commitment cycle is both subject to the opposing forces of creative and structurated commitments, and the continuing influence of spontaneous creative actions. The evidence from previous Section 6.2.4 that structurated commitments arise in response to actions is informative about the dynamics of the knowledge-commitment cycle. The knowledge creation process starts with a creative action, and the subsequent process is motivated by creative commitments. Creative commitments motivate actions, and structurated commitments arise in reaction.

Also, as knowledge creation progresses different directions are taken leading to more problem finding, and more creative actions aimed at resolving the problems. This effect is demonstrated in Figure 3.5 by the dotted feedback loop from the output of the knowledge-commitment cycle back to the organizational knowledge base. That loop completes a continuous cycle of knowledge creation that adds to the organizational knowledge base. This engenders further problem finding, further spontaneous creative action, and further creative commitments to motivate the ongoing process.

The evidence of the occurrence of these effects is the original level of innovativeness changing during the progress of a project. Such changes were observed in Projects M1, M3, M4, M5, and X2 of this study, the projects of highest innovativeness. This effect may be explained simply by the fact that the measure of higher innovativeness is based on measures of higher difficulty and uncertainty. Clearly the more uncertainty at the start of a project the more likely it is that changes will need to take place during the project. Evidence from the five projects of highest innovativeness of this study suggests that the higher the level of uncertainty the more noteworthy the changes in direction may be. For example, the direction of Projects M3 and M5 was greatly affected by the aftermath of the September 11 attacks. However, changes associated with events of this nature will remain salient in the memory of informants whereas many other changes will be accepted as routine for project work, and their saliency decline. Thus it is also reasonable to predict that changes will continually occur in the early stages of projects (after all that is what the term project development is intended to infer) and that the process follows the logic of Figure 3.5.

In summary, the knowledge-commitment cycle described by Figure 3.4, and its integration into the model of organizational change of Figure 3.5, has been shown to have validity at a descriptive level. The fact that the models provided adequate explanations of the outcomes of all ten cases of this study also demonstrates the validity of the models at an explanatory level (refer Appendix 9 - Summary Analysis - All Cases). As well, previous sections have
shown that effects were observed that were not predicted by the model. These effects were incorporated into the model descriptions without changing the basic character of the model. This provides a compelling reason to believe that the models outlined in Figures 3.4 and 3.5 are robust and general descriptions of change processes. The additional effects associated with Project Commitments and Structural Commitments are incorporated into the knowledge-commitment cycle of Figure 3.4 resulting in the revised knowledge-commitment cycle of Figure 6.1 below.

Figure 6.1: Revised Knowledge-Commitment Cycle
6.2.6 Change outcomes

The final logical stage in the model of Figure 3.5 is the outcomes of the process of knowledge creation described by the model. Each case analysis was able to explain the outcomes of the project in terms of the commitment variables of the model, so the logics of the model were well supported. The across-case correlation analysis involving outcomes provided additional evidence in support of the model, but some caution is probably necessary as the use of informant’s opinions as a measure of outcomes is a less than ideal approach.

Assessing the worth of project outcomes is not an easy matter as comparisons of success and failure are biased towards success, and in historical perspective failures are many times a necessary preliminary to success (refer Section 2.2.2.3 for fuller discussion). The approach taken in this study was, first, to admit the difficulties and assume that the informant was capable of reporting the consensus view of the organization rather than a biased personal view and, second, to assume that any knowledge creation was useful to the organization’s future. Making the latter assumption allows outcomes to be considered a variable quantity rather than a success-failure dichotomy. However, setting up a simple scale to measure an outcome variable unavoidably means relying on categories, and even though arranged so that the higher categories represent more desirable outcomes than lower categories, correlations involving outcomes may have a reduced meaning.

As discussed in Section 5.2.2 the informants in this study tended towards giving two answers to the question of outcomes, necessitating a protocol change. In the informants’ terms technical outcomes needed separate discussion and assessment to the business outcomes. The informants also responded more favourably to the question of knowledge creation (technical) outcomes than they did to business outcomes, and in previous Section 6.2.3 it was suggested that this may have been the result of bias, since most informants were responsible for achieving the technical objectives of the project rather than the overall business objectives. However, the relevance of separate measures of knowledge creation and business outcomes needs to be questioned.

In the theory informing the models of change of this study, knowledge provides the potential for change but it is creative commitments that close the knowledge-action gap. In other words, knowledge creation is necessary for change, but is not change itself. That is the reason for a knowledge-action or knowing-doing gap (Pfeffer & Sutton, 2000). So to equate
knowledge creation with change is also to neglect the knowledge-action gap, the explanation of which is the purpose this research study. So the useful measure of change outcomes is not what has changed in the organization’s knowledge base, but what has changed in the organization’s business.

Discussing outcomes at separate knowledge creation and business levels might also reflect a narrow view of what business innovation is about. Referring to the business practice continuum of Figure 3.1, at any level of innovativeness there is a certain amount of understanding (knowledge) necessary for successful implementation of a project. This understanding needs to cover all of the technical, marketing and administrative knowledge necessary for implementation. If a product is designed and manufactured but not able to be sold, there are two ways to view the situation. One can view it as a problem of a mismatch of product and market, or one can view it as a problem of insufficient understanding of how to sell the product to the market. From the organizational viewpoint, lack of business success and insufficient knowledge creation may be one and the same thing.

The across-case correlation analysis suggested three significant correlations with business outcomes all significant at a 99% level of confidence. Two of these, with Project Commitments and the composite Creative Commitments, describe essentially the same relationship for there is a strong positive correlation between the two (0.9 at a 99% level of confidence). These relationships attest to the great importance of Project Commitments, and the project management skills that sustain them, in achieving outcomes in change projects. This, of course, is not a discovery but a re-confirmation of what is widely accepted as best management practice (Nevens, Summe, & Uttal, 1990).

A strong positive relationship between Creative Commitments, the motivating force, and business outcomes is what commonsense might lead us to expect, and certainly should be considered supportive of the theoretical model, and the view that Creative Commitments work towards closing the knowledge-action gap. To reason that the higher the level of creative commitments the more effectively that knowledge would be turned into action also makes sense. Since the theoretical model makes the claim that Creative Commitments are opposed by Structurated Commitments one would expect a strong negative correlation between Structurated Commitments and business outcomes. That correlation was indeed negative but insignificantly small (- 0.16), so once again the role of Structurated Commitments remains uncertain.
The third correlation is that between business outcomes and innovativeness which is a strong and significant negative relationship (-0.78 at the 95% level of confidence). This is an important relationship that is largely concealed by the practice of the innovation research of conflating the innovation and business outcomes variables. If innovation is defined in terms of outcomes rather than as a style of problem solving – that is doing things differently – then the extent of doing things differently becomes irrelevant. The idea of the business practice continuum and the variable innovativeness is to remove the assumption that the innovation and outcome variables are correlated, allowing the relationships between the variables to be examined.

The negative relationship between innovativeness and business outcomes seems readily explainable. The business practice continuum of Figure 3.1 shows that the higher the level of innovativeness the more knowledge is necessary for successful implementation of the project. The across-case innovativeness patterns also showed that at higher levels of innovativeness more conflicting commitments arose, and, because of that, additional strategies for achieving an outcome became necessary. The description of increasing innovativeness is of increasing complexity, difficulty, uncertainty, conflict and potential confusion. There can be no surprise that the downside of this situation is a lower probability of project survival and success. Experienced practitioners may implicitly understand this relationship. Adaptation-innovation theorists (Kirton, 1984) and philosophers (Grudin, 1990) have recognized the importance of the relationship to the management of ideas. Innovation researchers have systematically neglected and concealed the relationship.

In summary, as well as supporting the logic of the model of organizational change of Figure 3.5, this section has confirmed two known relationships. The first is the importance of Project Commitments in achieving project outcomes. The second is that, all other things being equal, the higher the level of innovativeness of a project the less likely it is to succeed. Researchers generally neglect the latter relationship.

6.2.7 Business practice continuum

The primary purpose of the conceptual business practice continuum was to establish a conceptual framework for the measurement of innovativeness; the level of disturbance to an organizational system. This purpose was achieved by the innovativeness measure ranging the ten projects along the business practice continuum from 32% to 77% of the scale maximum.
An ordinal scale of innovativeness was sufficient for the needs of this study, but conceals that each of the sub-measures (novelty, difficulty, uncertainty, etc) may have differential effects on the predictions of the business practice continuum model, and that these differentials may differ in different project contexts. Where a research problem requires more precision with the innovativeness variable, available mathematical procedures such as Saaty’s Analytic Hierarchy Process (Saaty, 1995) would allow the differential effects to be calculated for particular contexts and provide the equivalent of ratio data for analysis. However, the simplest of innovativeness indices, such as that used in this study, would benefit innovation research by ranging the objects of study on a more realistic basis than the commonly used dichotomous categories, such as incremental versus radical innovation. Accepting such dichotomous categories means theorising at the extremes of the business practice continuum and neglecting those objects of study in the middle of the continuum.

An advantage of removing the dichotomous categories based on the Kuhn model of change (refer previous Section 2.2.3.2), is promoting the Popper cognitive model of continuous change (refer previous Section 2.2.4.3) as the operational model for innovation. The Popper model more realistically reflects the innovation process as practiced in organizations, both in terms of accommodating changing markets and the experimental nature of the internal process. And the concepts of the business practice continuum and innovativeness also point to an important dimension of achieving higher levels of innovation - that is, increasing the innovative content of projects to achieve higher levels of innovativeness.

The conceptual relationships posited by the business practice continuum model received support from several aspects of this study. The across-case pattern analysis for innovativeness (refer Appendix 11) clearly showed that the patterns of novelty, technology difference, performance objectives, and uncertainty of the actual projects were in line with the theoretical basis of the innovativeness scale. In previous Section 6.2.6 it was shown that the across case significant negative correlation between Business Outcomes and innovativeness supported the conceptual relationships of the model. And in a following Section 6.5 it will be reasoned that across case significant negative correlations between Proprietary Knowledge, Public Knowledge and the Knowledge Base and innovativeness also support the conceptual relationships of the model.

In summary, the concepts expressed by the business practice continuum enabled a measure of innovativeness, provided a means of unbundling the innovativeness variable from the outcome variable, and received support from the results of this study.
6.2.8 Routes to innovation

The conceptual model of Figure 3.3 extends the business practice continuum model to provide a strategic level view of the knowledge-commitment-innovativeness relationship. In the analysis of the ten cases of this study, the model proved relevant to identifying and describing the innovation strategies that were at work in each case. The model also appears to have been relevant to practitioners in their review of case reports.

The across case pattern analysis for innovativeness (refer Appendix 11) clearly demonstrated that the higher the level of innovativeness, the more likely that more than one strategic direction had to be adopted. Strategic learning appeared necessary for all projects to achieve an outcome. That is what the business practice continuum model also shows. However, projects at the lower levels of innovativeness (Projects M2, X3, X4, X5) appeared to rely solely on strategic learning.

As the level of innovativeness of projects rise, so the more they depart from current practice, the more that uncertainty and ambiguity prevails, and the more likely that the projects will trigger conflicting commitments and meet resistance. The higher the uncertainty and
ambiguity the less likely that rational planning will achieve an outcome, and the more that the work needs to be guided by ‘strategic intent’ (Hamel & Prahalad, 1989) and creative commitments - the process referred to in the model as entrepreneurship. And when projects trigger conflicting commitments that arise from long established consensual structures, then ‘paradigm breakout’ is the only way forward. What this means is that at higher levels of innovativeness the job of a manager of innovation becomes increasingly complex.

In summary, the conceptual routes to innovation model of Figure 3.3 proved a relevant descriptive and explanatory framework for the strategic level analysis of the cases in this study.

### 6.2.9 Review of Research Proposition 1

The review conducted in foregoing sections followed a process of examining each of the three theoretical models, as well as each of the components of the overall model of organizational change of Figure 3.5. The purpose of each examination was to evaluate whether the model or component of the model provided a logical description of the theoretical process and whether this description was a fit with the observations and analysis of the ten cases of the study. As well, evidence was drawn from the survey questionnaire data and the correlation analysis of that data to support or reject these descriptions.

The original formulation of the knowledge-commitment cycle and organizational change models did not specify the full range of commitments identified in the study. However, the types of commitments identified added to the completeness of the model descriptions rather than raising objections to the theoretical process of the models.

Consequently, every examination of the models has confirmed the logic and merit of the process descriptions underlying the models. As well, the process descriptions have been shown to match the observations of the practical organizational change projects represented by the ten cases of the study. Thus the evidence in support of Research Proposition 1 is compelling.
6.3 Research proposition 2

That the models apply generally to doing things differently in organizations.

The multiple case study method adopted in this study follows a path towards what Yin (2003) refers to as ‘analytic generalization’. This is the process of generalizing from case study to theory.

The study commenced with five cases from various parts of a benchmark organization – a large organization with a strong reputation for systemically managing change processes. Each of the cases was shown to support the theoretical models of the study, with the proviso that some additional commitment effects were identified that were not part of, but could be readily incorporated into the theoretical models. Five replications provided compelling evidence that the original theoretical models could be generalized to this one organization.

Falsification of the theoretical models was invited through five cases from different organizations and different types of change. Each of these cases also supported the original theoretical models, but again additional commitment effects were identified. Overall, the replications cover large organizations (Projects M1-5, X3, X5), small organizations (Projects X1, X2, X4), administrative-marketing changes (Projects M1, X4, X5), technology changes (Projects M2-5, X1, X2, X3) and changes of various levels of innovativeness, and provide strong evidence of the applicability of the theoretical models to a wide range of organizations.

That additional commitment effects could be identified and readily incorporated into the model (refer previous Sections 6.2.3 and 6.2.4) without any change to the fundamental principles of the model testifies to the robustness of the theoretical models. As well, informants to the study had no difficulty in identifying the relevance of the elements of the model and discussing them in response to the verbally administered questionnaire. They also raised no objections to the diagnosis of their cases based on the theoretical models when reviewing their case reports, indicating that the model descriptions were at an appropriate level of abstraction for practitioners.

The conclusion is that the results support the view that the theoretical models have general application across organizational contexts.
6.3.1 Benchmark organization – personal comments

This study was designed to investigate the theoretical models rather than any of the organizations studied. However, since the benchmark organization has a higher reputation for innovation than the other organizations in the study it would be reasonable to ask whether there were observed differences between the benchmark organizations and others that would help with the question of what distinguishes more innovative from less innovative organizations.

There are two conjectures that might reasonably be made. First, if the benchmark organization is known to achieve a higher level of innovative outcomes than others then one might expect it to manage the knowledge-commitment processes outlined by the theoretical models of this study differently to others. Second, following the business practice continuum of Figure 3.1 one might expect the benchmark organization to work at a higher level of innovativeness than other companies (refer previous Section 3.2.2).

The results of the study provided no support for the first conjecture. There were no marked differences between the knowledge and commitment measurements of the benchmark and other organizations, and insufficient data points to make any sensible comparison. However, the failure to discern differences between knowledge and commitment processes in the benchmark and other organizations adds support to the view that the theoretical models describe a general process of change in organizations.

The study supported the second conjecture to a limited extent. Examined qualitatively the projects of the benchmark company were, overall, higher in innovativeness through higher novelty of ideas, greater technology differences, and higher performance increases. The projects also tended to face more conflicting commitments and require a greater emphasis on paradigm breakout strategies. Examined quantitatively the M projects had higher innovativeness scores than others (means 45.6 versus 40.6) but with the small sample the differences were insignificant (refer Appendix 13). As well, the projects studied were not selected on the basis of typicality, so it would not be valid to use the distinguishing feature of the benchmark organization projects, innovativeness, in inter-organizational comparisons. At the same time, it could be argued that since each project was based on the same specification of ‘doing things differently’ the study may reflect different organizational views about what that means, and so the idea of typicality may be inherent in the selection
of projects. However, taking an objective viewpoint, the study provides no information on differences between innovative organizations and others.

It may be appropriate to make some personal comments about the two conjectures and the benchmark organization. As to the first conjecture, my view is that following an established process, whatever it might be, may work towards improving effectiveness, but unavoidably means a shift towards adaptive rather than innovative problem solutions. The 3M of my experience was not process oriented. Nonaka and Takeuchi (1995) quoted the CEO of 3M saying that in order to encourage autonomous development ‘one “closes one’s eyes” to process’ (p. 139). However his 2002 successor, James McNerney, the first CEO appointed from outside the company in 100 years, pinpointed processes as a fundamental weakness of 3M and immediately set about installing six-sigma quality processes throughout the company.

Improving process requires discipline and the reputed achievement of this within 3M has earned McNerney a place in the Business Week (12 January) list of Best Managers of 2003, and a lead article in Business Week (Arndt, 2004) extolling both his performance and 3M’s surge in sales and profits. However, the improved efficiency that comes with more discipline can only be achieved by opting for adaptive over innovative problem solutions, and that means reducing innovativeness (or moving downwards on the business practice continuum of Figure 3.1). More discipline may result in profit improvement in the short term, but will unavoidably have an effect on the innovativeness of the organization and its growth performance in the longer term. I do not believe that understanding process, including that of the theoretical models here, will necessarily add to the innovativeness of an organization, this being just another example of a knowledge-action gap.

With the second conjecture, my view is that 3M does not differ from other organizations in its commitment to organizational change, but rather in its institutionalised obsession with disruptive technologies and product innovativeness. The organization continually renews itself through internal structural responses to products of high innovativeness. This dynamic reflects the self-reference view of organization, and has been identified as a general organizational effect in the work of Danneels (2002).

In 3M, “me too” products are an anathema. The history of 3M successes tells a consistent strategic story, and implicitly sets the strategic rules (or values) of the organization. The strategic rule is to use proprietary technology to disrupt settled markets, thus achieving technology leadership and a monopoly position. Having achieved technology leadership
then the task is to maintain leadership by continuing to disrupt the market by introducing combinations of different 3M technologies. At the operational level 3M follows the Popper cognitive model of change. If a point is reached where things cannot be done differently then the business is moved to harvest and exit modes.

In 3M, the company stories are all about new-to-the-world products or disruptive products that have changed the way that business is done, and corporate recognition programs are similarly biased. The heroes of the stories struggle with and overcome a disbelieving organization. It is the individual versus the organization in a continuous battle about innovativeness. But high innovativeness means higher risk of failure, so the strategic rules also incorporate a low-risk, experimental approach reflected in the 3M maxim of ‘make a little, sell a little, then make a little more’ and a high tolerance of failure.

3M has also demonstrated an amazing ability to maintain market leadership over long periods of time. A 3M laboratory assistant, Dick Drew, invented masking tape in 1925. Over an eighty period 3M has been responsible for every major technical development in and remains the technology leader of the Pressure Sensitive Adhesive Tapes industry, as well as establishing many other successful businesses based on the technology. A company cannot do that without having highly developed adaptive practices. At a strategic level, 3M follows the Kuhn cognitive model of change.

So I would make three unsubstantiated claims about the benchmark organization, 3M. First, that the company has institutionalised the Popper cognitive model as its operating model. Second, that the company is committed to product innovativeness rather than to change per se. Third, that the company has institutionalised the Kuhn cognitive model as its strategic model.

### 6.4 Research proposition 3

*That an organization’s structurated and creative commitments are positively related to the level of innovativeness of spontaneously arising change initiatives.*

Evidence in support of this proposition was insufficient for a convincing answer. The case analysis identified that higher creative commitments were likely associated with projects of higher levels of innovativeness, although the analysis was incomplete because certain creative-type commitments were not measured (refer previous Section 6.2.3). In the case
analysis the role of structurated commitments remained unclear, again a result of certain structurated-type commitments remaining unmeasured (refer previous Section 6.2.4). However, the across-pattern matching of the qualitative data did identify that projects of higher innovativeness were more prone to the conflicting commitments that were unmeasured. This clearly suggested that higher structurated commitments were likely associated with higher levels of innovativeness.

The across-case correlation analysis did not find any significant relationship between innovativeness and either Creative Commitments or Structurated Commitments, but any relationship identified here would have remained unclear because of the shortfalls in commitment measurements outlined above. However, there is a suggestion of a relationship between innovativeness and Psychological Commitments (+0.46 at a 90% level of confidence) that would not be affected by this shortfall, and works in the direction of the proposition.

The analysis identified a strong correlation (+0.80 at a 99% level of confidence) between the Creative Commitments measure and the level of business outcome that suggests an important role for Creative Commitments in motivating projects, but since there is an equally strong negative correlation (-0.78 at 99% level of confidence) between business outcomes and innovativeness this simply confirms the lack of correlation between commitments and innovativeness that has already been noted.

The conclusion drawn from all analysis is that support for this research proposition remains unconvincing, but there is no evidence suggesting that the proposition should be rejected. The necessary step in determining this research proposition is the measurement of the additional creative-type and structurated-type commitments that were identified in this study, and this is left to future research.

6.5 Research proposition 4

That an organization’s knowledge is unrelated to the level of innovativeness of spontaneously arising change initiatives.

Previous Sections 6.2 and 6.3 have provided some reasons why the research proposition should be supported. Problems are found from within the organizational knowledge base, but their interpretation and resolution is by people who have different preferences for types
of solutions. There is no direct connection between the knowledge base and the type of solution chosen. Furthermore, the nature of the problem found will also play a role in determining the type of solution chosen. For example, Projects M3, M4, M5, X3 and X5 involved co-development activity with external stakeholders. This type of activity involves the shaping of problems towards meeting customer requirements, and often means implementing different solutions to those originally planned. For example, in Projects M3, M4 and M5 the solutions originally planned did not solve all of the customer’s requirements. Solutions of higher innovativeness were necessary to do that.

A conclusion from each of the ten cases of this study was that the innovation idea and creative action was a response to an organizational problem, and that the innovativeness of the solution was related to the problem, and the type of solution necessary to resolving it. While such a conclusion might be thought obvious and trite, it has a claim of validity unless other tenable explanations exist, and these were not found. Thus the case analysis provides support for the research proposition.

The across-case quantitative analysis of questionnaire data was equivocal in its support for the research proposition. The analysis provided some support for the case analysis conclusion. If the knowledge base were strongly identified with the types of solutions necessary to resolving the problems found within the knowledge base, then one would expect the knowledge base to play a strong role in the knowledge creation necessary to pursuing that solution. That was not the case. The analysis indicated only low negative correlations between the components of the knowledge base and ultimate knowledge creation, thus suggesting that the knowledge base, and the work of resolving problems, to be independent, as the research proposition suggests.

The analysis indicated no significant relationship between innovativeness and both Personal Knowledge and Collective Knowledge (refer Section 5.3.2). This result is in agreement with the many large-population studies that have established that knowledge and innovation are unrelated at the individual level (Kirton, 1994a, 2003), and thus confirms the research proposition in part. However, the analysis of the organization’s codified knowledge forms - Proprietary Knowledge and Public Knowledge - indicated a significant negative correlation with innovativeness (- 0.63 and - 0.56 respectively at the 95% level of confidence). This is unexpected, and denies the research proposition.

According to the economics and management literature codified forms of knowledge are associated with the development of the knowledge economy, knowledge management and
innovation. The research proposition that codified knowledge and innovativeness are unrelated represents a challenge to the assumptions of these literatures. A finding that higher levels of knowledge are associated with lower levels of innovativeness does more than cut across assumptions; it turns all thinking about the matter on its head. The result needs to be explained to determine whether or not it is spurious.

The correlation with most meaning is that between innovativeness and Proprietary Knowledge, so further evaluation will concentrate on it. In the survey questionnaire the statement seeking the informant’s judgment about the roles of patents and know how, designs and/or prototypes, formal operating procedures and formalized knowledge of key customers, was ‘The outcome of this project depended on the organization’s intellectual assets, namely: ….’ This required two judgments on the part of informants; first, a judgment about what of the organization’s intellectual assets applied to this particular project, and second, a judgment about what contribution the identified assets made to the outcome of the project.

If the first of these judgments is made it means that the measure of the organizational knowledge base determined from the survey needs to be interpreted as that part of the organizational knowledge base that applies to the particular project. In a small organization that part could be assumed to be the organizational knowledge base in its entirety, but in a large organization, such as that of the M group of projects, the measured knowledge base will represent only that part of the greater organization’s knowledge base that is relevant to the project or to the division of the greater organization in which it exists. However, this does not invalidate the measure of Proprietary Knowledge, and its role in achieving project outcomes from the informant’s viewpoint.

In comparing the correlation of innovativeness with Proprietary Knowledge and that of uncodified knowledge forms, it could be argued that an informant is in a better position to judge the role of proprietary knowledge more objectively. There is a marked difference between the specificity of information when judging the link between a proprietary knowledge and a project outcome, than when judging the link between broad forms of personal and collective knowledge and a project outcome. If a project is based on extending an existing design - as in Project X1 - then the extent that the existing design played a role in the new design process is very clear to participants in the process. Whereas in the team process which person contributed what to the new design is not as clear. Also, the measurement system used in this study is based on the observation of behaviours, and attributing responsibility for success or failure at the Personal Knowledge level of analysis.
may be prone to biases (Jones & Davis, 1965; Ross, 1977) that may not exist to the same extent when evaluating the role of more objective items.

The second of the informant’s judgments - the contribution of knowledge to the project outcomes - may be prone to self-presentation effects, for the informants of this study were also active participants in the projects. One might expect that responses to questions about the role of personal knowledge will be boosted over the responses to questions about proprietary knowledge. And the self-presentation effect might tend towards minimizing the contribution of the knowledge that previously existed (proprietary knowledge) in favour of boosting the role of the new knowledge creation activity that the informant managed. The availability heuristic (Tversky & Kahneman, 1973) may also lead to recent work being more salient to judgments about causality, and reduce the perceived role of the pre-existing proprietary knowledge. However, if the informants’ responses boosted all scores on personal knowledge, and discounted all scores on proprietary knowledge, it would make little difference to the correlation of each with innovativeness, as long as the variations between data points remained fairly much the same.

It would thus appear that the significant negative correlation between Proprietary Knowledge is unlikely to be an effect caused by the questionnaire or its questions. So the next step of evaluation will be to assume that the informants’ responses followed a rational pattern.

If a project were about doing the same things as the organization has always done, then one would expect most of the knowledge relevant to the project to be at hand, and a response to the question of the role of Proprietary Knowledge in outcomes to indicate a high importance rating. On the other hand, if the project is about doing things differently to that of the past, then one cannot expect as much of the knowledge relevant to the project to be at hand. So a response to the question about the role of Proprietary Knowledge might indicate a lower importance rating. This reasoning is in accordance with the measured relationship.

The availability heuristic (Tversky & Kahneman, 1973) must also be considered. For an informant trying to recall the events of the project, the information most salient is information about the recent events of the project. In this study, most of the projects with high levels of innovativeness were projects that extended over many years (Projects M1, M3, M4, M5), so that the availability heuristic may have reduced the importance rating of Proprietary Knowledge on the projects of higher innovativeness and to a lesser extent on
projects of lower innovativeness. This effect is in line with the measured relationship, but there seems no case for believing that the effect has created the relationship.

This analysis would thus suggest that the negative correlation between innovativeness and Proprietary Knowledge has a strong claim to validity. The same reasoning would apply to the similar although weaker correlation between innovativeness and Public Knowledge, and here the availability heuristic would have played a lesser role. However, while this may suggest a case for rejecting the research proposition for codified forms of knowledge the following must also be taken into account.

The research proposition is concerned with the relationship between the existing organizational knowledge base and the types of problem solutions that the organization chooses to follow. To examine that relationship at the time of project commencement would require a measure of the knowledge base at that time, and a measure of the innovativeness of the problem solution at the same time. It is not possible to do that after the events of the project development for the knowledge base will have changed during the development, and possibly the problem solution also. To prove or deny the research proposition would have required a longitudinal study that was beyond the scope of this research project. The question thus becomes; has anything useful been measured, and what is the relevance of the measured correlation between innovativeness and codified knowledge?

Referring to Figure 3.1 and the business practice continuum, the measurements taken in this study are those consequent to the knowledge requirements having been met. Thus in contrast to the way in which the business practice continuum was explained as a curve at a distance from the vertical axis corresponding with the knowledge requirements of the project, the measurements in this study are taken at a later time from the position of the curve. In effect, the informant has estimated the distance back to the vertical axis, or the knowledge created during the project. At the lower levels of innovativeness, the organization’s existing knowledge (represented conceptually by the vertical axis) will have been important to the project outcomes. At the higher levels of innovativeness the extent of the additional knowledge creation will have overshadowed the organization’s pre-existing knowledge so that the pre-existing knowledge may be regarded as of lesser importance.

The conclusion from this reasoning is that across-case correlations of Proprietary Knowledge and Public Knowledge with innovativeness cannot be used to reject the research proposition, for they do not properly reflect on the terms of the proposition. However, these correlations strongly support the conceptual relationships between innovativeness and
knowledge requirements that are outlined on the business practice continuum model of Figure 3.1.

In summary, the case analysis and associated reasoning supports the research proposition that an organization’s knowledge is unrelated to the innovativeness of its problem solutions, and the across-case correlation study supports the proposition for uncodified Personal Knowledge and Collective Knowledge, but not for codified Proprietary Knowledge and Public Knowledge. Importantly, this study provides more support for the research proposition than for the alternative hypothesis, that knowledge and innovativeness are positively correlated, the assumption that underlies knowledge management, and innovation research and practice.

6.6 Theoretical implications

The research aims of this study, the evaluation of its research propositions, and other observed results of the study suggest a number of different theory directions for future attention. These are covered in the subsections that follow.

6.6.1 Self-reference view of organizations

Research Propositions 1 and 2 that were intended to establish the relevance of the self-reference theoretical view received inconclusive support from the study, yet no result that hinted at falsification of the basic concepts of the models. Behind the inability to draw firmer conclusions on the propositions were the problems of measurement reported in previous Sections 6.2.3 and 6.2.4.

However, while the evidence supporting Research Proposition 3 is not strong, the evidence in support of Research Proposition 4 that was less affected by the measurement problem was mildly positive. The overall analysis of cases supported the self-reference view that creative actions were spontaneously generated, and case explanations based on the theoretical models seemed to make sense to the practitioners who responded to the verbally administered questionnaires, and reviewed the case reports. So while the question of the relevance of the self-reference view is not answered conclusively, the support for the view is promising, and if this study is looked upon as an exploration of the view, then there is sufficient reason to continue the investigation.
The theory development of Chapter 3 demonstrated that a view different to the open-systems view of organization was necessary in order to formulate a truly social and organizational model of change, and to change the ontology of the model from an external to an internal view. A shift in systems view to the self-reference perspective may assist in resolving other long-standing theoretical issues.

For example, Weick (1991) pointed out that individual metaphors of learning are not applicable to organizations because individuals and organizations learn in different ways. When responding to the same stimulus individuals learn to respond in different ways, whereas when responding to different stimuli organizations learn to respond in the same way. This dilemma can only be resolved by a truly social model of organization that explains organizational learning, and incorporates the purposive actions of individuals within the explanation. This is what the theoretical models of this study accomplish.

As well, a truly social model of organization learning would provide the opportunity of integrating those part theories that seek an organizational context. For example, the core ideas of an organizational knowledge base (Duncan & Weiss, 1979; Shrivastava, 1983), experience curve effects that improve organizational routines (Abernathy & Wayne, 1974; Nelson & Winter, 1982), and the concept of assumption sharing and the learning organization (Senge, 1990a, 1990b) are all readily explainable by elements of the theoretical models of this study.

In summary, the self-reference view of organization formulated in this study may provide an opportunity to reinterpret and integrate many of the findings of organizational learning and innovation research.

### 6.6.2 Knowledge-action dialectic

The evaluation of Proposition 4 makes it clear that while the proposition’s support is not conclusive, a strong case is mounted for rejecting an alternative hypothesis that the organization’s knowledge and innovativeness are positively correlated. The following are reasons why this rejection should be implemented in research practice.

An outcome of working under the assumption that knowledge and innovativeness are positively related is that the knowledge-action gap does not need to be considered and
consequently action can become neglected (Pfeffer & Sutton, 2000). As well, if there is no need to attend to the knowledge-action gap then knowledge and action variables can be conflated, as in knowledge management and innovation research. However, if researchers are to understand the knowledge-action gap, and practitioners learn how to better turn knowledge into action, then the independence of knowledge and action must be made salient.

In the business practice continuum of Figure 3.1 the assumption that knowledge and innovation are correlated was removed by the insertion of the variable ‘innovativeness’. This was both a device to assist in the testing of the research proposition and self-reference theory, as well as way of obtaining a precise variable from within business and research definitions of innovation that have lost precision.

However, there are certain contexts where there is a consensus about the meaning of innovation. The broad business definition of innovation that equates it with just about any form of change, has no place in discourse about ‘the only truly sustainable advantage comes from out-innovating the competition’ (Moore, 1993; p.75). Strategy authorities are in agreement that to obtain strategic advantage things have to be done differently (Hamel, 1996; Hamel & Prahalad, 1994b; Porter, 1996). That is, achieving strategic advantage means moving up the scale of innovativeness. Consequently, in strategy contexts, in situations of continuous change and organizations working in innovative environments (Shareef, 1997), that follow the Popper model of change (refer previous Section 2.2.43), the variable innovativeness and a description of innovation becomes much the same thing.

Conventional thinking about innovation being more informed by technological models of change, uncritically accepts that creating new knowledge is intimately connected with innovation outcomes. That is the basis on which entrepreneurs, company R&D Managers and University Vice-Chancellors make strong cases for additional funds, so there is little incentive for innovation practitioners to think beyond the conventional. The case that the role of company R&D is more about learning than it is about innovation has been made (Cohen & Levinthal, 1989), but any conjecture about the role of Universities in the national innovation system is stifled by a strong consensus of interests. However, that should not prevent management theorists from thinking more critically about the matter.

The proposition from this study that knowledge and innovation are unrelated focuses attention on the knowledge-action gap. If objective knowledge cannot explain innovation then attention must turn to the subjective knowledge processes that achieve the link between
knowledge and action. Expounding the proposition establishes a dialectic that will create attention to, and discussion and argument about, the knowledge-action gap. That may lead to researchers adopting approaches that investigate all relevant variables, and eventually lead to more consistent research outcomes in innovation research, the objective that all reviewers of the field assert.

Proposing the knowledge-action dialectic challenges many of the traditional views of innovation. It shifts the emphasis from objective to subjective processes. It questions the role of knowledge in innovation. It strongly suggests that the more an organization accumulates knowledge the more likely that adaptive change responses will arise, and the lower the level of innovativeness that will result. To resist this latter effect requires individuals who are prepared to reject group consensus and do things differently.

### 6.6.3 A commitment theory of motivation

The theoretical models developed in this study can be regarded as an organizational theory of motivation. When Turner (1987) applied himself to the task of re-introducing motivational concepts into sociology, he tried to integrate what he saw as the abundance of implicit models into a composite model of interpersonal motivation. Presumably, he could conceive of a motivation that involved individuals in a social context, but not of a motivation that was social-based, and thus affected individuals. A motivational theory that is limited to explaining individual actions cannot explain organizational processes or their resulting organizational effects, such as why developing the organization’s core capabilities may also construct its core rigidities (Leonard, 1995).

The commitment theory of motivation represented in the models of this study is a truly organizational model that explains the role of both individual and organizational effects in motivating the knowledge creation process, as well as explaining its aftermath. The theory explains the motivating role of creative commitments, as well as the de-motivating role of structurated commitments. The theory is a dynamic one. Creative commitments motivate knowledge creation, and the knowledge thus created becomes part of the source of structurated commitments that de-motivate future knowledge creation. It is a theory of motivation that is also historical. It explains how the knowledge creation process is motivated into the future, while explaining how the process is influenced by the past.
The sign of a useful theory is that people can recognize it as telling them what they already knew but could not put into words, or that was obvious once explained. The commitment theory of motivation is one such theory. Everyone has an implicit understanding that he or she has a past that must be reckoned with. A commitment theory of motivation does no more than expand on that simple understanding in the organizational sphere.

A commitment theory of motivation in organizations is also a theory of organization. What is an organization theory other than an explanation of how people combine to get work done through organizing and in organizations? There are many perspectives on and theories of organization (Donaldson, 1995; Morgan, 1986). Implicit in all of them is the management of the members’ commitments towards getting the work of the organization done. However, traditional theories of organization are theories of commitment capture and use rather than of commitment generation, and, furthermore, cannot account for the effects of commitments made in the organization’s past. In short, the traditional theories of organization are theories of stability rather than change, whereas a commitment theory of motivation of organizations is a theory of continuous change.

### 6.6.4 Role of individuals

The knowledge-commitment models of this study place the role of individuals into organizational context without detracting from the crucial importance of individuals in change processes.

The model’s formulation of Personal Knowledge recognizes the key role of individuals in their understanding of how to bring the entire change process together through entrepreneurial knowledge. The explanations of the creative action element of the models (refer previous Section 6.2.2) also demonstrate that it is through individuals and their idiosyncratic ways of interpreting and solving organizational problems that creative responses range up the scale of innovativeness. Without the intervention of individual action, organizations would only be capable of programmed responses to problems.

Across the ten cases of this study the strength of response of Personal Knowledge exceeded the strengths of other measures (Personal Knowledge 86% versus Proprietary 53%, Public 31% and Collective 64%), and this relationship between the forms of knowledge remained the same for each case. The strength of response to Psychological Commitments was also greater than that for other forms of commitment. There is also the suggestion from the
across-case correlation analysis that these commitments become more intense at higher levels of innovativeness (+0.46 at 90% confidence level).

With the informants to the study also being key participants in the projects, it is likely that the responses are biased towards Personal Knowledge and Psychological Commitments. However, this does not take away from this study’s demonstration of the important role of the knowledge and commitment of individuals in generating the creative commitments that motivate change processes. As well, the knowledge creation cycle is a learning cycle that starts with individual creative action, and in its early cycles can only progress through the committed actions of individuals. It is only through individual action that projects can get started.

### 6.6.5 Role of communication

The Chapter 3 development of the self-reference view of organizations found that the traditional, rationalistic view of communication needed to be discarded in favour of an analysis that emphasized language and social transactions. This raises questions about the role of the traditional concept of communication in the innovation literature.

The innovation literature contains two main communication themes; one about the role of communication in promoting coordination of functions (Barnard, 1938), and another about its role in successful technology transfer and innovation (Allen, 1984). Early approaches to organization design for innovation were about trading off functional efficiency in the interests of functional coordination in schemes such as the matrix organization (Knight, 1976), but these have given way to approaches that emphasize organic organizational forms (Burns & Stalker, 1961), and the primary need for coordination through the flattening of functional hierarchies and the installation of team structures, all premised on the traditional view of communications and the trading off of functional efficiency.

In contrast to this discourse, and best practice view, are reports of case writers about the 3M organization that has a high reputation for effective innovation processes. First, there is the surprise that 3M is very hierarchical (Walker, 1993), while at the same time, ‘3M exemplifies the bottom-up model of management better than any of the large companies we know of today’ (Nonaka & Takeuchi, 1995; p.136). Second, there are descriptions of how 3M’s hierarchical structure is overlaid by numbers of cross-linking forums, councils and committees (Gilmour & Hunt, 1993; Gundling, 2000). Third, there are reports of visitors to
3M remarking on ‘all sorts of strange goings-on’ (Peters & Waterman, 1982; p.120), as scores of people of all functional varieties sat around informally talking about new products.

The 3M approaches to organizing appear to maintain functional efficiency through hierarchy while achieving bottom-up communication and coordination through an emphasis on plentiful cross-functional interaction of a both formal and informal nature. The point to be made is that the innovation literature concentrates on the rationalistic approach to communication, and thereby conceals the role of social transactions and the generation of the commitments that motivate the innovation process.

If management of innovation is about managing commitments, then it is also about managing social transactions. Research on the management of innovation may need to turn away from the traditional view of communication, and towards attending to what is happening in social transactions. The emerging field of conversation management appears to be a step in that direction, and may usefully inform innovation research (von Krogh & Roos, 1996b).

### 6.6.6 Stability versus instability

A test of whether the theoretical models developed in the study reflect on the processes underlying innovation (refer previous Section 2.2.1.1) is whether both its stability and instability are explained by the models, and observed in the study results.

Two observed effects appeared to lead to instability of process. First, the original innovation idea changed, sometimes several times. In one case, Project M3, the changes resulted from an external shock. The across-case innovativeness patterns of the ten cases studied showed this to occur in the five cases of highest innovativeness. Second, largely unanticipated conflicting commitments arose in the six cases of highest innovativeness. This immediately suggests that instability is related to higher levels of innovativeness.

An appropriate management response to instability is to adopt strategies that can accommodate the instability. In the six cases of highest innovativeness that were subject to idea changes and unanticipated conflicting commitments, additional strategies of entrepreneurism and paradigm breakout were identified as being used to overcome uncertainty, and remove social barriers. These were not identified in cases of lowest innovativeness where the idea changes and conflicting commitments were not identified.
These effects can be explained by reference to the business practice continuum of Figure 3.1. Projects of low innovativeness have few unknowns associated with them, so the likelihood of changes from the original formulation of the project, or of unanticipated resistance arising during the progress of the project is low. In contrast, with projects of high innovativeness there are more unknowns and the likelihood of changes to ideas or unanticipated occurrences during the project are higher.

In summary, the suggestion from this study is that innovativeness and stability are negatively correlated. This effectively means that the business practice continuum also describes the stability continuum with stability of process occurring where no additional knowledge is required for a project to be implemented (adaptive response), and instability occurring where all of the knowledge required for implementation is to be generated (innovative response).

From the self-reference system viewpoint, a disturbance to the organizational system will create instability of a certain dimension. It was also reasoned in previous Section 3.3.10 that a greater disturbance will create a greater instability, and that the level of disturbance corresponded with the level of innovativeness of a creative action. Accordingly, higher levels of innovativeness cause higher levels of instability.

### 6.6.7 Rational versus non-rational process

The evidence from the previous section of ideas changing and unanticipated commitments arising at higher levels of innovativeness also suggests that the rationality of process varies with innovativeness.

Referring again to the business practice continuum, with projects of low innovativeness there are few unknowns, and a rational planning process can be followed with a high degree of confidence that the plan will not change. However, with projects of high innovativeness where there are many unknowns there is a higher chance of changes to the plan becoming necessary, and a lesser degree of confidence in a rational planning process. The evidence from this study is that the non-rational processes of entrepreneurism and paradigm breaking became necessary at the higher levels of innovativeness.
This suggests that the business practice continuum also describes a rational versus non-rational continuum with non-rationality increasing with increasing levels of innovativeness.

### 6.6.8 A model of organizational change

The research aims outlined in Section 1.4 included a nine-point requirement for a useful model of organizational change. These requirements, distilled from recent authoritative writings (Poole & Van de Ven, 1995; Poole et al, 1999; Van de Ven & Poole, 2000c), guided the theory development of this study. The question is to what extent the requirements were met? Each of the nine requirements will be evaluated in the order listed in Section 1.4.

i. **Do the models provide a conceptual schema that is useful to management practitioners?** The evidence from the study is that the strategic and organizational change models evaluated in previous Section 6.2 reflect the practices and processes at play in organizational change projects. As well, the management informants involved in the study were able to readily discuss the components of the model and to understand the diagnosis that resulted from the models. Thus the models appear to provide a story of change that is understandable to management practitioners and should prove useful to them.

ii. **Do the models describe and explain the overall longer-term development process, as well as the operative processes that create the development patterns in the short term?** The three routes to innovation model of Figure 3.3 and the model of organizational change process of Figure 3.5 describe and explain the overall development process, while the knowledge-commitment cycle model of Figure 3.4 explains the knowledge creation process and the patterns of development in the shorter term. This requirement has been met.

iii. **Are the models transferable across organizational contexts?** In previous Section 6.4 it was concluded that the results of this study provided strong support for the general applicability of the models. The applicability of the models can only be sustained if the models are based on a definition of innovative change that is transferable across organizational contexts. The business practice continuum model of Figure 3.1, and the definition and measurement of the variable innovativeness, provided the precision necessary to achieving this.
iv. Are the models applicable to all forms of innovative change? - product, process, technical and administrative. The study showed that the models explained change projects of product, technology development, and administrative and marketing character.

v. Do the models recognize that decision-making about innovative change takes place in a context of a highly uncertain or unknowable future, and involve processes that are both rational and non-rational? The model development responded to this requirement by adopting the concept of commitment as the basis of the model (refer previous Section 2.4.2), thus allowing subjective processes to be integrated into the model. Commitment processes provide the means by which uncertainty is managed and irrational persistence in the pursuit of a course of action is developed, both important effects in the innovative change process.

vi. Do the models explain how and why knowledge is generated for the purposes of change, and how and why this knowledge is applied towards innovative change? The explanations of previous Sections 6.2.1 and 6.2.2 cover how and why creative actions arise in organizations and how and why, through the role of individuals, these actions may be of different levels of innovativeness. The knowledge-commitment cycle model of Figure 3.4 explains how further knowledge is created and applied.

vii. Do the models explain how organizational relationships are linked with individual purposive actions in order to produce change? The explanations of Sections 6.2.1 and 6.2.2 show how the purposive actions of individuals initiate the change process. The knowledge-commitment cycle model of Figure 3.4 relates individuals, their personal knowledge and their psychological commitments to the greater organizational context.

viii. Do the models explain both the stability and instability of the innovative change process? Previous Section 6.6.6 provided explanations of the stability and instability of the change process based on the innovativeness of the change project. The study noted the role of external shocks in causing instability through change responses that changed the innovativeness of the project.

ix. Do the models explain how the innovative change process is motivated? The models developed in this study incorporate both objective and subjective elements and thus
provide an explanation of how knowledge is transformed into action through the psychological and social processes of the organization. Previous Section 6.6.3 explains why the models can be regarded as an organizational theory of motivation.

This review indicates that the models of this study almost entirely meet the model requirements set down by authorities, and can thus claim to provide a useful model of organizational change.

6.7 Practical implications

The development of the knowledge-commitment models, and the findings and evaluations of the study, suggest several ways in which the models might inform practice. Adopting the knowledge-commitment perspective might prove advantageous to practitioners in following ways.

6.7.1 Understanding commitments

Commitments are the emotional attachments by which the organization is held together and gets things done. Members of organizations can be seen to exist within a network of commitments that constitute their emotional world, yet it is clear that they are little aware of this. Members can be expected to understand their obligations to their organization and the responsibilities of their role within the organization, but they may be largely unconscious of their own emotional attachments and commitments, and of the organization’s social and structural commitments that influence their personal behaviour.

Since it is only through the commitments of people that things get done it makes sense for members of organizations to be more aware of their commitments, and those of their organization, how they are generated towards change, and how they arise to resist change. A common starting point in organizational development programs is individual training aimed at improving self-awareness, hence gaining an understanding of how one’s own preferences influence the interpretation of events and the actions of other people.

A shortcoming of the array of consultant driven programs that organizations use to help their members become aware of their preferences is in linking this personal knowledge with the needs of the organization. The benefit of the knowledge-commitment models is that
whatever technique is used to uncover individual commitments, the commitments can be placed into the context of the organizational change program. The knowledge-commitment models establish the links between individual commitments and those of the organization and the organizational change process. An individual with an understanding of their place in the organization’s network of commitments is better placed to make decisions in line with the organization’s chosen direction.

In summary, there may be important benefits in training members of organizations on how commitments are generated and their role in motivating and resisting change.

### 6.7.2 Closing the knowledge-action gap

It is important that managers be made aware of the existence of the knowledge-action gap and the role of commitments in closing it. The claim of the theoretical models of this study is that creative commitments close the gap, while structurated commitments work at keeping the gap open.

It is only recently that researchers have paid attention to the practical problem of many business organizations accumulating knowledge about how to do things, but never acting on the knowledge, essentially wasting billions of training dollars in the process (Pfeffer & Sutton, 2000). Clearly, the rhetoric associated with the idea of the knowledge economy may reinforce this effect. Thus, apart from the theoretical reasons why the knowledge-action gap should be highlighted (refer previous Section 6.6.2), there are important economic reasons for managers to be made aware of the gap, and trained in how to overcome it.

Pfeffer & Sutton (2000) is a report on practical measures for closing the knowledge-action gap. These measures have been inferred from their case analysis rather than reflecting any explicit theory. While a detailed analysis of each of Pfeffer and Sutton’s measures is not justified here, what becomes clear is that they are guided by an implicit theory that there are certain measures that close the gap while there are other measures needed in order to overcome those things that keep the gap open. Pfeffer and Sutton’s gap closing measures can all be interpreted as the Personal Knowledge, Psychological Commitments and Project Commitments of the theoretical models of this study – essentially the Creative Commitments. The things keeping the gap open can all be interpreted as the structural and social elements of Structurated Commitments. Thus, the Pfeffer and Sutton research appears
to both support the theoretical models of the study, and demonstrate that that their concepts can be realized in practice.

There would also be a practical training advantage in couching the problem of the knowledge-action gap and its resolution in the language of commitments. All emotional attachments would have a common label, and the theoretical models of this study would provide an integrative framework for broader understanding.

6.7.3 Managing ideas

The literature on organizational creativity is focused on creating conditions for the generation of ideas in organizations; in comparison there is negligible literature that assists practitioners in the further management of ideas in organizations.

Any literature pertaining to a management of ideas is usually restricted to the terms of how to get ideas accepted (Grudin, 1990; Pinchot & Pellman, 1999; Waters, 2001). A broader view of the problem requires the guidance of theory.

The self-reference metaphor of organization may provide the basis of a practical theory through the concept that the higher the level of innovativeness of an initiative the higher the disturbance to the organizational system. This concept is made practical by the business practice continuum of Figure 3.1, and the practical inference that ideas need to be managed differently dependent on their level of innovativeness.

The conceptual models of this study may also assist the practical management of ideas by allowing the perceived problem of gaining acceptance of ideas to be reconceived as building commitment to ideas, or closing the gap between having knowledge and taking action. If the problem is conceived in these latter ways then the knowledge-commitment model of Figure 3.4 becomes a guide to the commitments that must be fostered, and the commitment barriers that must be negotiated, for the idea to progress through the organization.

A manager with an understanding of commitments, and following the knowledge-commitment model, would be provided an ability to plan the task of negotiating the progress of ideas through an organization, as well as the task of progressing the subsequent practical project. The skill of managing negotiations is referred to as ‘diplomacy’, so that term may be appropriately used when an understanding of commitments is used to plan the
negotiation process. Understanding the conceptual models of this study provide managers with the opportunity of developing a personal ‘diplomacy of innovation’.

### 6.8 Future work

The results of this study can be regarded in two parts. For the first part, the results have established the relevance of the theoretical knowledge-commitment models of organizational change through their support of Research Propositions 1 and 2, although the descriptions of the model cannot be claimed as complete.

For the second part, the results have found some but not convincing support for Propositions 3 and 4 and the self-reference view of organization on which the models are based. The shortcomings in the findings of this part of the study related to commitment effects that were not identified or measured by the Survey Questionnaire. The identification and measurement of these additional effects would not only assist in the further evaluation of Research Propositions 3 and 4, but also complete the descriptions of the theoretical models, and position the revised Survey Questionnaire as a useful diagnostic tool.

Previous evaluations in this chapter have suggested that the following research questions need to be pursued to complete the model descriptions:

i. How to identify and measure creative-type commitments that are seemingly external to the change project but, in practice, compete with the commitments motivating the project (refer Section 6.2.3.1)?

ii. How to identify and measure creative-type commitments that are seemingly external to the change project but, in practice, support or reinforce the commitments motivating the project (refer Section 6.2.3.2)?

iii. How to identify and measure structurated-type commitments that are generated from within the structure of the informal organization, and conflict with and resist the commitments motivating the project (refer Section 6.2.4)?
Completing the model descriptions would allow for a more thorough examination of Research Proposition 3, and the dynamics of the relationships between innovativeness, Creative Commitments and Structurated Commitments (refer Section 6.4).

However, the testing of the model revisions may require a deeper level of investigation than conducted in this study. It would be necessary to gain a better understanding of the structurated-type commitments pervading an organization, and how they are triggered by the creative actions. The investigation and analysis would require information from all stakeholders to a project, and would thus inconvenience more people and require a higher level of cooperation from the organizations involved.

Obtaining more convincing relationships between innovativeness and the commitment variables may also require statistical generalization procedures to be followed. This may mean expanding the study to 50 or more data points. However, concentrating on collecting mainly quantitative data may also allow normal survey procedures to be followed.

As outlined in previous Sections 6.6 and 6.7, the implications drawn from the theoretical models of this study open up different research directions of both theoretical and practical importance. The following opportunities have been generated:

i. To reinterpret and integrate past findings in organizational and innovation research on the basis of the self-reference metaphor.

ii. To re-direct innovation research towards the measurement of all relevant variables.

iii. To investigate the knowledge-action gap and how to overcome it.

iv. To reinterpret the role of communication in innovation research.

v. To formulate a commitment theory of organizational motivation.

vi. To formulate a management of ideas in organizations.
7 Chapter Seven: Conclusion

7.1 Chapter introduction

This study met its research aims of gaining an understanding of the role of knowledge and commitment in innovation processes by the development of theory expressed in conceptual models of the organizational development process. These models demonstrate the roles of knowledge and commitment in both generating and resisting change in organizations. The investigation of the models through multiple case studies was guided by four research propositions that spoke to the relevance of the models to change practice in organizations, and to the merit of their theoretical basis in self-reference systems theory.

The evaluation of Research Propositions 1 and 2 (refer Sections 6.2 and 6.3 respectively) provided strong support for the view that the conceptual models reflected on actual management practice and were widely applicable to business organizations. The models were also shown to realize the requirements of a useful model of organizational change as specified by authorities in organizational research (refer Sections 1.4 and 6.5.8).

The evaluation of the theoretical basis of the models in self-reference systems was less compelling. Research Proposition 3 that investigated the dynamics of commitment processes following system disturbance was provided only inferential support from the case analysis. Shortcomings in the model descriptions were uncovered and additional research work is necessary to firmly resolve the proposition. Research Proposition 4 that investigated the relationship between organizational knowledge and the innovativeness of spontaneously arising change responses received a useful level of support.

When compared with the traditional research models of innovation, the models developed here represent a departure from current research directions. However, many authorities have pointed out that a re-orientation may be necessary to achieving more consistent research results in innovation research. The theoretical and practical conclusions that follow from the models and their theoretical basis in self-reference systems are presented in the following three subsections.
7.2 The theoretical models

The theoretical models developed in this study depart from previous models of innovation research in a number of important and useful ways. The models represent both a re-conceptualization of innovation research and an opportunity for a redirected research effort.

i. The models incorporate both objective and subjective knowledge processes and thus tell more of the innovation and organizational story than the traditional research models based solely on objective processes.

ii. Through the development of a self-reference view of organization based on social transactions and commitment the models adopt an ontology that is internal, social and organizational rather than the ontology of external observer.

iii. This self-reference view of organization provides an explanation and understanding of the dual perspectives of knowledge in organizations, as constituting both a source of organizational change as well as a restraint on the change process.

iv. The models describe and explain the relationship between knowledge and commitment at the strategic and organizational levels of the overall and longer-term development process of organizations, as well as at the operative process level that creates the short-term patterns of development.

v. The knowledge-commitment model of the operational process explains how individual purposive actions are linked with organizational relationships in order to produce organizational change. The models do not diminish the role of the individual, but places it into an organizational context.

vi. The strategic, organizational and operational models explain how and why knowledge is created for the purposes of change, and how and why this knowledge is applied towards innovative change rather than towards adaptive forms of change.

vii. The conceptual models together with the concept of innovativeness that informs the models, are transferable across organizational contexts, and are applicable to all forms of innovative change - product, process, technical and administrative.
7.3 Explanations of models

The findings of the study and the evaluation of the conceptual models led to conclusions about the explanations offered by the models:

i. The concept of an organizational knowledge base can be made operational by categorizing knowledge as Personal Knowledge, Proprietary Knowledge, Public Knowledge and Collective Knowledge that can each be measured by their perceived contribution to a change project. The categories and their measurement reflected different levels of codification and sharing of knowledge in organizations.

ii. Creative actions were shown to arise spontaneously in response to organizational problems, as suggested by the self-reference view of organizations. Motivated individuals discover problems that are constrained by the organizational knowledge base. However, the problems are interpreted, defined and solved by individuals. The nature of the solution chosen thus relates to the nature of the problem and the idiosyncratic views of individuals, rather than the organizational knowledge base.

iii. The knowledge creation process of organizations is motivated by Creative Commitments that arise from the Personal Knowledge of individuals and the Public Knowledge, Project Commitments and Social Commitments of the organization. However, the study demonstrated that Creative Commitments were modified by external commitments that either competed with or supported the commitments motivating the project. These effects were incorporated into the conceptual models but their detailed identification and measurement requires additional research.

iv. The knowledge creation process of organizations is resisted by Structurated Commitments that arise to protect the organization’s identity. These Structurated Commitments flow from the Proprietary Knowledge, Collective Knowledge, Structural Commitments and Social Commitments of the organization. However, the study demonstrated that various structurated-type commitments also arise from inappropriate consensual relationships in stakeholder groups. These resistive commitments are difficult to anticipate and to take into account. These effects were incorporated into the conceptual models but their detailed identification and measurement requires additional research.
v. Since all relevant commitments were not identified and measured in the study, the dynamic of the relationship between Creative Commitments, Structurated Commitments and project innovativeness was not firmly resolved. Since this relationship is integral to determining the relevance of the self-reference view of organization, the question of this relevance cannot be confirmed.

vi. The study confirmed the logic of the operational level knowledge-commitment cycle model (refer Figure 3.4) in describing the motivated process of knowledge creation. This operational model represents a great advance on the knowledge creation models popular in the knowledge management literature by its incorporation of a motivating mechanism.

vii. The study demonstrated that change outcomes could be specified and discussed in terms of either knowledge creation or business outcomes. The study concluded that the appropriate level of study for innovative change was business outcomes.

viii. The study demonstrated how the concept of innovativeness can be made operational through the business practice continuum model (refer Figure 3.1). The innovativeness concept allowed innovation to be treated as an independent style variable, rather than the constructed level variable that is the norm in innovation research, where the innovation variable is conflated with variables that are assumed correlated with innovation without justification.

ix. The business practice continuum model (refer Figure 3.1) demonstrates that stability and rationality are variables within the innovation process. The implication of the business practice continuum, that projects need to be managed differently depending on their level of innovativeness, provides a basis for variation in project management and for the development of a ‘management of ideas’.

x. The strategic routes to innovation model (refer Figure 3.3) provides useful descriptions of the development path of organizations. The strategic routes of entrepreneurism and paradigm breakout are more necessary at higher levels of innovativeness. Strategic learning is necessary at all levels of innovativeness.

xi. The study provided strong evidence that the theoretical models are transferable across organizational contexts. Analytic generalization was established for a large organization that is a global benchmark for successful management of innovation,
with projects involving both product and process change. This generalization was extended to other small and large organizations, and projects of a technical, administrative and marketing nature.

xii. The theoretical description of change derived from the self-reference view of organization provides a readily understood model of organizational change. The dynamics of change as described through the interaction of two separate circuits of commitments - one historical and resisting change (Structurated Commitments) and the other future-oriented and leading to renewal (Creative Commitments) - is simple in concept and explanation, suggesting it to be useful to practitioners.

### 7.4 Theoretical implications

The theory development and findings of this study led to conclusions that are informative to theory in management of innovation:

i. Schumpeter’s metaphor of innovation has been abused. It has been loaded with rhetorical, political and ideological baggage. The interest of business has been in innovation as a level variable, rather than the instrumental and style variable that Schumpeter envisaged. To make innovation into a level variable researchers have conflated the innovation variable with level variables such as knowledge and successful outcomes, on the unjustified assumption that these are correlated with innovation. This has led innovation research into a confusion of terms and an inability to accumulate knowledge.

ii. The practice of innovation research of conflating the innovation variable with the implementation or outcome variable has concealed the problem of the knowledge-action gap, and directed academic attention away from its analysis. As a result, research attention is directed at knowledge creation, rather than on explanations of actions and business outcomes.

iii. Directing research attention to the knowledge-action gap requires any assumptions about the correlation of innovation with other variable to be rejected. The findings of this study provide no support for the view that knowledge and innovativeness are related. While declaring that organization knowledge and innovativeness are unrelated goes against conventional thinking, it, more importantly, establishes a
dialectic by which the issues of the knowledge-action gap become salient, and can be discussed, argued and investigated.

iv. The conceptual models developed in this study constitute a readily understood theory of motivation at an organizational level of analysis. Such a theory does not currently exist in the sociological literature. The commitment theory of motivation explains how the knowledge-action gap is closed. Structural Commitments hold the gap open, Creative Commitments are necessary to close the gap.

v. The roles and actions of individual members of an organization need to be placed within the organizational context. Individuals use their Personal Knowledge in discovering, interpreting and solving organizational problems and thus determine the innovativeness of change responses. The Personal Knowledge of certain individuals is also about how the entire change process comes together - entrepreneurial knowledge. The Psychological Commitments of individuals provide the motivation for the knowledge creation process in the early life of an initiative.

vi. The self-reference view of organization requires the rejection of the traditional concept of communication, and instead the view that knowledge and commitments are generated through the transformational processes of social transactions. The social transaction view provides an opportunity to reinterpret the role of the traditional concept of communication in the innovation research literature.

vii. While the study did not provide conclusive support for the self-reference view of organization based on social transactions and commitments it was not negative to the view, and a clear direction was established for obtaining additional research evidence. If the relevance of the self-reference view is established the theoretical models of this study provide an opportunity to reinterpret and integrate many findings from the organizational and innovation research literature.

### 7.5 Final comments

This study made substantial progress towards gaining a comprehensive understanding of the connections between the concepts of knowledge, commitment and innovation. It also made substantial progress towards developing a comprehensive and useful model of organizational change that incorporates both objective and subjective knowledge processes.
To achieve this the study confronted two of the more intractable problems of innovation research, the definition of innovation and the incorporation of motivational processes. The solutions developed, namely the business practice continuum and innovativeness variable and the extension of the psychological concept of commitment to the organizational sphere through the self-reference metaphor, break from the traditions of innovation research. However, the proposed ideas received a level of support from the findings of the study, and deserve to be considered as opportunities for change.

Many authorities have pointed out that innovation research continues to do things in the same way without improving the consistency of its results. This can only mean that the current research paradigm has been extended beyond the point where useful knowledge can be accumulated. Things have to be done differently. Innovation research needs some innovation, and this study points out ways in which that innovation might proceed.

This study has shown that explanations from the psychological and social processes of the organization have more merit than those based solely on objective knowledge. Only from within the psychological and social processes of organization can explanations of how and why; spontaneous changes arise, the change process is motivated, the change process is resisted, and organizations learn, be made. Objective knowledge explanations are limited to describing rational processes, when much of the process of innovative change cannot be explained in rational terms.

In traditional innovation research the psychological and social processes of an organization are treated as an external mediator of the innovation process. In the theory presented here the psychological and social processes of an organization become the core of the process that links knowledge with action, the central problem for organizations.

This study has pointed out how innovation research has neglected the real problem of innovation - transforming knowledge into action - by treating innovation as a level variable, and thus concealing the knowledge-action gap. To correct this neglect innovation must be treated as an independent style variable, and knowledge and innovation must be assumed as unrelated. Indeed the important theoretical contribution of this study may be in its formulation of this knowledge-action dialectic and the means of its resolution.
The findings of this study also inform managers of industry in a number of important ways. First, general managers need to understand that there is no one-way of achieving higher levels of innovation. Rather, a mix of entrepreneurial, strategic learning and paradigm breaking activity is necessary and a mix can only be determined from an understanding of the history of the organization and its knowledge capacity.

Second, managers of innovation need to understand that the accumulation of objective knowledge is not sufficient to ensure organizational changes of an innovative nature. Innovative action requires that the psychological and social processes of the organization be engaged, through the network of individual and organizational commitments within which the action takes place. Predicting whether an innovative action will progress through an organization, and effectively planning the action, requires managers to identify, understand and analyse all individual and organizational commitments that might bear on the action. Management and other social processes set up commitments to action that protect the organization’s identity. These structurated commitments must be carefully managed so as to reduce their resistance to the commitments to change that are generated by individual or group actions. The management of commitments becomes more crucial to success the higher the level of innovativeness of the project.

Third, human resource managers need to understand that the management of commitments goes further than managing the commitments of members to the organization. Individual commitments to the organization work towards protecting the organization’s identity, and are not necessarily conducive to organizational change. Rather, individual commitments and preferences for change need to be recognised for the important role they play in the interpretation of organizational problems. Consequently, an organizational diversity in individual commitments and preferences for change favours the formulation of innovative solutions and creative actions of an innovative nature.
Appendices
Appendix 1 – Case study research protocol

Case Study Research Protocol

The purpose of this Protocol is to standardize the sampling, case investigation, interview record and survey processes.

Case selection

The basis of case selection will be a change project that conforms to the following criteria:

- Has been completed within an existing business organization during the past 6 months.
- Was clearly about ‘doing things differently’.
- Was focused on business creation or substantial cost reduction objectives.
- Had a recognized project manager/leader who is interested in participating in the study.
- The organization is hospitable to the study.

Participant selection

The study takes a “single source” approach to the collection of case data. One participant will be interviewed for each case description, and the same person will complete the survey questions. The basis of participant selection will be the following criteria:

- A person at management or senior professional level who was leader of the project.
- Was continuously or closely involved with the project from its formal inception.
- Has knowledge of all functional management aspects of the project.

The participant may wish to refer to other people or sources of information to complete survey detail or refresh memory, but all data will be managed through the participant.

Consent process

The primary consideration of the consent process will be to ensure that the participant has the freedom to choose to be involved without pressure or fear of negative evaluation from others in the organization. This issue will be best resolved by ensuring that involvement is voluntary, and achieving the consent of the prospective participant before seeking formal consent from the organization (represented by a higher level of management).

Sending letters of invitation to potential participants seeking their involvement, but asking them to contact the researcher if they wish to be involved will ensure the voluntary nature of participation.

In many cases prospective participants will be able to be identified without prior reference to a higher level of management. However where a prospective participant is identified and nominated by a person of higher management level, care will be taken to ensure that the prospective participant understands that she/he is free to choose whether or not to participate. Where the participant expresses feelings of pressure to participate, or concern about the reactions of higher management to her/his participation, then consent will not be pursued, and the nominator thanked and advised that the project did not meet the criteria for the study.
Where the prospective participant consents but a higher level of management does not, the project will be removed from the study.

Letters of invitation and consent forms attached.

Investigation, interview record and survey

The case data will be obtained from participant’s descriptions and question answers that are gathered under the following headings. Where the participant grants permission to do so the interview will be recorded.

Innovation idea

a) Describe innovation idea as viewed today.
b) Describe innovation idea as originally conceived.
c) How, when and why did the innovation idea change?

“Innovativeness” of idea
(Answers to questions in this section will be recorded in Part 1 of the Research Survey – Contact and Project Details - Questions 1-15)

a) Describe the primary and secondary objectives of the innovation.
b) Describe the novelty of the innovation.
c) Describe the novelty of the processes involved in developing the innovation.
d) Describe the improved performance features for the ultimate user.
e) Describe the known improvement in performance.
f) Describe the level of potential cost reduction for user.
g) Describe how easy it was to understand the correct steps necessary to developing the project.
h) Describe the existing rules or procedures for doing the work involved in the project.
i) Describe the frequency that problems arose during the progress of the project.
j) Describe the uniqueness of the problems that arose during the progress of the project.
k) Describe the difficulties in predicting the outcome of the project.
l) Describe any difficulties that users may have in adopting the innovation.
m) Describe the novelty to the organization of the field of user activity.

People

a) List key players involved at commencement of project.
b) List key players at completion of project.
c) How, when and why did the key players change?

Formal Transactions

a) Describe key agreements with others.
b) Describe any changes to agreements during progress of project.
c) How, when and why did the agreements change?

Internal organization

a) Describe the work group organization of the project.
b) Describe any changes to the organization of the project during the progress of the project.
c) How, when and why did the organization changes occur?
Industry/ Market context
   a) Describe the industry/ market factors affecting the project.
   b) Describe any changes to the industry/ market context during the progress of the project.
   c) How, when and why did these industry/ market changes occur?

Outcomes
(Answers to questions in this section will be recorded in Part 1 of the Research Survey – Questions 16 and 17)
   a) Describe criteria used to judge success of project.
   b) Describe grade given on these success criteria.
   c) Describe any changes to outcome criteria or grade during progress of project.
   d) How, when and why did these changes to outcome criteria occur?

Critical Incidents
   a) Describe any events that stood out as crucial to the success or failure of the project.
   b) Describe how the issues raised by the incident were resolved.

Internal Text Materials
   a) A request will be made for internal memos, reports or other text material, not commercially sensitive that may throw light on the issues of the case.

Commitment Behaviour Survey
   a) Each survey question will be verbalized by the researcher with the researcher recording the answers on the survey sheet.

Follow-up Procedures
   a) The case information will be written up under the above headings and sent to the participant to verify the case details.
   b) Each participant will be thanked for their participation.
Appendix 2 – Research question mapping

The purpose of this mapping exercise is to link each of the proposed research questions with its underlying theoretical concept. There are three groups of questions covering the concepts of innovativeness, knowledge and commitment. In the case of questions on knowledge and commitment the link to the theoretical concept is made through observed behaviours that are also listed. The identification (ID) number shown for each question is that of the final research survey questionnaire of Appendix 4.

Question Mapping – Position on Business Practice Continuum (innovativeness)

<table>
<thead>
<tr>
<th>ID</th>
<th>Theoretical Concept</th>
<th>Reference</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Primary objective</td>
<td>Tidd et al (2001)</td>
<td>What was primary objective of project?</td>
</tr>
<tr>
<td>2</td>
<td>Secondary objective</td>
<td></td>
<td>What was secondary objective (if any)?</td>
</tr>
<tr>
<td>15</td>
<td>Novelty of market</td>
<td>Tidd et al (2001)</td>
<td>How novel or different was the market in which users operate?</td>
</tr>
<tr>
<td>3</td>
<td>Novelty of idea</td>
<td>Van de Ven &amp; Chu (2000)</td>
<td>How novel or different was the idea?</td>
</tr>
<tr>
<td>4</td>
<td>Novelty of technology used</td>
<td>Perrow (1967)</td>
<td>How novel or different were the technology, techniques and tools necessary to the development?</td>
</tr>
<tr>
<td>8</td>
<td>Difficulty in knowing development steps</td>
<td>Van de Ven &amp; Chu (2000)</td>
<td>How easy was it to know in advance of steps necessary?</td>
</tr>
<tr>
<td>12</td>
<td>Predictability of outcomes</td>
<td>Van de Ven &amp; Chu (2000)</td>
<td>Were there any difficulties in predicting the outcome?</td>
</tr>
<tr>
<td>10</td>
<td>Frequency of difficult problems</td>
<td>Van de Ven &amp; Chu (2000)</td>
<td>During development, how often did difficult problems arise?</td>
</tr>
<tr>
<td>11</td>
<td>Uniqueness of problems arising</td>
<td>Van de Ven &amp; Chu (2000)</td>
<td>How different were these problems?</td>
</tr>
</tbody>
</table>
Benefit to users

5 Performance features. What improved performance will result, from the user’s viewpoint?

6 Increase in performance Leifer et al (2000) What is your estimate of the overall increase in performance?

7 Reduction in costs Leifer et al (2000) What is your estimate of the overall cost savings?

Adoption difficulty for users

13 Need for more learning Lee & O’Connor (2003) Did users need to develop new learning for outcomes to be achieved?

14 Need for behavior change Lee & O’Connor (2003) Did users need to change their behavior for outcomes to be achieved?

Standardization of procedures

9 How many rules to follow? (Reverse scored, the more rules that exist the more likely the project lies within current practice). Van de Ven & Chu (2000) How many rules and procedures existed in the work group or organization for doing the work?

Success grading

16 Criteria for success Describe the criteria used to judge the success of the project.

17 Grade on basis of stated criteria Van de Ven & Chu (2000) How do you grade the success of the project based on these criteria?

Question Mapping - Knowledge

ID Theoretical concept Observed Behavior Question

Personal Knowledge

18 Tacit knowledge (Polanyi, 1966). Purposeful actions that demonstrate unique individual capabilities. Unique skills and abilities.

The outcomes of this project were dependent on the qualities of its key player(s):
| 20 | Accumulated education and training (Polanyi, 1962). | Purposeful actions that can be explained by past training. | Past education and training. |
| 21 | Preference for innovative change (Kirton, 1994) | Non-routine behaviors. | Tendency to want to change things. |

**Proprietary Knowledge**

| 22 | Intellectual property (Stewart, 1997). | Activity based on proprietary intellectual property. | Patents and/or know how. |
| 23 | Knowledge embedded in drawings, designs, prototypes (Clark & Staunton, 1989). | Activity based on proprietary drawings and designs. | Ability to create designs and/or prototypes. |
| 24 | Routines formalized as operating procedures (Winter, 1994). | Activity that follows SOPs. | Formal standard operating procedures. |
| 25 | Knowledge of key accounts and lead users (von Hippel, 1986). | Activity informed by important customers. | Knowledge of key customer accounts and/or users. |

**Public Knowledge**

| 26 | Use in forming proposal and promoting initiative (Boisot, 1994). | Public information sourced. | Promoting project initiative. |
| 27 | Use in design of project (Boisot, 1994). | Public information sourced. | Designing the project’s outcomes. |

**Collective Knowledge**


30 Organizational strategy. Decisions in line with organization’s espoused strategy. Responding to the organization’s strategies.

31 Values – risk-taking. Decisions in line with organization’s normal approach to risk. In accord with the organization’s approach to risk-taking.

32 Values – gross margin expectations (Christensen, 2000). Decisions in line with organization’s normal level of gross margin. Having regard to expectations of gross margin.

33 Values – growth (Christensen, 2000). Decisions in line with organization’s normal approach to business growth. Having regard to expectations of growth.

Question Mapping – Commitments

<table>
<thead>
<tr>
<th>Psychological commitments</th>
<th>Observed Behaviour</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership of ideas (Kiesler, 1971).</td>
<td>Public expression of belief in ideas.</td>
<td>Promoting the ideas that got the project started.</td>
</tr>
<tr>
<td>Ownership through participation (Locke et al, 1988).</td>
<td>Involvement in design.</td>
<td>Were involved in designing the change project.</td>
</tr>
<tr>
<td>Protecting past record of success (Locke et al, 1988).</td>
<td>Participant statements, or awareness of participant’s history.</td>
<td>Making reference to past success with similar projects.</td>
</tr>
<tr>
<td>Public presentation (Kiesler, 1971).</td>
<td>Oral and written presentations to significant audiences.</td>
<td>Made presentations to higher management about their ideas.</td>
</tr>
<tr>
<td>Personal choice (Kiesler, 1971).</td>
<td>Volunteering effort.</td>
<td>Volunteering to take an active role in project.</td>
</tr>
<tr>
<td>Emotional attachment to goal (Kiesler, 1971).</td>
<td>Public expressions of commitment.</td>
<td>Convincing others about worth of project.</td>
</tr>
</tbody>
</table>
**Project commitments**

40 Planned result beneficial (Locke et al, 1988).  
Performance against objectives.  
Project objectives met.

41 Individual participation in group process (Katzenbach & Smith, 1993).  
Effective teamwork.  
An example of effective teamwork.

42 Presentation of plans to significant people (Kiesler, 1971).  
Making oral and written presentations about progress.  
Higher management was always kept informed of progress.

43 Attainable time schedules (Locke et al, 1988).  
Performance against time line.  
The project was completed on time.

44 Appropriate resources (Locke et al, 1988).  
Shortage of resources affecting performance.  
Appropriate resources were made available.

45 Partnering expectations  
Partner’s performance assisting progress towards goals.  
Performance of partners met expectations.

**Structural commitments**

46 Fit with existing structure  
Lack of fit leading to internal conflicts.  
Fitted within the organization’s existing structure.

47 Fit with existing markets (Tidd et al, 2000)  
Lack of fit raising uncertainty.  
Fitted the organization’s existing markets.

Past investments influencing current decisions.  
Was in an area of business in which the organization had made substantial past investments.

49 Displacement of existing (Becker, 1960; Teger, 1980).  
Company actions  
If successful meant that past investments needed to be written off.

50 Displacement of jobs (Becker, 1960; Teger, 1980)  
Company actions  
If successful meant that jobs would be lost.

51 Standardized responses (Weick, 1991)  
Company actions  
Was conducted in an organization that approached its problems in a standardized manner.
## Social commitments to change

This organization is one in which people:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Concern</th>
<th>Go to lengths to protect their personal reputation and image.</th>
<th>Tend to hide their own mistakes, but point out the mistakes of others.</th>
<th>Tend to complain that others are “letting the side down”.</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>Face saving (reverse scored, detracts from change) (Fox &amp; Staw, 1979).</td>
<td>Concern about personal reputation and standing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Peer rivalry (reverse scored, detracts from change) (Teger, 1980; Staw &amp; Ross, 1987).</td>
<td>Competitive behavior between peers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Level of cooperation between groups (reverse scored, lack of cooperation detracts from learning).</td>
<td>Destructive disputes about individual/group effort and contribution.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Individual behavior consistent with organization’s purpose (Christensen, 2000).</td>
<td>Purposeful actions that demonstrate that goals are understood.</td>
<td></td>
<td></td>
<td>Know where they are going and how to get there.</td>
</tr>
<tr>
<td>56</td>
<td>Individual behavior consistent with organization’s values (Christensen, 2000).</td>
<td>Purposeful actions that demonstrate that values are understood.</td>
<td></td>
<td></td>
<td>Know what is good for organization, and how to go about achieving it.</td>
</tr>
<tr>
<td>57</td>
<td>Acceptance of new ideas (Peters &amp; Waterman, 1982).</td>
<td>Criticism of new ideas or lack of it.</td>
<td></td>
<td></td>
<td>Are NOT critical of new ideas.</td>
</tr>
<tr>
<td>58</td>
<td>Organizational climate favoring risk-taking (Kirton &amp; de Ciantis, 1994).</td>
<td>Demonstrations of risky or risk-averse behavior.</td>
<td></td>
<td></td>
<td>Encouraged to take risks.</td>
</tr>
<tr>
<td>59</td>
<td>Organizational climate favoring change (Kirton &amp; de Ciantis, 1994).</td>
<td>Demonstrations of change or change-averse behavior.</td>
<td></td>
<td></td>
<td>Are strongly committed to change projects.</td>
</tr>
</tbody>
</table>
Appendix 3 – Pilot testing of research questionnaire

Report on Pilot Testing

The testing of the research protocol and survey questionnaire was conducted in three phases.

i. The first phase was concerned with initial testing of the research survey documents. The first round testing led to revisions of the research survey questionnaire for testing in the second phase.

ii. The second phase was intended as a comprehensive test of the research protocol, and the use of the revised survey questionnaire within it. The second round testing was also intended to test the recording equipment and the mechanics of its use within the interview process.

iii. The third phase was a preliminary analysis of the data collected to test the data for its consistency with the case description from which the data was collected, and for appropriateness in examining the research questions.

The subjects involved in the pilot testing were selected from past work colleagues and current colleagues in community service. Apart from their current availability, the basis of their selection was their management experience in change projects, and the diversity of the projects that they would bring to the interpretation of the research survey documents.

First Phase Testing

Subjects
There were two subjects in the first round of testing. Both subjects were past business colleagues, recently retired. Both were males with project management experience in a globally operating company (35 and 21 years service respectively) that had a global reputation for creative and innovative practice. One subject’s career had concentrated on engineering and technical activities, the other on technical and marketing activities. Both persons had earned a Post-Graduate Diploma in Technology Management from the Graduate School of Management of Macquarie University in the early 1990s. Both subjects, by work experience and mid-career education, could be expected to have a comprehensive and up-to-date understanding of the language and nature of change projects in organizations.

Procedure
The subjects were asked to read and comment on the invitation letter and consent form that participants to the research study would receive and be asked to sign. The respondents were then requested to read and independently complete the research study’s survey documents. These letters, forms and survey forms were second draft documents submitted to the UWS Human Research Ethics Committee as the Document Revision – 6 June. The survey form component is attached to this report as Appendix 3A – First Draft Survey Questionnaire.

The case study protocol called for the survey documents to be completed during the interview process (that is, with the researcher delivering and interpreting the questions). However for the purposes of this test the subjects were asked to note any
ambiguities or problems of interpretation by marking these on the survey forms for later discussion with the researcher. The researcher was available to the subjects during their reading of and working with the documents but was not called upon for any assistance.

In order to make sense of the survey forms the subjects were asked to select a recent change project that they had personally managed, and met the project specification of “doing things differently”. This specification encouraged both subjects to think towards changes other than product innovation.

Results
The change projects reviewed by the subjects and the concerns about the survey documents raised by the subjects are listed below.

The first subject (S1) reported on an sales management and training initiative that was aimed at changing a divisional sales process from focusing on product sales to focusing on system sales. The concerns raised were:

1. Raised the question of whether the interview and survey could be completed in the “little over an hour” that the Invitation Letter stated. The respondent had taken 45 minutes to complete the survey form, but stated that he had read the documents quite slowly in order to evaluate the terms used, as requested.
2. Expressed reservations about the consent process and the need to sign consent forms. The personal view was that managers were socialized not to sign any agreement with outside parties without obtaining corporate legal advice, and that a request to sign a consent form might raise unnecessary suspicions.
3. Commented on formatting, especially as it related to the integrity of each page of the survey form.
4. Question 1 concerns the objective of the change project. Respondent felt that the change project’s objectives could not be described by one statement.
5. Question 2 concerns the novelty of the idea. Respondent felt that the term “novel” was ambiguous and that the question would be better expressed in terms of “difference” rather than “novelty”.
6. Question 3 concerns the novelty of the technology. Respondent’s comments were the same as for Question 2.
7. Questions 5 and 6 concern increase in performance and cost savings that users might expect. Respondent felt that the term “user” was not appropriate to the change process selected here. In the case of a change to the selling process, the term “user” would refer to the sales person, whereas the ultimate beneficiary of the change was the “customer”.
8. Question 16 concerns grading the success of the project. The subject felt that the term “all criteria well met” was inappropriate. Projects may be commenced on the basis of several criteria, and the project may be highly successful without meeting all of them.
9. Questions 25, 26, 27, 28 concern sources of public information. The subject felt that public information played no part in the initiation or formulation of his project. All information used was proprietary in nature.
10. Question 35 concerns the discovery of the ideas involved in the change. The respondent felt that the term “discovering” was inappropriate in organizations, and that the term “introducing” was more meaningful.

11. Question 51 concerns loss of jobs. The respondent felt that the term “jobs would be lost”, and its generality, concealed the impact of a change process, and suggested that a phrase such as “individuals would lose their jobs”, or even “individuals who I know would lose their jobs”, would be more pertinent.

The second subject (S2) chose to report on a project involving the design and development of computerized product selectors (expert systems) that provided a changed means of selecting appropriate health and safety devices for particular workplace situations. The concerns raised were:

1. Raised no issues about the Invitation Letter or Consent Form.
2. Commented on formatting issues related to maintaining the integrity of each page of the survey form.
3. Commented generally that the questions seemed to favour product over service interpretations. In the case selected the service changes directly benefited the ultimate user of the service but was, at the same time, transparent to the user. The question raised was whether the user should be defined in terms of internal or external user.
4. Question 1 concerns the objective of the change project. Respondent stated that he could not describe the change objectives with a single statement and required 3 of the 5 answer statements to describe his selected project.
5. Question 5 concerns the increase in performance that a user might expect. Respondent felt that the question was only applicable to physical products and inapplicable to services. Suggested that the term “benefit” would be more meaningful than the term “performance”.
6. Question 50 concerns the writing off of past investments. Respondent confused this question with the different issue of expensing the costs of the project itself.
7. Questions 25, 26, 27, and 28 concerning sources of public information were readily answered by this subject. In the light of subject S1’s rejection of these same questions, this subject’s answers were reviewed with him. The subject advised that the technical basis of his project, the expert system, had been featured in all types of public information, and that public discussion of its benefits had promoted the initiative. As well, a great deal of the knowledge that was to be embedded in the expert system, such as the physical and chemical properties of materials, came from public information sources. However, the subject stated that the necessary information could come from multiple sources and that his ratings on types of public information were based simply on his estimate of availability of information from each source rather than from him having any reasonable idea about the extent to which the information from any one source played a role in the outcomes of the project.

First Round Revision of Survey
The revisions to the survey documentation following first round testing were as follows:
1. In response to concerns S1/3 and S2/2, formatting changes were made to improve the readability and integrity of each page.

2. In response to concerns S1/4 and S2/4, an additional question was added to record both primary and secondary project objectives (Revised Questions 1 and 2).

3. In response to concerns S1/5 and S1/6 the phrase “or different” was added to help clarify the term “novel” (Revised Questions 3 and 4).

4. In response to concerns S1/7 and S2/3, a note was added to Revised Question 5 to assist in determining whether user is internal or external, and suggesting that terms customer or client may be substituted for the term user.

5. In response to concern S2/5, the phrase “or benefit” is added to the phrase “increase in performance” in Revised Question 6.

6. In response to concern S1/8, the phrase “criteria met overall” is substituted for the phrase “all criteria well met” in Revised Question 17.

7. In response to concerns S1/9 and S2/7 about sources of public information, the types of public information are collapsed into a single variable, since the categories did not appear to yield useful information. Instead Revised Questions 26 and 27 are intended to gauge the use of public information in two different modes – either to promote the initiative or as input to the design process.

8. In response to concern S1/10, the word “introducing” is substituted for the word “discovering” in Revised Question 34.

9. In response to concern S1/11, the phrase “known people would be displaced from their jobs” was substituted for the phrase “jobs would be lost” in Revised Question 50.

**Second Phase Testing**

**Subjects**

There were two subjects in the second round of testing. Both subjects were current colleagues in community service. Both were males with long-term project management experience in major companies. One subject’s career had concentrated on educational and IT consulting activities both as employee and business proprietor. The second subject, the holder of several globally important patents in the building construction industry, had recently retired from day-to-day involvement in project engineering and intellectual property management with a major Australian company, but remained on tenure with the company. Both subjects, by their work experience could be expected to have a comprehensive and up-to-date understanding of the language and nature of change projects in organizations.

**Procedures**

The subjects were asked to read and comment on the invitation letter and to complete the consent form. During their recruitment, and in preparation for the test, the subjects were asked to recall and select a recent change project that they had personally managed that met the project specification of “doing things differently”.

The interview and data gathering process using the research survey document was conducted by the researcher in the subject’s home environment, based on the project selected by the subject, and following the terms of the research protocol.
Results
The first subject (S3) reported on a MBO based business growth initiative that he had implemented in a private education and training company of which he and his wife were the proprietors. The company worked within a franchised system of business development and service delivery.

The subject expressed no concerns about the consent documentation or the use of voice recording. The interview and survey completion process ran smoothly, and was completed in an overall time of 78 minutes, including a 6-minute interruption.

The interview questions did not raise any difficulties for the subject. All of the survey questions appeared relevant but the subject expressed difficulty with interpreting certain questions in the light of his situation as proprietor of the business, and also as a franchisee within a franchise organization. The concerns were these:

1. Questions 5, 6 and 7 of the revised survey refer to benefits for the ultimate “user” (or customer, client). The question here for the subject was who was the ultimate user of the service? There were many direct stakeholders to this business, students, parents, school administration, contracted tutors, and the franchiser. The ultimate user of the educational service, the student, received only indirect benefits from the initiative. The real benefits of the initiative accrued to parents and the school administration, those controlling the purse.

2. Questions 37 and 42 of the revised survey refer to presentations to or keeping “higher management” informed of progress. The difficulties in interpretation here were twofold. First, as proprietor of the business, as well as manager of the project, the questions themselves could be thought redundant. Second, in the franchise context, higher management could be construed as the franchiser.

The second subject (S4) reported on a large technology, process and product development project that was aimed at saving an ailing but substantial local business but eventually created a global business opportunity that generated many hundreds of millions of dollars profit.

The subject expressed no concerns about the consent documentation or the use of voice recording. The interview and survey completion process ran smoothly, and was completed in an overall time of 75 minutes including a 5-minute interruption. However the subject was hesitant in answering the following questions, needing time to grasp their meaning.

1. Questions 1 and 2 of the revised survey use the phrase, “creating platform for future business”. The subject stated that within his company the term “spin-off” would have been used to express the meaning of this phrase.

2. Question 22 of the revised survey refers to “patents and/or other intellectual property”. The subject felt that this term might be misleading in that the major intellectual property of most companies is their “know how”, and that a failure to specifically refer to it might also result in its neglect in respondent’s minds.
3. Question 34 refers to key players “introducing the ideas that got the project started”. The subject stated that his difficulty with the question came from his company’s philosophy that individual ownership of ideas was counterproductive, and that any credit for ideas should be shared as widely as possible. When people were given the credit for an idea they then tended to promote the idea to the company’s benefit.

**Second Round Revision of Survey**

The revisions to the survey documentation following second round testing were as follows:

1. Concern S3/1 alerts the researcher to gain an understanding of the project’s target users from the initial discussion of the “innovation idea”, and by distinguishing between the ultimate end user of the business’s current service, and the internal or external stakeholder who may be the end user of the change program itself. In the case discussed here the ultimate end user of the service was clearly the student, whereas the user and beneficiary of the change program was designed to be the parent and school. The change program was transparent from the student viewpoint. Question 5 is revised by removal of the word “ultimate” and the note accompanying the question is revised to assist understanding of the above points.

2. Concern S3/2 has alerted the researcher to the issue of understanding the participant’s view of what is the “higher management”. However, since the purpose of the question is assessing the extent to which people publicly commit themselves to a project, whether the higher management is interpreted as board of directors, franchiser, or partner makes no essential difference, so no revision of the questions is felt necessary.

3. Concern S4/1 does not call for any revision. While there are clear similarities between the concepts of “creating a new platform” and “creating spin-off business”, it is felt that the first better expresses the idea of creating a future, even though ill-defined, opportunity base.

4. In response to concern S4/2, Question 22 of the revised survey is modified to substitute the term “know how” for the term “other intellectual property”.

5. In response to concern S4/3, two issues need to be considered. First, the expression of this question raised concerns in both rounds of testing despite changes after the first round from the sense of discovering to the sense of introducing ideas. This may reflect on the basic difficulty that an observer has in trying to understand the source of a particular idea, as the approach of subject S4 indicates. Second, the question is intended to inform on whether the commitments associated with the ownership of the original innovation idea are active in the project, and that may be difficult for an observer to determine, since the behaviors involved in discovering and introducing are not very explicit. A more relevant observed behavior related to the ownership of ideas may be that of promoting the ideas, again as suggested by subject S4’s approach. In the light of the fact that all subjects were able to understand the sense of the question, however phrased, it was felt that a further substitution of words in order to assist the observer, but without change to the intent of the question, is justifiable. Accordingly in Question 34 of the revised survey the word “promoting” will be substituted for the word “introducing”.

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Third Phase Testing

In this phase of testing scores were calculated from the survey questionnaire responses for those variables involved in testing the research question and propositions, namely “innovativeness”, “creative commitments”, “structurated commitments”, “organizational knowledge base”, and “success” scores. The calculations were conducted from the responses of the four test subjects, and based on the revised survey questionnaire of the second phase of testing, which is equivalent to the final version of the survey apart from the minor rewording of two questions. To accomplish the calculations, allowance had to be made to the scores of subjects S1 and S2 in order to account for the removal of two questions from the original unrefined survey documents. The calculated scores are tabulated below.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Innovativeness Score</th>
<th>Creative Commitments Score</th>
<th>Structurated Commitments Score</th>
<th>Knowledge Base Score</th>
<th>Success Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>45</td>
<td>62</td>
<td>67</td>
<td>51</td>
<td>3</td>
</tr>
<tr>
<td>S2</td>
<td>35</td>
<td>81</td>
<td>66</td>
<td>58</td>
<td>3</td>
</tr>
<tr>
<td>S3</td>
<td>28</td>
<td>94</td>
<td>59</td>
<td>62</td>
<td>5</td>
</tr>
<tr>
<td>S4</td>
<td>27</td>
<td>96</td>
<td>60</td>
<td>60</td>
<td>5</td>
</tr>
</tbody>
</table>

In order to test the relevance and trends of the data, comparisons are made across cases. These comparisons do not correspond with the pattern of data analysis of the main study. The expectations of the data relationships are as follows:

- The “innovativeness score” is intended to place the project on a continuum of doing things differently with a higher score indicating use of different technologies and entry into different markets. The calculated range of scores appears to match the relativities suggested by the case descriptions.
- The “creative commitments score” is intended to indicate the strength of commitments encouraging change. The calculated scores of creative commitments show higher scores being associated with higher levels of success, as expected.
- The “structurated commitments score” is intended to indicate the strength of commitments discouraging change. The proposition is that these are higher for a higher level of innovativeness. The calculated scores of innovativeness and structurated commitments indicate this relationship.
- For change to take place an expectation is that the “creative commitments score” will exceed the “structurated commitments score”. This relationship occurs in three of the four cases of the above table.

Summary

The research survey was tested across different types of change projects and was modified to ensure its relevance to technology, product, service and process initiatives. The research protocol, involving the data gathering for the case study and the administration of the survey, was also tested, indicating that the interview could be completed in the timeframe indicated in the participant information letter. A preliminary data analysis indicates that the calculated scores of key variables are generally in accordance with case descriptions and expected relationships.
Appendix 3A - First Draft Survey Questionnaire

Part 1 – Contact and Project Details

Code Number of Organization:     Date:
Name of Project:
Your position:
Your contact details:  Tel:   Fax:   Email:
Please describe your role in the Project:

Please circle a number that best reflects your judgment on the number scale

1. What was the objective of the change project?
   1 = defensive, maintaining status quo
   2 = creating platform for future business
   3 = improving current business
   4 = expanding business into new areas
   5 = capturing entirely new business

2. How novel was the idea on which the change project was based?
   1 = well used internal idea
   2 = copy of an external idea
   3 = moderate adaptation of a known idea
   4 = substantial adaptation of a known idea
   5 = an original, new-to-the-world idea

3. How novel to your organization were the technology, techniques and tools necessary to the development of this project?
   1 = our standard technology used
   2 = some different techniques introduced
   3 = many different techniques introduced
   4 = a great many different techniques
   5 = entirely different technology used

4. What improved performance features will result from the project, from the user’s viewpoint?
   1 =
   2 =
   3 =
5. What is your estimate of the overall increase in performance that the user might expect?

Estimate ............%

1 = very little, if any
2 = a small increase
3 = a moderate increase
4 = a large increase
5 = a great increase

6. What is your estimate of the overall cost reduction the user might experience?

Estimate ............%

1 = very little, if any
2 = a small cost reduction
3 = a moderate cost reduction
4 = a large cost reduction
5 = a great cost reduction

7. How easy was it to know in advance of the steps necessary to developing this change project?

1 = very easy
2 = quite easy
3 = somewhat easy
4 = quite difficult
5 = very difficult

8. How many rules and procedures existed in the work group or organization for doing the work on this project?

1 = very few, if any
2 = a small number
3 = a moderate number
4 = a large number
5 = a great number

9. During the development of this project, how often did difficult problems arise?

1 = monthly or less
2 = about weekly
3 = about daily
4 = several times a day
5 = many times daily

10. How different were these problems each time they arose?

1 = very much the same
2 = mostly the same
3 = quite a bit different
4 = very much different
5 = completely different

11. Were there any difficulties in predicting the outcome of this project?

1 = outcome fairly certain
2 = relatively easy to predict outcome
3 = quite difficult to predict outcome
4 = very difficult to predict outcome
5 = impossible to predict outcome

12. Do users need to develop new knowledge or learning for the outcome of the project to be effectively used?

1 = no new learning necessary
2 = some minor new learning necessary
3 = a moderate amount of new learning
4 = a large amount of new learning
5 = comprehensive new learning program
13. Do users need to change their behavior for the outcome of the project to be effectively used?  
   1 = no behavior change necessary  
   2 = minor degree of behavior change  
   3 = moderate degree of behavior change  
   4 = high degree of behavior change  
   5 = completely new behaviors required

14. How novel to your work group and organization was the market or field of activity in which the users of the project operate?  
   1 = our normal field of activity  
   2 = an extension of our normal field  
   3 = a different but closely related field  
   4 = a different but not unrelated field  
   5 = completely different field of activity

15. Describe the criteria used to judge the success of the project.  
   1 =  
   2 =  
   3 =

16. Based on the above criteria how do you grade the success of the project?  
   1 = an abject failure  
   2 = criteria not met, but useful learning  
   3 = criteria not met, but useful outcomes  
   4 = all criteria well met  
   5 = criteria exceeded, outstanding success
Part 2 – Commitment Behavior Survey

The questions that follow focus on behaviors that are thought to assist the progress of a change project within an organization. The term “key player(s)” refers to that person or those persons who were directly involved in the project, and recognized as providing the crucial inspiration and drive necessary to completing the project. Such person(s) may or may not have a formal leadership role, and may or may not be a respondent to this survey.

Please circle a number that best describes your views.

| The outcomes of this project depended, in part, on the qualities of the key player(s), namely their: |
|---|---|---|---|---|---|
| 17. Unique skills and abilities. | 1 | 2 | 3 | 4 | 5 |
| 18. Past work experiences. | 1 | 2 | 3 | 4 | 5 |
| 19. Past education and training. | 1 | 2 | 3 | 4 | 5 |
| 20. Tendency to want to change things. | 1 | 2 | 3 | 4 | 5 |

| The outcomes of this project depended, in part, on the organization’s intellectual assets, namely: |
|---|---|---|---|---|---|
| 21. Its patents and/or other intellectual property. | 1 | 2 | 3 | 4 | 5 |
| 22. Its ability to create designs and/or prototypes. | 1 | 2 | 3 | 4 | 5 |
| 23. Its formal standard operating procedures. | 1 | 2 | 3 | 4 | 5 |
| 24. Its knowledge of key customer accounts and/or users. | 1 | 2 | 3 | 4 | 5 |

| The formulation of this project depended on sources of public information such as: |
|---|---|---|---|---|---|
| 25. Industry or trade magazines. | 1 | 2 | 3 | 4 | 5 |
| 26. Technical or professional journals. | 1 | 2 | 3 | 4 | 5 |
27. Newspaper or other general articles.  
28. Internet research.

When describing the decisions involved in this project I would say that they:

29. Followed commonsense.  
30. Followed routine procedures.  
31. Responded to the organization’s strategies at the time.  
32. Had regard to the organization’s approach to risk-taking.  
33. Had regard to the organization’s expectations of gross margin.  
34. Had regard to the organization’s expectations of growth.

Some of the actions of key player(s) in this project were:

35. Discovering the ideas that got the project started.  
36. Involvement in designing the product/system that the project concerned.  
37. Referring to their past success with similar projects.  
38. Making presentations to higher management about their ideas.  
39. Volunteering to take an active role in the project  
40. Making public their agreement with the goals of the project.
When describing performance in this project I would say that:

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<tr>
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</thead>
<tbody>
<tr>
<td>41</td>
<td>Project objectives were met.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>42</td>
<td>It was a good example of effective teamwork.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>43</td>
<td>Higher management was always kept informed of progress.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>44</td>
<td>The project was completed on time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>45</td>
<td>Appropriate resources were made available.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>46</td>
<td>Performance of partners, whether internal or external, met expectations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

When describing this project I would say that it:

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</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Fitted within the organization’s existing structure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>48</td>
<td>Fitted the organization’s existing target markets.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>49</td>
<td>Was in an area of business where the organization had made substantial past investments.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>50</td>
<td>If successful, meant that some past investments had to be written off.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>51</td>
<td>If successful, meant that jobs would be lost.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>52</td>
<td>Was conducted in an organization that approached its problems in a standardized manner.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
This organization is one in which people:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>53.</td>
<td>Will go to great lengths to protect their personal reputation and image.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>54.</td>
<td>Tend to hide their own mistakes, but point out the mistakes of others.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>55.</td>
<td>Tend to complain that others are “letting the side down”.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>56.</td>
<td>Know where they are going, and what they need to do to get there.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>57.</td>
<td>Know what is good for the organization, and how to go about achieving it.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>58.</td>
<td>Are NOT critical of new ideas.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>59.</td>
<td>Are encouraged to take risks.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>60.</td>
<td>Are strongly committed to change projects.</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
Appendix 4 - Research Survey Questionnaire (Final)

Part 1 – Contact and Project Details

Code Number of Organization: Date:

Name of Project:

Your position:

Your contact details: Tel: Fax: Email:

Please describe your role in the Project:

---

Please circle a number that best reflects your judgment on the number scale

1. What was the primary objective of the change project?  
   1 = defensive, maintaining status quo  
   2 = creating platform for future business  
   3 = improving current business  
   4 = expanding business into new areas  
   5 = capturing entirely new business

2. What was the secondary objective of the change project (if any)?  
   1 = defensive, maintaining status quo  
   2 = creating platform for future business  
   3 = improving current business  
   4 = expanding business into new areas  
   5 = capturing entirely new business

3. How novel or different was the idea on which the change project was based?  
   1 = well used internal idea  
   2 = copy of an external idea  
   3 = moderate adaptation of a known idea  
   4 = substantial adaptation of a known idea  
   5 = an original, new-to-the-world idea

4. How novel or different were the technology, techniques and tools necessary to the development of this project?  
   1 = our standard technology used  
   2 = some different techniques introduced  
   3 = many different techniques  
   4 = a great many different techniques  
   5 = entirely different technology used
5. What improved performance features will result from the project, from the user’s viewpoint?

Note: The user here is the targeted beneficiary of the project’s planned outcomes. The user may be internal or external to the organization. For discussion purposes it may be appropriate to substitute the terms “customer” or “client” for the term “user”.

6. What is your estimate of the overall increase in performance or benefit that the user might expect after the change is implemented?

1 = very little, if any
2 = a small increase
3 = a moderate increase
4 = a large increase
5 = a great increase

7. What is your estimate of the overall cost savings that the user might experience?

1 = very little, if any
2 = a small cost reduction
3 = a moderate cost reduction
4 = a large cost reduction
5 = a great cost reduction

8. How easy was it to know in advance of the steps necessary to developing this change project?

1 = very easy
2 = quite easy
3 = somewhat easy
4 = quite difficult
5 = very difficult

9. How many rules and procedures existed in the work group or organization for doing the work on this project?

1 = very few, if any
2 = a small number
3 = a moderate number
4 = a large number
5 = a great number

10. During the development of this project, how often did difficult problems arise?

1 = monthly or less
2 = about weekly
3 = about daily
4 = several times a day
5 = many times daily
11. How different were these problems each time they arose? 
   1 = very much the same
   2 = mostly the same
   3 = quite a bit different
   4 = very much different
   5 = completely different

12. Were there any difficulties in predicting the outcome of this project? 
   1 = outcome fairly certain
   2 = relatively easy to predict outcome
   3 = quite difficult to predict outcome
   4 = very difficult to predict outcome
   5 = impossible to predict outcome

13. Did users need to develop new knowledge or learning for the outcomes of the project to be achieved? 
   1 = no new learning necessary
   2 = some minor new learning necessary
   3 = a moderate amount of new learning
   4 = a large amount of new learning
   5 = comprehensive new learning program

14. Did users need to change their behavior for the outcomes of the project to be achieved? 
   1 = no behavior change necessary
   2 = minor degree of behavior change
   3 = moderate degree of behavior change
   4 = high degree of behavior change
   5 = completely new behaviors required

15. How novel or different was the market or field of activity in which the users of the project operate? 
   1 = our normal field of activity
   2 = an extension of our normal field
   3 = a different but closely related field
   4 = a different but not unrelated field
   5 = completely different field of activity

16. Describe the criteria used to judge the success of the project. 
   1 =
   2 =
   3 =

17. Based on the above criteria how do you grade the success of the project? 
   1 = a complete failure
   2 = criteria not met, but useful learning
   3 = criteria not met, but useful outcomes
   4 = criteria met overall
   5 = criteria exceeded, outstanding result
Part 2 – Commitment Behavior Survey

The questions that follow focus on behaviors that are thought to assist the progress of a change project within an organization.

The term “key player(s)” refers to that person or those persons who were directly involved in the project, and recognized as providing the crucial inspiration and drive necessary to completing the project. Such person(s) may or may not have had a formal leadership role, and may or may not be a respondent to this survey.

The term “user(s)” refers to the ultimate user, customer or client of the process product or service resulting from the change project.

Please circle a number that best describes your views.

<table>
<thead>
<tr>
<th>The outcome of this project depended, in great part, on the qualities of the key player(s), namely their:</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Mixed feelings</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Unique skills and abilities.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19. Past work experiences.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20. Past education and training.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21. Tendency to want to change things.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The outcome of this project depended, in great part, on the organization’s intellectual assets, namely:</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Mixed feelings</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>22. Its patents and/or know how.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. Its ability to create designs and/or prototypes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24. Its formal standard operating procedures.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25. Its knowledge of key customer accounts and/or users.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Sources of public information such as Internet, textbooks, trade magazines, technical or professional journals were important to:

26. Promoting the project initiative. 1 2 3 4 5
27. Designing the project’s outcomes. 1 2 3 4 5

The decisions involved in this project are best described as:

28. Being guided by commonsense. 1 2 3 4 5
29. Following routine procedures. 1 2 3 4 5
30. Responding to the organization’s strategies at the time. 1 2 3 4 5
31. In accord with the organization’s approach to risk-taking. 1 2 3 4 5
32. Having regard to the organization’s expectations of gross margin. 1 2 3 4 5
33. Having regard to the organization’s expectations of growth. 1 2 3 4 5

Some of the notable actions of key player(s) in this project were:

34. Promoting the ideas that got the project started. 1 2 3 4 5
35. Direct involvement in designing the change project. 1 2 3 4 5
36. Making reference to their past success with similar projects. 1 2 3 4 5
37. Making presentations to higher management about their ideas. 1 2 3 4 5
38. Volunteering to take an active role in the project 1 2 3 4 5
39. Convincing others about the worth of the project. 1 2 3 4 5
The performance involved in this project would be best described as:

<p>| | | | | | |</p>
<table>
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</thead>
<tbody>
<tr>
<td>40. The project objectives were met.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>41. An example of effective teamwork.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>42. Higher management was always kept informed of progress.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>43. The project was completed on time.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>44. Appropriate resources were made available to the project.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>45. Performance of partners, whether internal or external, met expectations.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>

The way that this project related to the organization would be best described as:

<p>| | | | | | |</p>
<table>
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<tbody>
<tr>
<td>46. Fitting within the organization’s existing structure.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>47. Fitting the organization’s existing target markets.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>48. Was in an area of business where the organization had made substantial past investments.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>49. If successful, would mean that some of these past investments had to be written off.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>50. If successful, meant that known people would be displaced from their jobs.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>51. Was conducted in an organization that approached its problems in a fairly standardized manner.</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Mixed feelings</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>
This organization is one in which people:

52. Go to great lengths to protect their personal reputation and image.

53. Tend to hide their own mistakes, but point out the mistakes of others.

54. Tend to complain that others are “letting the side down”.

55. Know where they are going, and what they need to do to get there.

56. Know what is good for the organization, and how to go about achieving it.

57. Are NOT critical of new ideas.

58. Are encouraged to take risks.

59. Are strongly committed to change projects.
## Appendix 5 – Case descriptions

The following lists each of the projects investigated, and provides a brief profile of the organization involved, description of project and details of informant.

<table>
<thead>
<tr>
<th>Code</th>
<th>Brief Description</th>
</tr>
</thead>
</table>
| M1   | **Organization profile**  
The Australian subsidiary of a global company (M) with a high reputation for innovation. The Australian subsidiary employs less than 1000 people, with about 100 in R&D and technical operations. The project was conducted across several company divisions.  
**Project description**  
The project was about the design and implementation of software-based product selectors (expert systems) that addressed the need of several company divisions, involved in the supply of materials and devices into hazardous work situations, to better utilize their technical people, by shifting the role of providing selection advice to customer service people. The nature of the project changed as some marketing groups saw business opportunity for expanding the business through providing product selection capability on the Internet.  
**Informant**  
The Group Technical Manager who established and led project. |
| M2   | **Organization profile**  
The Health Care Division of M includes a full-scale pharmaceutical manufacturing plant with source of supply responsibility into SE Asia, NZ and South Africa. It has an R&D team of normally less than 20 people.  
**Project description**  
A project initiated in South Africa for the development of an over-the-counter cough inhibitor. The formulation involved a combination of active ingredients that did not exist elsewhere, and broke new ground from the chemistry viewpoint.  
**Informant**  
The Product Development Manager who led the development team and supervised all aspects of the project. |
| M3   | **Organization profile**  
A Division of M that supplies materials and devices for specialist security applications. The project was conducted in both Australia and USA.  
**Project description**  
The project commenced in Australia as a defensive strategy of meeting new Australian Government needs for upgrading passport security in order to
maintain current business. The September 11 attack catapulted the project from local into global, added new requirements, intensified the need to solve problems, and changed the strategy into business expansion.

Informant
Global Technical Service Manager who led the development team and project.

M4
Organization profile
A Division of M that supplies material and devices for controlling books in large libraries. The project was developed and first implemented in Australia, and then moved to the USA for global implementation.

Project description
The project commenced informally as a response to requests from the Australian library community to automate the largely manual job of issuing library books. Even in a mid-1990s world of ATMs and barcodes there were still technical problems to be solved to ensure library security. The original concepts developed in this project allowed the idea of “self-check” to proceed, and were recognized by the granting of global patents on the overall concept, and the security devices that enabled it to work.

Informant (s)
Technical Service Manager and Marketing Manager who were core members of the original “leaderless” team ‘We all agreed that if anything went wrong we were all at fault’.

M5
Organization profile
A Division of M that supplies materials and devices for specialist security applications. The project was conducted in both Australia and USA.

Project description
The project started in the mid-1990s and continued for several years as a one-man unsupported effort to research ways of verifying the security of passports. The US parent company became interested and funded the researcher to continue the work. In the late 1990s the Australian Government became interested in automatic processing of passports using face recognition software, and verifying the integrity of the passport security was an integral part of the process. For strategy reasons, the US parent company opted out of this larger development project, but retained control of the outcome by assigning the informant to continue to develop the device in conjunction with a specialist US company that would assume all development costs in return for the sole marketing rights. The final prototypes were completed just before the September 11 event, and the implementation of the project appears successful – even if not for M.

Informant
Staff Scientist who led the project in both Australia and the USA.
X1  **Organization profile**  
An Australian company of less than 50 employees that is involved in the design, manufacture and sales of industrial process machines for domestic and export.

**Project description**  
The company’s CEO inspired this project. His agenda can be inferred as an effort to transform the company by attracting new sources of technology and funding. The vehicle for the transformation was an ambitious technical project to upscale an existing machine design, and create a different product for a different market. This involved a major R&D and design effort that could only be done with the help of external technology consultants, and additional government and venture funding. The project appears a partial success from the technical and business viewpoint, but seemingly a total success from the viewpoint of the CEO’s agenda.

**Informant**  
Project manager for the pre-commercialization and design stages of the project.

X2  **Organization profile**  
A small Australian R&D company in the photonics industry that is part of a larger network of companies associated with a Cooperative Research Centre. The company normally employs less than 10 people.

**Project description**  
The project followed a business plan of building on the company’s intellectual property to create a component product for which there was an existing market in the telecommunications industry. By using the company’s robotics capability the quality of this component could be dramatically improved and the cost of manufacture greatly decreased. There were important new discoveries made during the development that improved on the original ideas and the business potential of the project. However, while the development was underway the global telecommunications market collapsed, and the sales made since the project’s 2003 fall well short of business plan expectations. Knowledge creation was highly successful but business objectives were not met.

**Informant**  
Chief Technology Officer, and leader of the new product initiative.

X3  **Organization profile**  
An Australian public company in the building products industry with about 8,000 employees worldwide and an R&D staff of approximately of 70.

**Project description**  
The project related to the development of a new formulation drainage pipe for ground drainage in road construction. This was a large-scale project that involved the chemical re-formulation of product, the development of the production process, the engineering and building of pilot-scale plant with which to prototype the product, and the engineering, building and commissioning of final production plant. This project might be considered as typical of a large innovation project within a large manufacturing organization.

**Informant**  
The R&D manager who led the project in the development and plant commissioning stages.
X4  **Organization profile**  
A small Sydney company that provides educational and coaching services through schools. It normally operates with a fulltime staff of 3 people involved in marketing and administration, and up to 15 part-time and contracted staff.

**Project description**  
The project was aimed at changing the company’s business model, simplifying administrative and marketing processes, and using software to support the changes. This project represented a radical change for the business.

**Informant**  
Joint proprietor and instigator and manager of the project.

X5  **Organization profile**  
An Australian public company that operates throughout Australia refining, distributing and marketing petroleum products. It has approximately 4,000 employees.

**Project description**  
The project was about developing a more effective and relevant brand positioning for the company. The project introduced different analytical techniques, of a higher level of sophistication, and different ways of involving internal staff. This was a major marketing exercise for the company that sought to change the way that internal and external stakeholders drove the business.

**Informant**  
Brand Manager for company, and senior manager on project.
**Appendix 6 – Case Report – Project X1**

**Note:** This description is not intended as a comprehensive report of the case, nor is it a direct transcript of the interview with the case informant. The description focuses on issues relevant to the research study, and the informant’s interpretation of them, as verified by the case informant.

**Organization profile**

Company X1 is involved in the design, manufacture and sales of industrial machinery. It employs less than 50 people working across design, production and sales functions. It conducts its business globally.

**Informant**

Project manager for the pre-commercialization and design stages of the project.

**Innovation idea**

In technical terms the project involved a significant scale-up of an existing machine design to create a new product. An existing machine had been marketed for several years, and it was recognized that a significantly larger machine was required to meet certain market requirements. This significant up-scaling represented ‘quite a phenomenal leap’ for the machine designers for non-linearity comes into play, and the significantly larger machine becomes a whole different world for the designers to understand, and for the people and bodies associated with funding the development to understand. Furthermore, there needed to be an understanding of the design process that would take the current geometry and transform it to a significantly larger and more powerful unit.

The basic idea of the significant scale-up remained intact throughout the evaluative stages of the project, although it was thought that some ‘tweaking’ might become necessary in the commercializing stages.

In broader terms the innovation proposal could be interpreted as the creation of a ‘compelling business case’ or ‘total package’ for attracting financial and scientific resources from a group of external and internal stakeholders. For the organization, ‘achieving the collective commitment was the innovation’. Evidence for this interpretation was that the ‘technical aspects and rigor needed to assess the design feasibility were not at the forefront’ of early evaluations and that ‘in these early stages defining and solving the product commercial/technical risks was apparent “detail” to be resolved in the design stage.’

**“Innovativeness” of the idea**

The primary objective of the project was to expand the company’s offering into a new area of business, and this would have a potential secondary effect of attracting investors into providing a cash flow injection into the company that would help sustain it over the short to medium term and create the business platform for future growth. The new business area was considered a logical extension to the company’s normal field of activity.
The existing product was suitable only for niche areas of the market, and the larger sized product would allow the company a wider participation in the market. This was considered essential to the company’s ongoing survival.

Extending the design by a significant factor, when technologies are working at their limit, was a ‘huge stretch’ for technical and R&D activity on many fronts. It was not an ‘off the shelf, nuts and bolts’ exercise. The project required a substantial adaptation of a current product concept, and in its development the company found it necessary to extend on the technologies and techniques involved in the current product as well as seek and adopt some different techniques.

The project was aimed at providing improved performance features related to the efficiency of the machine’s process and to providing a more variable and controllable process. For users of the machine and its process this project would provide a large improvement in efficiency, product quality, and product specification, leading to the creation of higher value added product and enabling better quality control in the user’s process. The users should achieve small cost savings but the belief is that the industry will be reluctant to take on this product solely on the basis of cost savings. Rather it was felt that the users would adopt the machine if it put them ahead of competitors through a step change increase in specification and quality.

In this project it was quite difficult to know in advance of the steps that were necessary for its development, and very difficult to predict the project’s outcome. In truth, the ultimate performance of the machine would only be known after the machine went into service. Neither the work group nor the organization provided much in the way of rules or procedures to guide the work.

During the development of the project problems requiring interdepartmental communication and negotiation arose on almost a daily basis. While the problems were generally of the same nature – normally, an impasse in technical or market requirements – the actual problem could be unique.

The product introduced a new technology for the market, and this would require the users to acquire new knowledge and techniques to run it. Accordingly, for the project to be a commercial success the machine’s users would be required to undergo a large amount of new learning, and a high degree of behavior change was necessary on the users’ part.

People

The key players in this project were drawn from the company’s executive level. The CEO was always the main player. It was him who created the stretch goal and ‘put the peg out at the significant size increase’. ‘I don’t think anyone else would have been brave enough to have done something like that’. It was the CEO that pulled together the financial package of Australian government and industry investors.

Formal transactions

There were formal agreements with investors based on a business plan.

There were formal agreements with the CSIRO and external consultants related to materials technology. A formal agreement for government funding was also entered into.

There were no changes to these agreements during the development of the project.
The agreements linked task achievement with funding, and this meant that significant reporting and discussion was necessary with each party to maintain satisfaction with the progress towards objectives.

**Internal organization**

The company is relatively small and people with managerial or technical ‘clout’ participate in the things related to the development of the business on a daily basis. These people come together in an “ad hoc” manner to participate in this project as required. There was no formal team ‘isolated or set aside from the normal business’. The project had priority and people willingly came together on a non-regular basis, as required.

**Industry/ Market context**

The industry/ market context influenced this project quite significantly. The machine needed to be adapted to user requirements and this required significant changes to the machine’s functions and ‘stretch’ in the technology.

The company’s understanding of the marketplace and user requirements changed during the period of the project’s development and this was reflected in changes to the specification of the machine.

**Critical incidents**

The project could not proceed without a substantial injection of funds, so getting the investment was critical to the project. The CEO managed this by attracting funding from investment banks, corporate investors and Australian Government grants.

**Outcomes**

The criteria used to judge the success of the project were first, achieving the technical requirements, second, ability to manufacture the machine at a cost that allows a marketable unit price and, three, producing a machine with good usability.

While the criteria have not been strictly met thus far, a usable product will result.

**Commitment behavior**

The internal resources important to this project were:

1. The unique capabilities and experience of the key players, and their tendency to want to change things.

2. The organization’s intellectual property (patents and/or know how) and design skills.

3. The organization’s values as related to risk taking, gross margin expectations and growth expectations.

Forces driving the project were:

1. The actions of key players in promoting the innovation idea, being directly involved in design processes, referring to their past successes in similar projects, and convincing others about the worth of the project.
2. The performance of external partners.

3. The project’s fit with the organization’s structure, its existing target markets, and its past investments.

4. The organization’s encouragement of risk taking, its acceptance of new ideas, and its commitment to change projects.

Forces inhibiting progress of the project:

1. Breakdown in teamwork.

2. Lack of appropriate communication on progress to higher management.

3. Lack of appropriate resources.

4. Failure to meet time and project objectives.

5. An organizational tendency towards face saving and hiding mistakes.

6. ‘Tensions arising from the differing technical and the commercial viewpoints within the organization.’ ‘The CEO may have had more faith in the design process than the designers.’
Appendix 7 – Case data and calculations

On the spreadsheet pages that follow the raw data and calculated variables are listed as item numbers 1 to 83, with a shortened description provided for each. The key to each item is as follows:

- There was no quantitative data collected for items 5 and 16, these requiring a qualitative response.
- Items 1-4, 6-15, 17a, 17b, and 18-59 constitute the data collected from the Survey Questionnaire question of the same number.
- All other items are calculated in accordance with following table.

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>Innovativeness</td>
<td>Sum of items 1-4 and 6-15, with item 9 reverse scored.</td>
</tr>
<tr>
<td>62</td>
<td>Personal Knowledge</td>
<td>Sum of items 18 to 21</td>
</tr>
<tr>
<td>64</td>
<td>Proprietary Knowledge</td>
<td>Sum of items 22 to 25</td>
</tr>
<tr>
<td>66</td>
<td>Public Knowledge</td>
<td>Sum of items 26 and 27</td>
</tr>
<tr>
<td>68</td>
<td>Collective Knowledge</td>
<td>Sum of items 28 to 33</td>
</tr>
<tr>
<td>70</td>
<td>Psychological Commitments</td>
<td>Sum of items 34 to 39</td>
</tr>
<tr>
<td>72</td>
<td>Project Commitments</td>
<td>Sum of items 40 to 45</td>
</tr>
<tr>
<td>74</td>
<td>Structural Commitments</td>
<td>Sum of items 46 to 51, with items 46, 47 and 48 reverse scored</td>
</tr>
<tr>
<td>76</td>
<td>Social Commitments</td>
<td>Sum of items 52 to 59</td>
</tr>
<tr>
<td>78</td>
<td>Creative Commitments</td>
<td>Sum of items 62, 66, 70, 72, and 55 to 59</td>
</tr>
<tr>
<td>80</td>
<td>Structurated Commitments</td>
<td>Sum of items 64, 68, 74 and 52 to 54.</td>
</tr>
<tr>
<td>82</td>
<td>Organizational Knowledge Base</td>
<td>Sum of items 62, 64, 66 and 68</td>
</tr>
<tr>
<td>61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83</td>
<td>% Response strength</td>
<td>For associated variable, percent of actual scores to maximum scores, calculated from a zero base.</td>
</tr>
</tbody>
</table>
Appendix 8 – Case analysis – Project X1

An analysis of knowledge and commitment in an organizational transformation

1.0 Introduction

The purpose of this analysis is to apply the three models of innovation, knowledge and commitment that were developed in this research study to an actual case, and demonstrate both their relevance to practice and their ability to explain the dynamics of knowledge creation in a studied organization. The conceptual models are those of Figures 3.3, 3.4 and 3.5 of the thesis document.

The analysis proceeds by first describing the organizational background to the project and the innovative initiative, and then analyzes the knowledge and commitments that bear on the success or otherwise of the project.

To aid the analysis measures of commitment level will be reported. These are calculated from questionnaire data and expressed as a percentage. The percentages are calculated by dividing the total scores on questions associated with the commitment category by the maximum possible score for the category. A measure of commitment strength of 100% means the informant observed the highest level of commitment behavior across the range of questions; a score of 0% means that no commitment behaviors were observed across the range of questions. Actual scores lie between these extremes.

2.0 Brief background

The organization in which this project was conducted (referred to as X1 in the following analysis) is involved in the design, manufacture and sales of specialized industrial machinery for processing industries. It employs less than 30 people working across design, production and sales functions, and conducts its business globally.

The informant on the project was X1’s Design Manager who managed the project in the pre-commercialization and design stages of the project and remains a key player in the commercialization of the project.

The stated version of events leading to the innovation project was of X1’s CEO identifying a business growth opportunity, and setting ambitious goals for the development of an up-scaled version of X1’s current machine design. However, there is a strong suggestion from the case data that the CEO had another agenda in mind and that, in the CEO’s view, the innovation project was more about revitalizing the company and its capabilities by engineering the means of attracting different sources of funding.

Supporting this latter view are the circumstances of the formation of the organization, and the unknowns about its future. The informant advised that the organization was originally conceived and formed as the R&D arm of a larger engineering organization, and was often referred to as the ‘plaything’ of the larger organization’s founder. The founder’s aging and reducing involvement in and support for the business raises questions about the organization’s future. The CEO’s agenda may be a survival strategy.

The key players in this project were drawn from the company’s executive level. The CEO appears to have been the main player in this project. He created the stretch goals on which
the project was based, and pulled together the financial package of Australian government and industry investors that enabled the project to proceed.

The project also involved formal contractual agreements with investors based on a business plan, with government funding agencies, and with the CSIRO and external technical consultants related to materials technology. The funding agreements linked task achievement to funding, and this meant that significant interaction was necessary with each funding party to maintain satisfaction with progress.

3.0 Knowledge base

The first step of analysis is to understand the capabilities that are inherent in the knowledge that X1 currently possesses. The concept of “knowledge base” is used here to refer to all of the knowledge resource available to this innovation project. This knowledge is both individual and collective and exists in both codified and uncodified forms.

At the uncodified level of knowledge X1 can call on the unique skills and work experiences of its key individuals and their apparent tendency towards wanting to do things differently. The past education and training of these individuals is thought less relevant to the project than their practical experience. Overall, any successful outcome is considered to be heavily dependent on the Personal Knowledge component of the knowledge base.

Again at an uncodified level, X1 has accumulated a Collective Knowledge that is about understanding the need to conform to the organization’s strategies, to its approach to risk-taking, and to its expectations of gross margin and business growth. The collective knowledge appears to put little weight on following routine procedures.

At a more codified level of knowledge X1 has accumulated strong intellectual assets or Proprietary Knowledge. Through the efforts of its individuals, present and past, the organization has accumulated know how about the design, manufacture and sales of certain types of industrial machinery, and the ability to create different designs and prototypes in this equipment area. X1 has not placed any emphasis on formalizing its knowledge through written procedures, so its proprietary knowledge is largely embedded in its designs and hardware. As well, X1 has not placed emphasis on developing a depth of knowledge about the needs of its key users, and places little emphasis on acquiring knowledge from public sources.

For this project, the knowledge profile of X1 measured by the informant’s level of question response is:

- Personal knowledge: 88%
- Proprietary knowledge: 69%
- Public knowledge: 25%
- Collective knowledge: 71%

The need for X1 to contract with external consultants for the supply of additional capability in materials technology would indicate that X1’s proprietary knowledge was insufficient for the project task, and that it either did not feel that the additional knowledge was available from public sources, or felt that their own cost of accessing and processing public knowledge was greater than that of using specialist services.
4.0 Spontaneous creative action

How did the innovative initiative arise and why?

The innovative idea appears to have arisen spontaneously, and sourced from within the organization’s existing knowledge base. There is no evidence of market pressure for change, but the background discussion suggests internal reasons for seeking change.

The idea of extending an existing design was immediately useful for it was adaptive from the business viewpoint. It extended X1’s normal field of sales activity and, on the face of it, it made good use of its existing intellectual assets. There was no external shock or environmental threat to the organization that demanded immediate action. Whether the initiative is regarded in technical terms as the development of a revolutionary (for X1) new product, or in the CEO’s terms as the creation of a ‘compelling business case’ that would tap different financial and knowledge resources, the evidence is that the idea resulted from an internal musings and the CEO’s (or his Board) realization that the current product line-up and current approaches to resource acquisition were limiting the organization’s future.

The initiative to extend an existing grinding mill machine design by a factor of about ten times is highly ambitious technically. All of the evidence points to the CEO as the source of the initiative and inspiration for the project. It was him who created the stretch goal and ‘put the peg out at the significant size increase’. ‘I don’t think anyone else would have been brave enough to have done something like that’, was the informant’s statement.

It is also clear that the CEO’s primary view of the initiative was about pulling together of a financial package that would be attractive to Australian Government and industry investors. The informant felt that for the CEO, ‘achieving the collective commitment was the innovation’. Further evidence contributing to this interpretation comes from the project manager’s statements that the ‘technical aspects and rigor needed to assess the design feasibility were not at the forefront’ of early evaluations, and that ‘in these early stages defining and solving the product commercial/technical risks was apparent “detail” to be resolved in the design stage.’

5.0 “Innovativeness” of initiative

The initiative introduced more uncertainty of a technical nature than it did in market terms, where it was a seemingly straightforward matter of extending into market segments that X1 knew. Existing product was suitable only for niche areas of the market, whereas a larger sized product would allow the company to participate more widely in the same industrial market.

Whether the primary objective of the project is viewed as expanding the company’s product offering into a new segment of business, or of creating a business package for acquiring different resources, there is a stated longer-term secondary objective of creating a new business platform for future growth.

The idea of substantially up-scaling an existing design to achieve a large increase in performance was not a straightforward exercise, and represented both a substantial adaptation of existing product principles, and a ‘whole different world’ for the machine designers. When technologies are working at their limit, extending a design by a significant factor becomes a ‘huge stretch’ for technical and R&D activity on many fronts. It was never an ‘off the shelf, nuts and bolts’ exercise. The development required X1 to both extend the technologies and techniques involved in the current product, as well as seek and adopt new technology and different techniques from external technology suppliers (CSIRO and other consultant).
The project aimed at providing greatly improved performance in the efficiency of the machine’s process by providing a more variable and controllable process. For users of the machine the project would provide large improvements in efficiency, product quality, and product specification (finer grind size), that would lead to better quality control of the user’s process, and to the creation of higher value product. The users might also achieve small cost savings, but the belief is that users of this industry would be reluctant to adopt this product solely on the basis of cost savings. Rather it was felt that the users would adopt the machine if it put them ahead of competitors through a step change improvement in specification and quality.

Because this project would take place in a different technical world for X1, it was quite difficult to know in advance of the steps necessary for its development, and very difficult to predict the project’s outcome. In truth, the ultimate performance of the machine would only be known after the machine went into service. Neither work group nor the organization provided anything in the way of rules or procedures to guide the work.

During the development phase of the project, problems requiring interdepartmental communication and negotiation arose on almost a daily basis. While the problems were generally of the same nature – normally, an impasse in technical or market requirements – the actual problem was often unique.

The product, when introduced to the market, would represent new technology, and users would be required to acquire new knowledge and techniques to run it. Consequently, for the project to be a commercial success the machine’s users would be required to undergo a large amount of additional learning, and to undertake a high degree of behavior change.

Overall, the idea had a relatively high level of innovativeness. On the innovativeness scale of this research study a score of 70 would mean that the initiative received a score of 5 in each of 14 questions related to business objectives, novelty, predictability, and uncertainty, and would indicate that the idea was about “doing things differently” from all viewpoints. At the other extreme of the continuum, a score of 14 represents the lowest rating across all of the same questions, and would indicate that the initiative provided no potential for change. As rated by the informant this project scored 46, representing a relatively high level of innovativeness, and, consequently, a relatively high potential for disturbing the organizational system.

6.0 Innovation strategy

The question is how X1 views the task of achieving innovation, and how did it plan to go about it? There are two views to be considered, first, that of the informant and the stated objectives of the project and, second, the CEO’s view as inferred from the case.

Referring to Figure 3.3, the level of innovativeness places this project towards the innovation end of the business practice continuum, where a substantial amount of additional knowledge is required for the project to reach implementation. It is a project that relies on successful knowledge creation for successful completion. The question is what strategic process should be adopted?

The case data provided by the informant positions the project as essentially an engineering-based project, and an exercise in strategic learning. Following standard engineering approaches the ultimate goal will be reached by making many incremental, low risk, creative steps towards building additional knowledge capability, and achieving a more innovative business practice (refer to Diagram 3.3 and its Process 2).
However the CEO’s approach appears to be entirely different. The evidence supports a view that the CEO sees the task as formulating a ‘strategic intent’, and moving forward, despite the uncertainty, believing that sufficient financial resources and knowledge will ultimately be generated to achieve the desired change outcome (refer to Diagram 3.3 and Process 1). This is the process that has been described as entrepreneurship. If one could read the CEO’s mind one might also find the idea that there are some paradigm’s that need breaking, for compensating for the loss of the founder’s patronage might mean a more independent and aggressive approach to business in the future. In other words, the CEO’s agenda may be nothing short of reinventing and transforming the organization.

Of course, the view of the informant and his CEO are not mutually exclusive, but rather the actions they inspire are complementary. What the analysis illustrates here is normal for any organization, in that the higher the organizational level of the viewer, the more macro the view that is expected. This also means that taking the project managers viewpoint will always result in a partial view of an organizational problem.

7.0 Analysis of commitment

The references for the commitment analysis that follows are Figures 3.4 and 3.5, and the process linkages and logic flows that these diagrams indicate. The purpose of the analysis is to describe the commitment mechanisms at play in this project and to explain the role and dynamics of commitments in the knowledge creation process. Each of the factors that generate commitments – psychological, project, structural, social - are analyzed separately.

7.1 Psychological factors

The psychological commitments have a positive effect on the knowledge creation process through the creative commitment link C1, as well as a potential dampening effect on the process through the structurated commitment link S1.

The creative commitments were established by key people’s desire to use their own unique skills and abilities that are part of the Personal Knowledge component of X1’s knowledge base, and the commitments generated by the behavior of key people in the project.

The key people in this project brought important qualities to the task in their unique and relevant skills together with their individual tendencies to want to change things. Their observed behaviors in referring to their past success in similar projects would have raised the level of commitment for themselves, and promoting the ideas on which the project was based, making presentations to outside people, and convincing others about the worth of the project would have raised the commitment level for themselves and others. Another positive contribution to commitment was that the key people were involved in the design process.

Voluntary participation in the project was not an explicit feature of the project, but the nature of the internal organization of X1 would appear to require people to join in as a matter of course. The informant advised that being a relatively small company people with managerial or technical ‘clout’ are involved in things related to the development of business on a daily basis. In this project, people came together in an ‘ad hoc’ manner to participate in this project as required. There was no formal team ‘isolated or set aside from the normal business’. The project had the interest and support of the CEO and thus high priority, and people willingly came together on a non-regular basis.

Taking all into account the level of creative psychological commitments is relatively high (79%). However working against these creative commitments will be the structurated
commitments associated with link S1. In the circumstances of this case, the latter commitments are associated with two effects.

First, there is the possibility that key individuals may have an inbuilt tendency to resist innovative change through an adaptive cognitive style, or as a result of the individual’s socialization towards risk free behavior. Clearly if key individuals are not disposed towards changing things then this will influence their interpretation of problems and situations, and their response to them, in favor of maintaining the status quo. Within X1, the key people are said to have a strong tendency to want to change things, and X1 appears to have social commitments encouraging risk taking, so, on the face of it, this effect has not inhibited knowledge creation to any great extent.

The second effect is the possibility that the key people in the design process, who are faced with a ‘whole different world’ of technology, may be over-influenced by their “old technical world”. The designers in X1 have spent their past efforts on filling gaps in their old technological world or paradigm, and now they are asked to change their views in a radical way in order to breach that paradigm. Feelings, that might be best expressed as “having too much invested to quit”, may cause designers to persist with their old world thinking beyond the point where it is useful to the future, and thus slow down the problem solving processes by which new knowledge is created. The informant has provided no explicit information that bears on the extent of this effect, however expressing the problem for designers in the terms of different “worlds” can be taken as implicit recognition that paradigmatic effects are involved, otherwise the issue of different worlds would not rate mention.

7.2 Project factors

The creative commitments established under this heading are those that are formally agreed during the project planning process as regards performance and time objectives. However the effect of formal commitments on the knowledge creation process will be mediated by X1’s performance towards meeting these objectives.

This project appears to have been marked by insufficient resources, ineffective teamwork and a poor level of progress reporting to higher management. As a result, time and other project objectives were not met. Whether or not project objectives are met is a direct reflection of the progress of knowledge creation, and progress that is below expectation also indicates that commitments have not diffused through the levels of the organization as expected. An inability to meet objectives due to causes outside of an individual’s control, such as lack of resources and poor teamwork, will have further reduced the level of individual commitment in this project. As a consequence of all above, the creative commitment link C2 may not be a strong motivator of the knowledge creation process.

Structurated commitments related to X1’s proprietary know how and past design capability might also have contributed resistance to the knowledge creation process. X1’s proprietary knowledge is not standardized or formalized but rather embedded in its designs and physical product and these contribute to X1’s public image and identity. The innovation initiative requires X1 to move beyond the traditions that were socially constructed in its past, but the limits of X1’s existing proprietary knowledge will have constrained its planning for the future. For example, because of past commitments the design question will not be “how do we break new ground in order to design an entirely different product?”, but more likely “how do we extend on past technological achievements in order to produce a design that meets new requirements while remaining a publicly recognizable X1 design?”. In practice, past designs, and the extent to which they have established X1’s public identity, will apply limits and constraints to the current design activity and the creation of knowledge.
At the same time X1 does not appear to have good knowledge about its key users. While this might take away some constraints on designers, and allow them freedom to choose additional paths of action and raise the chances of arriving at innovative solutions, it might also reduce the chances of arriving at a relevant solution. This is a dilemma for X1 or any other organization, the greater its proprietary knowledge of technology, operating processes and customers, the more constrained will be its change responses. However, without this proprietary knowledge its change responses will tend to be irrelevant. So the extent of resistance through structurated commitment link S2 will depend on to what extent the project is required to tap into the organization’s existing proprietary knowledge.

7.3 Structural factors

The structural commitments of an organization tend to be structurated rather than creative in nature, for they arise from the organization’s past actions. Organizations create structure over time in response to changes in their public/market knowledge, and this structure is aimed at achieving stability and efficiency. Changes in structure, as any other organizational change, can result from management change program or evolve naturally. No matter how the structural changes occur, when they are implemented, they add to the organization’s structural commitments for following change programs. So structural commitments are backward looking, and can be expected to raise barriers to change rather than encourage it.

X1’s history will have included the development of both internal structure and structured means of dealing with its market and customers. These structures reflect on X1’s past interpretation of the competitive market in which it participates, and places constraints on X1’s interpretation of the future. Thus the change management issue is more about reducing any negative effect of the structurated commitments of link S3 than it is about raising creative commitments through link C3.

Of course, a possible inference from the innovation strategy discussion of Section 6.0 is that the CEO may view the current structures and relationships as counterproductive to the future. In other words the CEO may see more need to reduce the inhibitive effects of the structurated commitments of link S3 than the case evidence presents. So the strategy of breaking the existing paradigm of structures and relationships may well be in the CEO’s mind, even if never expressed.

Initiatives that do not disturb the organization’s internal structure or current market arrangements, and enhance rather destroy any resource investments that X1 has made in the past represent a minimal challenge to the organization’s identity. This is the case for this project, where the project is a high fit with the organization, its market, and its past investments. As well, there are no difficult decisions to be made about writing off past investments or displacing people from their jobs. Consequently, from case evidence the current structural arrangements are not disturbed to any great extent, so the structurated commitment link S3 is a relatively weak one, and does not appear to inhibit the knowledge creation process.

7.4 Social factors

The creative commitments arising from X1’s social commitments appear to provide a strong impetus to the knowledge creation process through link C4. In X1, people feel committed to change projects, work with purpose towards what they feel is “good for the organization”, are not criticized for raising new ideas, and are strongly encouraged to take risks. Lack of criticism allows people freedom to experiment, to challenge the prevailing consensus, and to solve problems in different ways. As well, working for the organization good transcends the narrow perspectives and constraints of individuals.
But not all social commitments are creative in nature and helpful to the knowledge creation process. In X1, people go to great lengths to protect their personal reputation and save face and, as a consequence, tend to hide their own mistakes. There is also a moderate tendency of people to complain about the lack of effort of others. These types of behavior are counterproductive to knowledge creation, for face-saving, hiding mistakes and “buck passing” reduce the opportunities for individuals to learn, and delay the knowledge creation process. These social commitments are of the structurated type acting through link S4.

8.0 Knowledge creation

For a project to meet expectations, commitments must be diffused through the organization in step with iterations of the knowledge creation cycle. In this project the creative commitments providing motivation to the knowledge creation process through links C1, C2 and C4 were relatively high; the structurated commitments that provide resistance to the process through links S1, S2, S3 and S4 were relatively low. Consequently, commitments should not have impeded the project in achieving a satisfactory outcome.

The creative commitments playing a strong role in driving the knowledge creation process were the skills and abilities of the key players (88%), the individual psychological commitments the key players generated (79%), and X1’s social commitments that encouraged risk-taking and change (80%). At the same time the level of project commitments was very low (27%), so that the overall level of creative commitments (70%) was relatively low, and at the lower extreme of the sample of projects studied in this research study.

Fortunately, the structurated commitments resisting the knowledge creation process were also relatively low. X1’s existing proprietary knowledge and its strong collective knowledge about its approach to risk-taking, gross margin and growth contribute to the structurated commitments, but structural commitments are almost negligible, as the innovation project is a close fit to X1’s existing processes, structure, markets and past investments. Consequently, the overall level of structurated commitments is seemingly at a low level (16%), while still above the mean of the sample of projects in this research study (13%).

In summary, in relation to other projects in this study the level of creative commitments is very low yet the level of structurated commitments not at a comparably low level. This suggests that the knowledge creation will have been impeded, and this is reflected in the lack of timeliness with the project.

9.0 Change outcomes

A number of important changes have resulted from the project. X1 learnt about different ways of acquiring resources through transacting with external outside people and resource-owning institutions, and developed additional design processes and designs that will add to its know-how and proprietary knowledge. X1 is a more capable company as a result of the innovation project.

However, whether or not a project is perceived as a success depends on the expectations set up for the project at its establishment phase. The informant’s report of the project was based on what were the stated objectives of the project, and its business plan. In this the overall objective of the project was to expand X1’s business into additional market segments that existing equipment could not serve. The innovation initiative was designing and building a different industrial machine based on the general principles of X1’s existing equipment, but up-scaled to such an extent that different design processes needed to be developed and different materials technologies acquired. The criteria for judging success of this project are about achieving certain technical requirements and usability factors at an appropriate cost.
Based on these, largely technical, criteria the project was only a partial success. The technical criteria were not all met, but the final product was viable, and so the project’s outcome is described as ‘very useful’, but something less than successful (graded 3/5 for both technical and business criteria).

The stated secondary objective of the project was creating an additional platform for future business, and the additions to X1’s proprietary knowledge would indicate that this objective has been met to some extent. However, any project that is a dismal failure in a business sense might have a claim to partial success on the basis that additional knowledge had been acquired. But if a business’s primary profit-seeking objectives are not consistently met then the business will not survive, and for X1, simply accumulating knowledge will not pay the bills.

This analysis commenced from the position that this project involved more than one agenda. When considering the secondary objective, and discussing the innovation idea, the informant spoke about the base for the future being about financial resources rather than additional product platforms, and alluded to another agenda that he referred to as the ‘CEO’s agenda’, that he sensed or was maybe privy to, although he claimed no direct knowledge of it.

This innovation agenda was about finding a way to expand X1’s financial and technological resource base by transacting with outside people and institutions. In this agenda the idea of developing an additional machine was simply a means of attracting resources to the company and adding to the company’s value. This agenda is also consistent with making X1 more attractive to prospective purchasers of the company, something that was hinted at but not made explicit by the informant. The agenda is also consistent with transforming the company into a more independent and aggressive unit to face a future without the patronage of its founder.

If the CEO’s agenda and expectations had been taken as the criteria for rating the success of the project then the project may have been judged as more successful.

9.1 What was the project?

From the above discussion, judging the worth of the outcome depends on what we believe to be the “real” innovation project - whether it was the partly successful technical project to design and build an additional machine model, or the CEO’s seemingly more successful strategy to expand X1’s financial resources and capabilities, and in which the success of the technical project was secondary to the development of the means of expanding X1’s future.

One obvious answer is that the stated technical project was simply a subset of a larger unstated innovation project (CEO agenda), and the two cannot be divorced in any thinking about the case. However, this raises the issue of competing commitments. What is the affect of the CEO being committed to an agenda different to that of the people working towards the publicly stated objectives of a project? One affect may be for the CEO to try to achieve his own commitments at least cost. A way for the CEO to do that would be to minimize project commitments by restricting the resources available to the project. The fact that, in the informant’s view, appropriate resources were not made available to the project supports such a version of events. In this case, the existence of competing commitments will have worked against the commitments motivating people towards the publicly stated project objectives.

Competing commitments are an important issue for researchers. Any organizational change project is likely to have multiple objectives, some that are stated and used in building up the
business plan, and some that remain unstated because they are personal to influential players, or counterproductive to the interests of stakeholders if revealed (as in a strategy of readying a company for sale). For the researcher, the question of whether stated or unstated objectives are at play becomes important, as any reasonable interpretation of a project’s success or failure relies on being able to match project expectations and outcomes. Unless the researcher can achieve open access to the entire range of an organization’s thinking, the researcher has no alternative but to concentrate on the organization’s stated objectives, and these, as this case study demonstrates, do not allow the full story to be told and thus may be misleading.

10.0 Summary of analysis

This analysis demonstrates two important things. First, that the language about organizational knowledge and commitments associated with the conceptual models shown in Figures 3.3, 3.4 and 3.5 provide a means of describing important psychological and sociological mechanisms involved in knowledge creation and organizational change. The case description and analysis reflect on typical managerial practices and processes as conducted in practical organizational projects, and should be readily understandable by practitioners.

The analysis demonstrates how forward-looking creative commitments provide an impetus to the knowledge creation process, while backward-looking structurated commitments seek to protect the organization’s identity by resisting the knowledge creation process. In the case of Project X1 the creative commitments are low relative to other projects in this study, while the structurated commitments are reasonably high relative to other projects, so one might expect the knowledge creation process to have been impeded relative to other projects. It also seems likely that the commitments of the CEO competed with those of the project team, and this may have led to a reduction in project commitments and, consequently, to reduced creative commitments. The fact that the project lacked timeliness, and did not reach its stated objectives, is consistent with the view that the project lacked a sufficient level of creative commitments.

The case also raises the question as to whether matching expectations and outcomes is meaningful where some of the objectives of a project remain concealed. Ideally business projects would start with clear objectives, so that when the project is complete its outcomes can be compared with these objectives, and definitive statements made as to whether or not the project was successful or, to what extent the objectives were met. There are many reasons why objectives may change during the conduct of a project, but this was not the case here. This case demonstrates that organizations can have multiple agendas, some explicit, others not. For the innovation project X1, the innovation may have been more than that presented to the staff of X1 and public. The explicit innovation project and its stated objectives may have been the means by which another unstated innovation agenda, the CEO’s agenda, was furthered.

11.0 Conclusions

The question to be answered is to what extent does this case and its analysis support the research propositions? There are four general propositions that are covered by the following four questions and the answers to them:

1. Did the theoretical models describe what was going on in this case? The answer is mostly yes, with some hesitation about conflicting organizational commitments that arose outside of the project. The theoretical models relate to the knowledge creation process and in applying the models to this case, the analysis has described the strategies involved, and explained both the causal mechanisms underlying the
process of knowledge creation, and the project outcomes. However, the theoretical models cannot explain how the conflicting organizational agendas and commitments that are an integral part of this case arose, but they could explain how the conflict resolved itself in terms of its effect on knowledge creation. In summary, what has been shown is that if an organizational commitment can be identified, then the theoretical model can accommodate its effects.

2. To what extent are the descriptions and explanations of the analysis applicable to other change projects? The descriptions and explanations based on the theoretical models and relating to internal knowledge creation processes do not appear to be unique to the case analyzed. Different cases would present only different levels of the knowledge and commitments that constitute the process. However, different cases may present a different array of organizational commitments that conflict with those commitments motivating the knowledge creation process. These commitments may arise from agendas that are personal and hidden, and must be identified if their effect on the knowledge creation process is to be predicted.

3. Is innovativeness related to knowledge in this case? The CEO’s decision has a basis in what he perceived to be the capabilities of his company, but there is no evidence that the nature of the task he chose was anything other than what he perceived necessary to meeting his objectives. Apart from the need to boost the project to government agencies and venture capitalists as a great innovation, his objectives were best met by choosing a task that, on the face of it, was adaptive – working within the current practice of the company in both technology and market. However, evidence from the informant that the CEO ‘had more faith in the design process than did the designers’, indicates that the CEO may have underestimated the level of innovativeness, and the extent of the required technology development, of the project. Choosing a task for its adaptive qualities to find it is of higher innovativeness than expected does not suggest that organizational knowledge played any part in determining the level of the project’s innovativeness. The project, and its innovativeness, was more determined by what could be done in the business context.

4. Have creative and structurated commitments increased because of the innovativeness of the project? The fact that the project lacked sufficient resources is also strong evidence that the CEO has underestimated the project’s innovativeness. The explanation offered for the mixed outcomes of the project was that creative commitments were reduced by the lack of resources. So while it cannot be said that the case provides evidence of higher creative commitments existing because of the relatively high level of innovativeness, the case does provide evidence that the level of creative commitments needed to be higher if a higher level of achievement was to be obtained, and hence supports the view that a high level of creative commitment needs to accompany high levels of innovativeness. Apart from structurated commitments being relatively high when compared to other cases, there is no evidence to suggest that these would change because the project’s innovativeness was higher than expected. However, that does not rule out the possibility that internal commitments conflicting with those motivating the project have not been identified and their role in structurated commitments unexamined.

In conclusion, this case analysis provides evidence to support all of the research propositions.
Appendix 9 – Summary Analysis – all cases

Summary Analysis – Project M1

Organization profile
The project was conducted in the Australian subsidiary of a large US company that operates globally and has a reputation for continuous innovation. The Australian subsidiary employs less than 1000 people, with about 100 in R&D and technical operations. The project was initially intended to meet the specific needs of a division marketing materials and equipment that protects people in hazardous work situations, but grew into a multi-division project.

Informant
Group Technical Manager who established and led project.

Creative action
Spontaneously generated as a response to an internal problem. There was no obvious external pressure. Technical people were overcome by telephone calls with questions about product selection. The initial project was designing a software-based product selector to solve the problem. However, this soon mushroomed into a 10 year long multi-division marketing program when the business opportunities associated with the change were understood.

Innovativeness of project
The project commenced as a business improvement project but moved towards a means of broadening the business base and expanding business. The expert system technology was entirely new to the organization, so it was quite difficult to know what was necessary to getting the job done, and to predict the outcome. An important part of the development was the design of simple computer-human interfaces to minimize operator training.

Innovativeness score: 47 (59% of maximum)

Innovation strategy
There were two approaches at work in this project. First, the task was to achieve innovation through strategic learning and steadily working through knowledge creation cycles of increasing level of codification. Second, there was working with business groups to change their consensus view from the past about how information should be managed, in order that the Internet could be utilized. This has been referred to as paradigm breakout.

Commitment analysis
1. A strong motivation of knowledge creation was the psychological commitments of key people. There were social commitments reinforcing these in terms of the organization’s encouragement of risk taking and change, and project commitments related to effective teamwork and the performance of partners.
2. On the basis of the measures, there were only moderate structurated commitments impeding the project.
3. However, marketing groups appear committed to the idea that, in the interests of the business, product knowledge must be controlled. This project was about broadening the business base by making product knowledge easily accessible. So commitments of the marketing group conflicted with the commitments motivating the project.

Outcomes

The product selectors are in use but not as widely as originally envisaged, so while the technical criteria were met (4/5), the business objectives were not (3/5). The marketing groups are not convinced that making product selection information more freely available is in the interests of the business.

Explanation

A strong level of creative commitments motivated the project, with no significant resistance from measured structured commitments. Thus knowledge creation was able to proceed. However, some marketing groups were committed to a prevailing consensual structure about controlling information (business paradigm) that conflicts with the commitments motivating the project, and these have reinforced the structured commitments such that the creative commitments have been unable to fully overcome them. Consequently, overall business objectives have not been achieved.

Conclusions

In regard to the four research propositions:

1. The theoretical models provided an effective basis for explaining the facts of the case. However, measurement questions based on the theoretical models did not identify certain internal commitments (the marketing groups’ attachment to a prevailing paradigm) of a structured nature.

2. The explanations of knowledge creation based on the theoretical models appear to be general in nature. However, the structured-type commitment uncovered during the case interview should be tentatively taken as unique to this case.

3. The innovative idea was a spontaneous response to an organizational problem, and its innovativeness did not arise from the organization’s existing knowledge base, but from the need to do things differently.

4. If the project had not been about doing things differently the marketing group’s resistance to change (their commitment to the prevailing paradigm of information control) would not have been triggered. The associated commitments would not have existed. This supports the research proposition that higher innovativeness fosters higher structured commitments, and since there needs to be a certain level of creative commitments generated to overcome the structured commitments it follows that creative commitments will also be higher with the higher innovativeness.

The overall conclusion is that the research propositions are supported by the analysis of this case.
Summary Analysis – Project M2

Organization profile

The project was conducted in the Health Care Division of an Australian subsidiary of a large US company that operates globally and has a reputation for continuous innovation. The Australian subsidiary employs less than 1000 people, with about 100 in R&D and technical operations. The Health Care Division operates a full-scale pharmaceutical manufacturing plant with source-of-supply responsibility for SE Asia, NZ and South Africa (SA).

Informant

Product Development Manager who supervised all aspects of the project.

Creative action

The innovation idea for a unique product originally arose in the associated South African company, in a country where regulations allowed across-the-counter sales of drugs that would require prescription in other areas. There was no evidence of external pressure for a product such as that proposed.

Innovativeness of project

This project was intended to expand business into an entirely new market area. The idea of combining the two particular active ingredients into a liquid form was novel in a number of ways. The combination of active ingredients did not exist elsewhere, and it broke new ground from the chemistry viewpoint. However, for a pharmaceutical manufacturer it was relatively easy to know the way forward, and relatively easy to predict the outcome. Despite that, several difficulties arose that caused major delays to the project.

Innovativeness score: 35 (38% of maximum)

Innovation strategy

The task was to achieve innovation through strategic learning - working to create knowledge through knowledge creation cycles of increasing level of codification

Commitment analysis

1. The creative commitments motivating this project were generated from a team of people, who had past success with similar projects, all involved in a problem solving process. Effective teamwork, good communications with management, and the provision of appropriate resources provided project commitments of a commensurately high level, and the social commitments of the organization encouraged new ideas and risk-taking.
2. The project was not a good fit within the organizational structure because it was not normal for the organization to develop products for a single country development. This raised the level of structurated commitments, but not to a significant extent.

Outcomes

A new product project can only be graded as successful when there is a record of sales, and it is too early in the product’s life to make the judgment. The technical criteria were exceeded,
and created valuable knowledge that will be useful in the future (5/5). Progress towards the business objectives has been very satisfactory at an early stage of implementation, and the judgment is that the business criteria have been satisfied (4/5).

**Explanation**

The level of creative commitments motivating this project was sufficient to overcome the structurated commitments, even though these were boosted by the project’s lack of fit with the organization. Thus knowledge creation was able to proceed.

**Conclusion**

1. The theoretical models provided an effective basis for explaining the facts of the case.

2. The explanations of knowledge creation based on the theoretical models are essentially the same for this case as for Project M1, and appear to be general in nature.

3. The innovative idea was a spontaneous response to a perceived opportunity/problem, and its innovativeness did not arise from the organization’s existing knowledge base, but from the need to do things differently to capture the opportunity.

4. While this project had a level of novelty in terms of the technology employed, for a pharmaceutical company it was not a project of high innovativeness. With both creative and structurated commitments at moderate levels it does not conflict with the view that both creative and structurated tend to be higher with higher innovativeness.

The overall conclusion is that research propositions 1 – 3 are supported by the analysis of this case, and research proposition 4 is not falsified.
Summary Analysis – Project M3

Organization profile

This project commenced in the Australian subsidiary of a large US company that operates globally and has a reputation for continuous innovation. The Australian subsidiary employs less than 1000 people, with about 100 in R&D and technical operations. The project was conducted in the Australia subsidiary and in the laboratories of the US parent company, within a division of the company that supplies material systems for security applications.

Informant

Global Technical Service Manager who led the project and the development team.

Creative action

Spontaneously generated as a response to market pressures. The security technology for passports had been in place for almost 20 years and was now being beaten by ‘bad guys’, while competitive technologies were becoming better. At the same time the Australian passport authority wanted a more secure passport that was easier to produce and issue.

The innovation idea was about how meet new customer requirements while ‘leapfrogging’ competition. Management were not persuaded about the need for change until the September 11, 2001 attacks that got the project ‘on a roll’ with additional demands to be met.

Innovativeness of project

While the original objective was purely defensive, September 11 and the project upgrade provided the opportunity for selling into more countries. While the innovation idea was not hard to understand, it was based on entirely different thinking, and so was difficult for an organization that had been working along different lines to accept. The novelty of the idea was established by the granting of a global patent. The technology was not available and had to be developed with external specialist companies in several countries.

The potential performance benefits were a great increase in security performance and great cost reduction. It was very difficult to know in advance how to proceed with the project, and very difficult to predict the outcome. Difficult problems of an entirely different nature occurred quite regularly.

Innovativeness score: 47 (59% of maximum)

Innovation strategy

While strategic learning is fundamental to the innovation strategy, this case also involves the processes of entrepreneurism and paradigm breakout. The project did not elicit any interest from the US parent company until the development work was successful and September 11 had happened. The people in the project were those ‘who thought it was going to work’. Their faith and commitment to the idea, the uncertainty of a result, and the lack of organizational support, points towards entrepreneurism as their only process for taking the project forward. At the same time, the US parent company, that ultimately took global responsibility for the product, was committed to its 20 years of knowledge accumulation, and could not see a way forward. Breaking with its paradigm was also necessary to taking the project forward.
Commitment analysis

1. A significant factor in this project was the organization’s knowledge of and commitment to serving its key customers.
2. The full range of creative commitments motivated the project. Psychological commitments were at a high level and project commitments were high through team members volunteering, working together effectively, and being directly involved in the design of the project. Working against these commitments was a lack of appropriate resources.
3. Structurated commitments were moderately higher than M1 and M2, even though the project was an almost perfect fit to the organization and structural commitments very low. The resistance stemmed from the US parent company that was committed to its past investments in technology, and its people concerned with their personal reputations, with hiding mistakes, “passing the buck” and with little commitment to this change project. This might be a description of what is commonly known as the “not-invented-here-syndrome”.

Outcomes

1. The technical objectives were met, with the creation of a new technology that will set the organization apart from its competitors and stave off ‘bad guys’ for possibly up to 10 years (4/5).
2. There remains a question whether overall business objectives have been met. The new technology has not been embraced as might be expected, and management attention has been diluted by retirements and changes. The original objective of stopping the erosion of current business in Australia has been achieved, but this does not seem a sufficient result for the investments that were made in the development (3/5).

Explanation

While the project generated a high level of creative commitments these seem to have been insufficient to break the paradigm that entrap s the US parent company, and prevents them from seizing the opportunity that the new technology and the current security-oriented global environment appears to present. The fact of management retirements and changes may be an indication that this dilemma has been recognized, and that new people are required for progress to be made.

Conclusion

In regard to the four research propositions:

1. As with Projects M1 and M2, the theoretical models provided an effective basis for explaining the facts of the case. However, the measurement questions on structurated commitments did not identify commitments of the US parent organization that were opposing change because the innovative idea was “not invented here”. Whether these commitments are considered as internal to the global company or external to the Australian company they are still commitments of a structurated nature, and through that may be able to be incorporated into the theoretical models.

2. The explanations of knowledge creation based on the theoretical models appear to be general in nature. However, at this stage, the structurated-type commitment (NIHS) uncovered during the case interview should be accepted as unique to this case.
3. The innovative idea was initially a spontaneous response to an organizational problem that demanded that things be done differently. The idea developed over time in the direction of higher innovativeness, not because of any organizational knowledge but because circumstances demanded that more difficult and unique problems be solved.

4. If the project had not been about doing things differently the US parent organization’s resistance to the project (through their commitment to their own strategy) would not have been triggered. This supports the research proposition that higher innovativeness leads to higher structurated commitments, and since there needs to be a sufficient level of creative commitments to overcome these structurated commitments it follows that creative commitments will also be higher.

The overall conclusion is that research propositions are supported by the analysis of this case.
Summary Analysis – Project M4

Organization profile

This project commenced in the Australian subsidiary of a large US company that operates globally and has a reputation for continuous innovation. The Australian subsidiary employs less than 1000 people, with about 100 in R&D and technical operations. The project was conducted both in Australia and in the laboratories of the US parent company, within a division of the company that manufactures and sells library security systems.

Informant

Technical Service Manager who was part of the development team - there was no formal team leader. ‘We all agreed that if it went wrong we were all at fault’.

Creative action

Spontaneously generated as a response to customer pressures. The manual job of issuing book loans was a standard feature of libraries, and tied up about half of their staff. The innovation idea was to apply a degree of automation to the issuing task.

Innovativeness of project

This was a business creation project that would establish the concept of “self-checking” in libraries. The world already had ATMs and automatic ticketing, and everyone in libraries understood the need, so it seems strange that this was a new-to-the-world concept recognized by the granting of the head patent on the system.

The basic technology was off the shelf but the technology for making the system secure did not exist before this project. This work also resulted in a global patent on a crucial security device. The project started with little knowledge of library control systems, so it was quite difficult to know in advance of what was necessary to develop the project, and difficult to predict the outcome.

There were great benefits to libraries in a great increase in performance of library systems, and significant cost reductions, but library work would change and this would mean that many people would be required to change their behavior.

Innovativeness score: 53 (70% of maximum)

Innovation strategy

While strategic learning is fundamental to the innovation strategy here, the process of entrepreneurship can also be identified. Management support and resources were lacking. There was a senior manager nominally responsible for the activity but he, very sensibly, ‘kept out of the way’. The team started with little knowledge of library systems, and worked under conditions of ambiguity and uncertainty until the development problems were solved, and the US parent company began its work in turning it into a global project. The US parent company was begrudging in its acceptance of the project. It was committed to its own accumulated knowledge and strategy, and could not see the opportunity. Breaking with this paradigm was necessary to taking the project forward.
Commitment analysis

1. A high level of creative commitments motivated this project. Psychological and project commitments were high and the organization’s social commitments favored risk-taking and commitment to change projects.
2. Measured structurated commitments were relatively low, and, on the face of it, provided few barriers to the project.
3. The informant referred to this project as a ‘dream project’. It was a co-evolution of technology and customer requirements, and the key customers remained committed to the project throughout.
4. The US parent company was committed to its own business strategy that did not see this project as an appropriate business opportunity, echoing the circumstances of Project M3 but with less effect as the development was essentially complete before the parent organization became involved.

Outcomes

1. The accumulated revenues associated with the project are reported to be nearing A$1 billion worldwide, and this is an indication that business objectives were met (4/5).
2. Overall the technical criteria were met but not easily. The self-check system needed to interface with the library circulation system, and the great variety of these made for complications, and with the system vendors facing falling revenues because of the self-check devices, obstacles were continually placed in the way (4/5).

Explanation

This project appeared to have had most things going in its favor; the commitments of key customers reinforcing the high creative commitments of the organization and its people, with structurated commitments seemingly at a subdued level.

Conclusion

In regard to the four research propositions:

1. As with Projects M1, M2 and M3, the theoretical models provided an effective basis for explaining the facts of the case. However, the measurement questions on creative commitments did not identify the strong commitments of key customers that were reinforcing of the creative commitments. As well, the measurement questions on structurated commitments did not identify the commitments of the US parent organization to its own strategy that would have reinforced structurated commitments. Both types of commitments, one creative the other structurated in nature, will need to be incorporated into the theoretical models.

2. The explanations of knowledge creation based on the theoretical models appear to be general in nature. However, at this stage, the creative type commitments (key customer support) uncovered during the case interview should be accepted as unique to this case.

3. The innovative idea was initially a spontaneous response to an organizational problem that required that things be done differently. The idea developed over time in the direction of higher innovativeness, because key customers introduced more complex problems that had to be solved. There is no evidence that the development of a higher level of innovativeness was in any way related to the organization’s knowledge.
4. This project is noteworthy for the high level of measured creative commitments that were reinforced by the external commitments of key customers. This case pairs high creative commitments with high innovativeness and this is supportive of the research proposition. However, there is insufficient information to comment on the role of structurated commitments.

The overall conclusion is that while research propositions 1, 2 and 3 are supported by the analysis of this case, proposition 4 is not denied.
Summary Analysis – Project M5

Organization profile

This project commenced in the Australian subsidiary of a large US company that operates globally, and has a reputation for continuous innovation. The Australian subsidiary employs less than 1000 people, with about 100 in R&D and technical operations. The project was conducted both in Australia and in the laboratories of the US parent company, within a division of the company that supplies material systems for security applications.

Informant

Staff Scientist who led the project in both Australia and USA.

Creative action

Spontaneously generated as a response to customer pressures. The innovation idea was of a device that would verify that a secure film had not been tampered with. The need had been self-evident for many years. For 15 years the organization had been selling material for making passports secure without the means of verifying that the security was in place.

Innovativeness of project

The project started in 1994 to defend existing business, but by 1997 the idea of integrating verification with other necessary security functions had turned it into a business creation project. The ideas were a substantial adaptation of existing ideas, and entirely different technologies needed to be introduced to the organization. For customers, there was the potential for a great increase in security and productivity, but a large amount of learning if the system was to be successful.

Innovativeness score: 46 (57% of maximum)

Innovation strategy

Strategic learning seems to be the fundamental innovation strategy here, but in the first 2/3 years of the project, where the project was a lone effort without much organizational support, entrepreneurship is identified. Also the US parent company’s commitment to their long term strategy, that saw it opt out of the business creation aspects of the project, indicates that a paradigm breakout was necessary, if not achieved.

Commitment analysis

1. This project was based on the unique skills and abilities of certain people, and the organizations intellectual assets, especially its knowledge of key customers.
2. There were very strong creative commitments motivating the project. Psychological, project and social commitments to change were all very high.
3. The project’s strong fit with the organization and market meant that the measured structurated commitments were relatively low.
4. The US parent company’s commitment to its own strategy (presumably to specialize in materials rather than hardware) raised barriers to the full implementation of the project.
5. The co-development activities with key customers generated strong customer commitments to the project.
Outcomes

The technical criteria that evolved during the project were met and exceeded (5/5). The business objectives at the project start, of defending and improving the current business, were met (4/5). The objectives for business creation that developed at about 1997 were recanted by the organization, presumably for strategic reasons, so the business ultimately created benefited the partners, and not the organization. A highly successful project, but the organization opted out of the major benefits.

Explanation

The creative commitments of key people, key customers and the Australian element of organization were aligned in motivating this project, and consequently knowledge creation was unhindered. However, these creative commitments were insufficient to overcome the commitments of the US parent company to its current strategy, and this limited the extent to which the project’s benefits were implemented.

Conclusion

In regard to the four research propositions:

1. As with Projects M1, M2, M3 and M4, the theoretical models provided an effective basis for explaining the facts of the case. However, as with Project M3 the measurement questions on structurated commitments did not identify commitments of the US parent organization that were opposing change, and as with Project M4 the measurement questions on creative commitments did not identify the supporting commitments from key customers. However, both may be able to be incorporated into the theoretical models.

2. The explanations of knowledge creation based on the theoretical models appear to be general in nature. The additional commitments identified, of both creative and structurated nature, were identified in previous cases and so are not unique.

3. The innovative idea was initially a spontaneous response to an organizational problem that demanded that things be done differently. The idea developed over time in the direction of higher innovativeness, not because of any organizational knowledge but because circumstances demanded that more difficult and unique problems be solved.

4. If the project had not been about doing things differently to the US parent organization’s own strategy its resistance to the project would not have been triggered. This supports the research proposition that higher innovativeness leads to higher structurated commitments. Since there needs to be a sufficient level of creative commitments to overcome these structurated commitments it follows that creative commitments will also need to be higher, and in this project the creative commitments were very high.

The overall conclusion is that research propositions are supported by the analysis of this case.
Overall Conclusions – Projects M1, M2, M3, M4 and M5

The purpose of this section is to review and summarize the conclusions from the projects in the benchmark company. The focus of the review is the research propositions.

1. The theoretical models provided an effective basis for describing and explaining the facts of each case. However, the measurement questions of the survey questionnaire did not identify certain commitments of both creative and structurated types, namely:

   - In M1 the marketing groups attachment to an outdated paradigm of information control (structurated).
   - In M3 the US parent organization’s commitments to its own strategy and traditions - not-invented-here-syndrome – (structurated).
   - In M4 the strong commitments of key customers to the proposed change (creative), as well as the NIHS of M3 (structurated).
   - In M5 the strong commitments of key customers (creative), as well as the US parent’s commitment to the current strategic direction (structurated).

This indicates that the structurated commitments are probably under-measured, because they are not made explicit, and maybe only triggered during the progress of the project. However, the fact that the commitments can be classified under the theory means that they can be readily incorporated into the theoretical models. The research proposition that the theoretical models can explain real-world change projects is supported.

2. The only objection to generalizing the theoretical models across the benchmark group was the possibility that the commitments identified but not measured were unique to a particular case and not capable of generalization. That does not seem to be the case. The above descriptions of commitment effects are not uncommon in business, and can be classified as either creative or structurated, and thus can be incorporated into the theoretical models. The research proposition of the generalizability of the theoretical is supported.

3. In all cases it was concluded that the innovative idea was a response to an organizational problem, and the nature of the problem determined the need to do things differently. The research proposition that organization knowledge and innovativeness are unrelated is supported.

4. Taking all cases together the evidence for a strong relationship between innovativeness and creative and structurated commitments is inconclusive. A perceived under-measurement of structurated commitments, as discussed above, contributes to a problem of case interpretation with the issue. However, no case falsified the proposition.

Overall these five case replications provide compelling evidence in support of the first three research propositions.
Summary Analysis – Project X1

Organizational profile

An Australian company of less than 50 people involved in the design, manufacture and sales of industrial process machines for domestic and export purposes.

Informant

Design Manager, and project manager for the pre-commercialization and design stages.

Creative action

Spontaneously generated by CEO. No obvious external pressure. There is a question as to the actual idea. Was it about designing a new product, and stretching the company’s capability in the doing? Or was it about reinventing the organization’s future by tapping government and venture funding, and the stated project simply an appropriate vehicle?

Innovativeness of project

The stated project was a new business creation initiative. It was technically ambitious, being based on design processes and materials technology that were new to the company. It aimed at achieving a great increase in performance for users.

Innovativeness score: 46 (57% of maximum)

Innovation strategy

1. For the CEO the project was about entrepreneurism – he ‘put the peg out’ and was prepared to work with the uncertainty. No one else was ‘brave enough to have done something like that’. It was the CEO ‘who may have had more faith in the design process than did the designers’.
2. For the informant, responsible for getting the technical project going, the task was about achieving innovation through strategic learning. There was no breakthrough technical idea. The job was to follow engineering practice, and to work towards the required design by achieving several creative leaps, in tune with cycles of knowledge creation.
3. There was also suggestion of a paradigm breakout. The informant talked about the need for designers to enter a ‘new world’. The CEO was putting a peg into this new world in order to stir the organization into action, and change investors view of the organization’s potential.

Commitment analysis

1. The main motivation for knowledge creation was the psychological commitments of the key people. There were social commitments reinforcing these, in terms of a sense of organizational purpose and acceptance of risk taking, but these were conflicted by tendencies towards face saving and hiding mistakes. Project commitments, especially teamwork, seem to have suffered through the project being insufficiently resourced, so that overall creative commitments appear relatively low.
2. The level of structurated commitments measured would not impede the project.
3. The CEO’s agenda involved commitments that competed with the organizational commitments driving the project, and the interests of the agenda may have led to limiting of project resources – possibly leading to ambiguous objectives and reduced project commitments.
Change outcomes

1. When judged against the business plan objectives, the project was considered a partial success (graded 3/5). The objectives were not met, but the project delivered new technology, and a product that will be useful (graded 3/5).
2. The evidence points to the CEO following a separate agenda that appears to have been quite successful. Additional sources of funding were obtained, and investors appear satisfied with progress.

Explanation

Conflicting agendas and commitments have lead to a confusion of objectives with those doing the work of the project, and this, as well as a lack of resources, has caused a breakdown in teamwork, and reduced the level of creative commitments acting to motivate the knowledge creation of the project. As a result the formal project has not met its objectives.

Conclusion

Small organization, moderately high innovativeness, technology-based project type.

In regard to the four research propositions:

1. As with the benchmark projects, the theoretical models provided an effective basis for explaining the facts of the case. However, the measurement questions did not identify that the CEO may have been working to a personal (or maybe Board) agenda that was not made explicit. The commitments associated with this agenda are creative in nature, in that they promote change, but they compete with the commitments that motivate the formal project. Thus rather than reinforce structurated commitments these commitments take away from the creative commitments generated to motivate the knowledge creation process. These commitments can be accommodated by the theoretical models.

2. Assuming that competing commitments can be incorporated into the theoretical models, this case does not deny the general nature of the models.

3. The innovative idea was a spontaneous response to an organizational problem, and the nature of the problem determined the innovativeness of the project. The knowledge of the organization was influential in what problem was to be solved but not the innovativeness of the solution.

4. This project was noteworthy for its low creative commitments, possibly the result of competing commitments introduced by the CEO’s agenda. So while this project matches low creative commitments with a moderately high level of innovativeness, the reasons for low creative commitments are explained. It was also explained that a higher level of creative commitments was required to achieve the desired outcomes. So the association of low creative commitments and moderately high innovativeness is not associated with successful outcomes, and so cannot be taken as a denial of the research proposition. The moderately high innovativeness matches the moderately high level of measured structurated commitments, and this is supportive of the research proposition.

The overall conclusion is that no research propositions are denied by the analysis of this case.
Summary Analysis – Project X2

Organization profile

A privately owned R&D company in the photonics industry seeking to commercialize its intellectual property and know-how. Before the completion of this project it employed up to 10 people in R&D, production and marketing. While a separate entity, the company is part of a network of research oriented companies associated with a Cooperative Research Centre. The Centre acts as a central hub and channels financial resources and technological and management competencies into spin-offs such as this organization. A complication that arises is that in questions about “organization”, the subject organization will not be differentiated from its supporting network structure.

Informant

Joint-founder of company, now Chief Technology Officer, a PhD in Physics experienced in laser research, leader of the project initiative.

Creative Action

Spontaneously generated by CTO. The idea was new-to-the-world, and sourced from the CTO’s unique knowledge of robotics and operational processes. It was a creative response to adversity, and the need to survive.

The innovation idea can be analyzed at two levels. First, it can be seen as aimed at greatly improving an existing specialist product by using of novel robotic processes. Second, it can be seen as using novel robotics to create a different business model based on different customer-supplier relationships.

Innovativeness of project

For the organization, this was a business creation project. The proposed product was not novel, but the process technology was new-to-the-world, and would provide a breakthrough in performance and cost for users. The development work was at the leading edge of robotics technology. It was difficult to know in advance the steps necessary to achieving the desired outcome, and very difficult to predict the outcome.

Innovativeness score: 57 (77% of maximum)

Innovation strategy

A great deal of knowledge creation had to be achieved and a great deal of uncertainty resolved for this project to be successful. This required investors to have a great deal of faith in the CTO and the CTO to have great faith in himself. The course of action was primarily entrepreneurism. However, in aiming at developing a viable product, knowledge had be accumulated is a systematic way through working through knowledge creation cycles and strategic learning.

Commitment analysis

1. This project was built on the unique skills and abilities of the CTO. He and the other joint-founder, a marketing person, generated a high level of psychological commitment
to the project, and, consequently, were able to obtain necessary funding from the network organization and venture capitalists. While project commitments were reduced by poor teamwork and communications, the knowledge creation objectives were met.

2. Commitments associated with the network organization seemed to conflict with the creative commitments driving the project. The supporting network organization appeared to lack purpose, tended to hide mistakes and discouraged risk-taking.

3. The evidence indicates that the CTO’s knowledge commitments took precedence over all else in the project. It is also clearly evident that the CTO was in dispute with the investors about the need to raise more operating funds.

Change outcomes

1. The CTO’s view is that this project was an outstanding success. However, examining his quotation about the outcomes, ‘in terms of world history it has to be put down as an outstanding success in terms of human knowledge. You would have to place it with the discovery of radioactivity, or something like that’ would suggest he is guilty of overstatement, or even lack of reality. His further statement that while the business plan’s criteria were not met the investors were not dissatisfied may also have been unrealistic, for the investors have since capped their investment, and the organization now consists of only the CTO with some part time help. The organization’s joint founder advised that if the CTO had put as much effort into achieving the business plan as he did in following his own research interests, the story may have been different.

2. However, it is not clear that the blame for the business setback lies with the CTO. During 2002 the worldwide downturn in telecommunications manufacturing caused the Australian photonics industry to totally collapse. In the market context, the fact that the project gained some useful sales in 2003 could be considered as a reasonable success.

3. So the objective situation is that the business objectives have not been met to an extent that no more resources will go into the project (at least in the short term), but that the knowledge creation work has met and exceeded objectives and created valuable intellectual property (this from the CTO’s viewpoint, the investors being somewhat less positive).

4. Graded 2/5 from viewpoint of the business plan objectives, and 5/5 for knowledge creation objectives.

Explanation

There appears to be competing agendas and commitments that have lead to disputes between the CTO and the organization’s investors, leading to the poor teamwork and communication that reduced the project commitments. The CTO has demonstrated his commitment to knowledge creation, but not to achieving the business objectives. At the same time the project has been badly affected by an industry downturn, and it is not clear that the project would have met its business plan objectives whatever the CTO had done. What seems perfectly clear is that the CTO has achieved his personal knowledge creation objectives, and that he expresses little regard for the investors – they have simply been there to help him achieve his personal objectives.

Conclusion

Small organization, high innovativeness, technology-based project type.

In regard to the four research propositions:

1. As with the benchmark projects, the theoretical models provided an effective basis for explaining the facts of the case. However, the measurement questions
did not identify that the CTO was working to a personal agenda that was not made explicit, and that personal commitments competed with the commitments motivating the formal project (as in X1). Neither did the measurement questions identify the structurated-type commitments associated with the parent network organization that are similar to those identified in M3, M4 and M5. The competing creative commitments and unmeasured structurated commitments can be accommodated in the theoretical models.

2. Assuming that the theoretical models can accommodate the competing creative commitments and the unmeasured structurated commitments, this case does not deny the general nature of the models.

3. The innovative idea was a spontaneous response to an organizational problem, and the nature of the problem determined the innovativeness of the project. The knowledge of the organization was influential in what problem was to be solved, but not the innovativeness of the solution.

4. This project was similar to X1 in being relatively low in creative commitments at the same time as high in innovativeness. However, as with X1, this is explainable and is not associated with successful outcomes, so the research proposition is not denied. The high innovativeness does not match the moderately high level of measured structurated commitments, but there are other structurated-type commitments related to the parent network that were not measured, so while the research proposition is not supported, it is also not denied.

The overall conclusion is that no research propositions are denied by the analysis of this case.
Summary Analysis – Project X3

Organization profile

A large Australian public company in the building products industry with 14000 employees world-wide. Project conducted within the pipes division that had an R&D staff of about 70.

Informant

The R&D manager who led the project in the development and plant commissioning stages.

Creative action

The innovative idea was the organization’s response to an external threat that would lead to the compulsory shut down of a very profitable area of business. One could say that the organization was receiving data from their environment about a threat, but no knowledge about how to overcome it. So overcoming the threat required an internal response. There was no external knowledge base that could provide a source of useful ideas on resolving the problem.

Innovativeness of project

While this project was aimed at replacing existing products in an existing market that the organization knew well, the project called for substantial adaptation of what was previously known and the introduction of a great many techniques and technologies that were new to the organization. Different production machines were required to be designed and built, and these would replace existing plant. Users would need additional training in the use of the product and would need to change their normal behavior to use it successfully.

Innovativeness score: 34 (36% of maximum)

Innovation strategy

Because of the organization’s extensive knowledge of materials technology and the market, any uncertainty about the outcome was at a relatively low level. Because all stakeholders appeared to be of one mind in pushing for outcomes, the consensus was favoring change rather than resisting it. The approach to achieving innovation was to gradually extend on existing knowledge through additional cycles of knowledge creation, what has been referred to as strategic learning.

Commitment analysis

1. This project was about replacing a very profitable profit that all stakeholders were very happy with and unwilling to walk away from. There was no effective replacement for the product. All stakeholders understood the organization’s problem and were committed to helping resolve it. The consequent commitment of external stakeholders helped key internal people to promote the innovation idea, and convince the Board to allocate appropriate resources to the project.

2. A high level of psychological and project commitments were generated, that together with a high level of social commitments favoring change, meant that a very high level of creative commitments existed. At the same time, since the project was simply replacing
something that was a perfect fit with the organization there was only a moderate level of structurated commitments resisting the project.

**Outcomes**

The project was graded an outstanding success on both technical and business criteria. (5/5)

**Explanation**

This case describes the “dream project”. It was based on the organization’s existing strong competencies; it attracted an appropriate level of resources, and was enthusiastically supported by all stakeholders. There was no ambiguity involved in the project. Success was assured as long as some technical problems could be solved, and the organization had a history of doing that. There were no competing commitments, and so everyone remained committed to a common goal, with nothing standing in the way. The creative commitments were very high and reinforced by supporting commitments from external stakeholders, and the structurated commitments were only moderate. The project had every reason to be successful.

**Conclusion**

Large company, low innovativeness, technology-based project type.

In regard to the four research propositions:

1. As with the benchmark projects, the theoretical models provided an effective basis for explaining the facts of the case. The measurement questions did not identify the strong commitments from external stakeholders that would have reinforced the creative commitments, but these can be accommodated in the theoretical models as in previous cases.

2. This case does not deny the general nature of the models.

3. The innovative idea was a spontaneous response to an organizational problem, and the nature of the problem determined the innovativeness of the project. The knowledge of the organization was influential in what problem was to be solved, but not the innovativeness of the solution.

4. This project was very high in creative commitments while innovativeness was not at a high level. While this explains why the project succeeded it does not add support to the research proposition that suggests high innovativeness requires high creative commitments. However, the theoretical models do not preclude a situation where the creative commitments generated by a project of great importance to the organization are reinforced by strong external stakeholder commitments and lead to creative commitments that are overwhelmingly greater than that required to overcome the moderate level of structurated commitments. That is maybe what a “dream project” is about. So while the evidence is not convincing either way, the research proposition is not denied.

The overall conclusion is that no research propositions are denied by the analysis of this case.
Summary Analysis – Project X4

Organization profile

A franchised company that conducts educational courses, and provides educational services in the North Western area of Sydney. With casual contracted tutors, the normal staff level is less than 20.

Informant

Joint proprietor in charge of administration and marketing.

Creative action

Spontaneously generated by joint proprietors after a thorough review of business. The innovation idea was about simplifying the business through integration of marketing and administration towards a more systematic approach to increasing course numbers.

Innovativeness of project

The primary objective was to improve existing business by moderate adaptation of the existing business model, and introducing new software based control techniques. From each of the clients’ viewpoint - school, student, parent – there was a large increase in service performance at the same cost. The change did not require clients to learn anything new but did require them to undertake a moderate degree of behavior change.

Innovativeness score: 32 (32% of maximum)

Innovation strategy

The organization had extensive knowledge of both technology and market through the past experience of it proprietors and the franchise systems support, so uncertainty about the outcome was at a relatively low level. The approach to achieving innovation was strategic learning - extending on existing knowledge through cycles of knowledge creation.

Commitment analysis

1. The past educational and work experiences of key people, and the organization’s formal operating procedures, were important to success in this project.
2. There were strong creative commitments motivating the project. Psychological and project commitments to change were both very high.
3. The project’s strong fit with the organization and market meant that the structurated commitments were at a moderate level.

Outcomes

The project was graded as exceeding expectations on both technical and business criteria (5/5).
Explanation

In this project creative commitments were high, and structurated commitments low. There were no other competing commitments, so there was nothing standing in the way of the project being successful.

Conclusion

Small company, low innovativeness, marketing project type.

In regard to the four research propositions:

1. The theoretical models provided an effective basis for explaining the facts of the case.

2. This case does not deny the general nature of the models.

3. The innovative idea was a spontaneous response to an organizational problem, and the nature of the problem determined the innovativeness of the solution, and subsequent project. The knowledge of the organization was influential in what problem was to be solved, but not the innovativeness of the solution.

4. This project was very high in creative commitments while innovativeness was not at a high level. As with X3, the creative commitments are overwhelmingly greater than that required for overcoming the moderate level of structurated commitments. This made for a successful project. However, the evidence as to whether creative and structurated commitments are related to innovativeness is not added to in any way, so the research proposition is not supported, but also not denied.

The overall conclusion is that no research propositions are denied by the analysis of this case.
Summary Analysis – Project X5

Organization profile

This project was conducted in an Australian public company that operates throughout Australia in refining, distributing and marketing petroleum products. It is 50% owned by a US parent and has approximately 4,000 employees.

Informant

The Brand Manager for the company, who was senior manager on the project.

Creative action

The organization operates in an industry that has been shaken up by the entry of two large retailers, changes in local clean fuel standards, and growth in demand in China drying up any surplus refining capacity in the Asian area. This has led to changes in competitive marketing in the industry. The organization commissioned consumer research that indicated that the organization’s brand positioning was not differentiating the organization or its products from its competitors. The organization’s creative response was a “Brand Review” project to develop a more effective positioning.

Innovativeness of project

This project would normally be described as a business improvement rather than innovation project. However the project did involve substantial adaptation of previous work with branding concepts, and different techniques were introduced that were new to the organization, and at a higher level of sophistication than previously. There were quite large longer-term benefits to external stakeholders through increasing the value of the business franchise. For the benefits of the project to be achieved, external stakeholders would need training and would need to change their behavior in relatively minor ways.

Innovativeness score: 34 (36% of maximum)

Innovation strategy

The approach to achieving innovation was strategic learning – gradually extending on existing knowledge through additional cycles of knowledge creation.

Commitment analysis

1. The shake-up of the industry has left external stakeholders uncertain of the future, and looking for leadership. Its knowledge of the industry and key customers is a capability that might help the organization in providing this leadership.
2. The project was motivated by a high level of both psychological and project commitments, and the organization’s social sense of purpose. The only commitments resisting this were the organization’s tendency to be risk averse, and its people’s concern with protecting their personal reputations.
3. An important competing commitment was that of the US company’s Board representatives who were committed to adopting a more consistent global approach. The creative commitments generated in the project were sufficient to overcome this barrier.
Outcomes

The results of a change program such as this in terms of brand equity measures and sales growth objectives might take many months or even a year or so to objectively measure. The shorter-term criteria is about acceptance and support by internal and external stakeholders. At the implementation stage all criteria have been met (4/5).

Explanation

There were sufficient creative commitments generated to overcome a relatively high level of structurated commitments to see this project proceed, and meet its knowledge creation and business objectives.

Conclusion

Large company, low innovativeness, marketing project type.

In regard to the four research propositions:

1. The theoretical models provided an effective basis for explaining the facts of the case. However, the measurement questions did not identify commitments of a structurated type related to the US parent’s strategy to maintain global consistency. As in other cases these commitments may be able to be accommodated in the theoretical models.

2. This case does not deny the general nature of the models.

3. The innovative idea was a spontaneous response to an organizational problem, and the nature of the problem determined the innovativeness of the solution, and subsequent project. The knowledge of the organization was influential in what problem was to be solved, but not the innovativeness of the solution.

4. This project had moderately high creative and structurated commitments while innovativeness was not at a high level. There is no evidence adding to the question of whether creative and structurated commitments are related to innovativeness, so the research proposition receives no further support, but is also not denied.

The overall conclusion is that no research propositions are denied by the analysis of this case.
Appendix 10 – Across case patterns

This analysis conducted on the following spreadsheet compares the pattern of across-case responses to 33 questions described under the seven headings below. In this analysis the patterns for the M cases are compared with those of the X cases. The questions raised in this analysis are as follows:

Creative action (Questions 1-3)

The questions are whether or not the idea was spontaneously generated (Q1); responded to external pressure (Q2); changed during the project (Q3). Answered either yes (Y), or if answer was no the cell left blank.

Innovativeness (Questions 4-12)

These questions relate to the various elements of the innovativeness measure. Questions 4-6 are about the purpose of the change and are answered (Y) or the cell left blank. Questions 7-12 relate to the level of the elements of innovativeness addressed in the Survey Questionnaire. The questions are answered by reference to questionnaire responses and categorized as low (L), moderate (M), or high (H), high being 5 on the 5-point scale.

Strategy (Questions 13-15)

These three questions relate to the identification of the routes to innovation of the conceptual model of Figure 3.3. Answered yes (Y) if the particular strategy is identified or no by the cell being left blank.

Knowledge profile (Questions 16-19)

These questions relate to the level of the four forms of knowledge in the case. The strength of the measure is categorized as low (L), moderate (M) or high (H) based on the calculated strength of response figures shown in Appendix 7. The strength of response category is a rough measure indicative of both across case relativities for each knowledge and across knowledge relativities within each case.

Commitment analysis (Questions 20-26)

Questions 20-24 relate to the level of the four forms of commitment in the case. As for knowledge the categorizations as L, M or H are based on the calculated strength of response figures of Appendix 7, and across case and within case relativities. Questions 25 and 26 ask whether internal conflicting commitments or external supporting commitments were identified in the case analysis.

Change outcomes (Questions 27-29)

Questions concern the level of reported outcomes related to knowledge creation, business creation and business improvement.

Explanations (Question 30-33)

These questions relate to the perceived role of the various forms of commitment in the case explanations. The categorization L, M or H is a subjective estimate.
<table>
<thead>
<tr>
<th>Q No</th>
<th>Question</th>
<th>Case M1</th>
<th>Case M2</th>
<th>Case M3</th>
<th>Case M4</th>
<th>Case M5</th>
<th>Case X1</th>
<th>Case X2</th>
<th>Case X3</th>
<th>Case X4</th>
<th>Case X5</th>
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<td>Y</td>
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<td>Y</td>
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<td>Y</td>
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<td>M</td>
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<td>Project commitments generally higher for X cases than M cases.</td>
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<td>H</td>
<td>L</td>
<td>M</td>
<td>M</td>
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<td>Project commitments generally higher for X cases than M cases.</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
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<td>M cases had conflicting commitments more often than X cases.</td>
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<tr>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
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<td>L</td>
<td>H</td>
<td>H</td>
<td>M</td>
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<td>M</td>
<td>L</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td></td>
<td></td>
<td>All cases had similar levels of knowledge creation results.</td>
</tr>
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</table>

Explanations:
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
- M cases had more need of external supporting commitments to resolve.
Appendix 11 – Across case innovativeness patterns

The analysis conducted on the following spreadsheet compares the pattern of across-case responses to the same 33 questions as the analysis of Appendix 10. The descriptions of the questions are covered in Appendix 10.

In this analysis the cases were ranged in the order of increasing innovativeness of the change projects covered by the case. The level of innovativeness was taken to be that calculated as Item 60 of Appendix 7 – Case data and calculations.
<table>
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<th>Q No</th>
<th>Question</th>
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<th>Case X3</th>
<th>Case X5</th>
<th>Case M2</th>
<th>Case M1</th>
<th>Case M3</th>
<th>Case M4</th>
<th>Case X2</th>
<th>Comments</th>
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<td>Y</td>
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<td>Y</td>
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<td>Y</td>
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<td>Y</td>
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<td>Higher 1 cases sought higher performance increases.</td>
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<td>L</td>
<td>M</td>
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<td>M</td>
<td>M</td>
<td>L</td>
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<td>L</td>
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<td>Y</td>
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<td>H</td>
<td>M</td>
<td>H</td>
<td>L</td>
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<td>M</td>
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<td>M</td>
<td>L</td>
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<td>M</td>
<td>H</td>
<td>M</td>
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<td>M</td>
<td>M</td>
<td>L</td>
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<td>H</td>
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<td>H</td>
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Appendix 12 – Correlation analysis

The correlation analysis was conducted on the 14 variables listed in the following table. The item number shown for each variable is the one assigned in Appendix 7 – Case data and calculations.

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<th>Abbreviation</th>
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<td>66</td>
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<td>SC</td>
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<td>B out</td>
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<td>17a</td>
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<td>Prop K</td>
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Appendix 13 – Differences between case groups

This analysis was conducted on the same 14 variables listed in the table of Appendix 12 – Correlation analysis.

The hypothesis tested is that the sample groups come from the same population.

Means were calculated for each sample of M projects and X projects for all of the innovativeness, knowledge and commitment variables. The test was a t-test paired two sample for means procedure at a 95% confidence level. The hypothesis was accepted for all variables.
<table>
<thead>
<tr>
<th>Case</th>
<th>Innovativeness</th>
<th>Pers K</th>
<th>Prop K</th>
<th>Pub K</th>
<th>Coll K</th>
<th>KB</th>
<th>Psyc C</th>
<th>Proj C</th>
<th>Struc C</th>
<th>Soc C</th>
<th>CC</th>
<th>SC</th>
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<th>B out</th>
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<td>4</td>
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<td>12.5</td>
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<td>31</td>
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<td>2</td>
<td>19.5</td>
<td>50.5</td>
<td>29</td>
<td>20</td>
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<td>25</td>
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<td>52.5</td>
<td>5</td>
<td>2</td>
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<td>X3</td>
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<td>18</td>
<td>14</td>
<td>5</td>
<td>25</td>
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<td>9</td>
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<tr>
<td>X5</td>
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<td>14.5</td>
<td>7</td>
<td>24</td>
<td>63.5</td>
<td>23</td>
<td>27</td>
<td>13</td>
<td>25.5</td>
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<td>60.5</td>
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<td>4</td>
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<tr>
<td>Mean</td>
<td>40.6</td>
<td>18.2</td>
<td>14.1</td>
<td>4.8</td>
<td>22.1</td>
<td>59.2</td>
<td>25.8</td>
<td>22.9</td>
<td>10.6</td>
<td>27.1</td>
<td>90.2</td>
<td>55.4</td>
<td>4.2</td>
<td>3.8</td>
</tr>
</tbody>
</table>

| M1   | 47             | 16     | 9      | 7     | 23     | 55 | 23.5   | 21     | 10      | 27    | 85.5| 51  | 4     | 3     |
| M2   | 35             | 17     | 11     | 4     | 21     | 53 | 21     | 24     | 12      | 28    | 85  | 53  | 5     | 4     |
| M3   | 47             | 17     | 13     | 4     | 19     | 53 | 28     | 20     | 9       | 29    | 63  | 56  | 4     | 3     |
| M4   | 53             | 19     | 10     | 4     | 22     | 55 | 25     | 25     | 7       | 30    | 95  | 47  | 4     | 4     |
| M5   | 46             | 17     | 12     | 2     | 19     | 50 | 28     | 30     | 7       | 27    | 98  | 44  | 5     | 4     |
| Mean | 45.6           | 17.2   | 11     | 4.2   | 20.8   | 53.2| 25.1   | 24     | 9       | 28.2  | 89.3| 50.2| 4.4   | 3.6   |

- Mean difference = 0
- t statistic = -0.677
- 1.285, 2.062, 0.418, 0.727, 2.271, 0.33, 0.39, 0.961, -0.841, 0.291, 1.585, -0.534, 0.302
- t critical, two-tail = 2.78, 2.78, 2.78, 2.78, 2.78, 2.78, 2.78, 2.78, 2.78, 2.78, 2.78, 2.78
- Accept/Reject at 0.05?: Accept, Accept, Accept, Accept, Accept, Accept, Accept, Accept, Accept, Accept, Accept
- Accept/Reject at 0.1?: Reject
- t critical, 2.132
Appendix 14 – List of publications from this research


Glossary

Adaption – in business, expanding upon existing practice (refer Section 2.2.1).

Autopoiesis – a system’s capacity for self-production through a closed system of relations. The character of living systems that are organizationally closed, autonomous systems of interaction making reference only to themselves (refer Section 3.3.8).

Business practice continuum – the continuum of business practice ranging from pure adaption to pure innovation (refer Section 3.2.2).

Codified knowledge – knowledge in the form of oral, written or numeric statements that, given appropriate technology, can be readily communicated (refer Section 2.3.1).

Commitment – individual and organizational behaviour that binds the individual or the organization to a particular course of action (refer Section 2.4.1).

Creativity – in business, the process of producing useful ideas (refer Section 2.2.1.2).

Innovation – in business, doing things differently (refer Section 2.2.1).

Innovativeness – as defined in this study, a point on the business practice continuum (refer Section 3.2.1).

Invention – the act of creating something from the imagination (refer Section 2.2.1.2).

Knowledge – all types of knowledge relevant to business, both subjective and objective, namely, information, skill, explanation and understanding (refer Section 2.3.1).

Level variable – a variable dealing with the question ‘how much?’, where more is desirable whatever the context. For example, more rather than less knowledge is desirable whatever the context (refer Section 2.2.2.1).

Objective knowledge – knowledge that is independent of the knower, as in theories, problems, critical arguments, and the content of books and libraries (Popper, 1979).
Organizational commitment – in conventional usage, the psychological state that characterises the relationship between an employee and an organization (refer Section 2.4.1).

Organizational level commitment – as defined in this study, an organization’s commitment to its stakeholders, and to organizational courses of action (refer Section 2.5.1).

Self-reference system – a non-living system that follows the organizational logic of autopoiesis (refer Section 3.3.10).

Social transaction – a social interaction that resolves differences in value between participants (refer Section 3.3.3).

Subjective knowledge – knowledge that needs a knower, as in mental states and behavioural dispositions to act (Popper, 1979).

Style variable – a variable dealing with the question ‘in what manner?’, where what is appropriate depends on context. For example, innovation is appropriate to certain problem solving contexts but not to others (refer Section 2.2.2.1).

Uncodified knowledge – knowledge that is not articulated and resides in the mind of the knower (refer Section 2.3.1).
References


Lawrence, P. R., & Lorsch, J. W. 1967. *Organization and Environment: Managing Differentiation and Integration*. Boston: Division of Research, Graduate School of Business Administration, Harvard University.


